Reprinted from

Journal of Emerging Market Finance

Published by
SAGE Publications India Pvt Ltd
Post Box 4109
New Delhi 110 017, India.

New Issues in Emerging Markets: Determinants, Effects, and Stock Market Performance of IPOs in Korea

Stephen C. Smith
Hesuk Chun

This article investigates why Korean companies go public and their subsequent performance. Ex ante and ex post evidence suggests firms do not go public to fund investment in fixed assets. Financially marginal firms are more likely to go public to take advantage of windows of opportunity. Financially healthier independents also go public to rebalance their portfolios. Chaebol *(conglomerate) subsidiaries apparently use initial public offerings (IPOs) to fund equity investments and take advantage of windows of opportunity. Buy-and-hold returns show Korean IPOs outperformed the stock market—with the divergence widening over time—in contrast to developed markets.*

1. Introduction

Emerging stock markets play an increasingly important role in developing countries, but have received less attention in the literature than the banking sector and the bond market. Moreover, most studies of emerging stock markets have focused on the secondary market.[1] This article seeks to explain

Acknowledgements: We would like to thank Robert Phillips, Chris Snyder, Isabelle Bajeux-Besnainou, and an anonymous IGMR working paper series referee for their valuable comments.

[1] For example, in a study of 40 countries, Atje and Jovanovic (1993) found a significant correlation between economic growth over the 1980–88 period and the value of stock market trading as a share of GDP. Levine and Zervos (1998) found that, after allowing for other

why Korean companies go public, using ex ante and ex post evidence. Other than the Italian data of Pagano et al. (1998), ours is the first use of evidence on firms while they are still private to study the IPO decision. We test the hypothesis of Singh (1995) that emerging market firms go public to finance investment against the conclusion of Pagano et al. that Italian firms go public to rebalance accounts after a period of high investment and growth.

The evidence we present suggests that there is considerable heterogeneity in motivations for going public. Financially marginal firms are more likely to go public to take advantage of windows of opportunity. Financially healthier independents also go public to rebalance their portfolios. It is difficult to infer the IPO motivations of *chaebol* (conglomerate) subsidiaries, but our evidence suggests that these firms use IPOs to fund equity investments and take advantage of windows of opportunity. A consistent finding, however, is that these firms generally do not go public to fund new investment in fixed assets. We also find that current industry market-to-book (MTB) value increases IPO probability, while lagged-MTB decreases it. We argue that most firms who wish to conduct an IPO would do so when MTB is high; and similarly firms may postpone an IPO when MTB is low.

In addition, we find that Korean IPOs subsequently outperform the stock market average. Indeed, this divergence widens over time, in contrast to the IPO 'new issue puzzle' literature on IPO underperformance in developed stock markets.[2] Although consistent with our finding that IPOs exceed the market's average profitability in the five years after listing, this result presents another IPO puzzle: why do markets not capitalise the information that Korean IPOs consistently show superior performance with an immediate rise in their prices, rather than leave a predictably widening gap over a period of several years?

The organisation of the article is as follows. Section 2 provides a brief literature review. Section 3 describes the unique data sources and samples for the study. Section 4 analyses the determinants of the decision to go public on the basis of firms' ex ante characteristics. Section 5 reports the effects of going public on subsequent profitability, investment, cost of financing and other accounting variables. Section 6 compares the stock market

factors associated with growth, the level of stock market development, especially market liquidity, was robustly correlated with current and future economic growth, capital accumulation, and productivity growth. Moreover, they found that measures of both stock market development and banking development independently predicted long-run growth even when entered together in cross-country growth regressions.

[2] See e.g., Loughran and Ritter (1995).

return on investments in IPOs with the market index. Section 7 summarises and draws general conclusions from the results.

2. Literature Review

The literature has considered a number of potential costs and benefits of going public.[3] First, smaller and newer companies are less well known to investors; this informational asymmetry adversely affects the average quality of companies seeking to go public and thus their potential share price. As a result, IPO probability would be positively correlated with firm size.

Second, going public entails initial (IPO) and subsequent (listing) costs of underwriting, registration, legal, accounting, auditing and other professional fees. In the United States, IPO costs are typically 7 per cent of gross proceeds.[4] In Italy, IPO costs amount to about 3.5 per cent of gross proceeds (Pagano et al. 1998). In Korea, IPO costs have been reported to be about 3 per cent of gross proceeds.[5] Liquidity of a company's shares increases with trading volume, so only sufficiently large companies may effectively gain the liquidity benefits of listing. Thus, listing expenses do not increase proportionally with IPO size; again, the implication is that IPO probability will be positively correlated with company size.

Third, gaining access to a non-bank source of finance is a benefit of going public, especially for firms with major investment plans and high leverage. In this view, newly listed companies would increase investment or reduce debt after an IPO. Fourth, and relatedly, by gaining stock market access and in the process disseminating information to investors, firms encourage competition for outside financing and generally receive a lower cost or a larger amount of credit (Rajan 1992). Thus, companies facing higher interest rates are more likely to go public and interest rates paid by firms would be likely to fall after an IPO. Fifth, if diversification is an important motive in the IPO decision, then riskier companies would be more likely to go public. Thus, IPO incidence may vary by industry.

Sixth, firms 'recognising' that listed companies in their industry are overvalued have an incentive to go public (Ritter 1984). Alternatively, a high MTB ratio may also indicate that investors anticipate valuable growth opportunities within the industry. If these opportunities require large investments,

[3] This section draws extensively from Pagano et al. (1998).

[4] See Ritter (1987) and Chen and Ritter (2000).

[5] The Korean figure was reported in M.K. Choi, 'A Case Study on the Public Offerings of Korean Firms' Masters Thesis, Yonsei University, 1990. In each country modest fixed fees were also assessed, on the order of $250,000 in the reported periods.

then companies will be induced to go public to raise funds (Singh 1995). If firms have higher growth and profits after an IPO, the latter interpretation is more likely; if growth and profits are lower, the former implication, known as the window of opportunity hypothesis, is more likely.[6]

Singh and Hamid (1992) investigate the potential links between corporate capital structure and the types of financial markets and institutions that are supportive of long-term growth. To that end, they examine accounting and stock market information for the top 50 listed manufacturing corporations in nine emerging markets—India, Jordan, Korea, Malaysia, Mexico, Pakistan, Thailand, Turkey and Zimbabwe. They find that emerging market corporations rely on external finance, particularly equity finance, for the growth of their net assets to a greater extent than their counterparts in more advanced economies. They conclude that more than 40 per cent of corporate growth in five of their nine sample countries, including Korea, was financed by new share issues. Singh (1995) tests the robustness of these results by expanding his sample to the top 100 firms and by adding a tenth country, Brazil. Relying in part on UNCTD (1993) statistics, Singh concludes that emerging market corporations tap equity markets to finance investment.

In contrast, Pagano et al. (1998) conclude that Italian companies go public not to finance future investment and growth, but to deleverage, or 'rebalance their accounts after high investment and growth.' Using financial data from private firms in Italy over the period 1982–92, Pagano et al. analyse the determinants of IPOs by comparing ex ante and ex post characteristics of IPO firms with those of firms that remained private. They find that the likelihood of an IPO increases most significantly with industry MTB ratio and company size. After the IPO, firms exhibit a lower leverage ratio, credit costs, and capital expenditures.

The United Nations Conference on Trade and Development (UNCTAD 1993) reports that, for several emerging market countries, new issues on the stock market have been important in financing a considerable proportion of total gross domestic investment (GDI). In 1989, new capital raised by domestic companies in the Korean stock market represented 32 per cent of aggregate GDI. In Thailand, the corresponding ratio was 28 per cent in the same year.

Using a survey of the Securities Supervisory Board (1988), Park (1990) reports that 33.9 per cent of Korean companies indicate that the most important benefit of going public is easy access to a source of funding and/or benefits from new funding. The second most important benefit is gaining

[6] For a further discussion see Pagano et al. (1998).

market credibility (28.3 per cent response). The survey showed that loss of control is considered one of the most critical obstacles to going public.[7] While attitudinal evidence can provide important insights, this study takes a revealed preference approach to identifying the underlying motives for the IPO decision.

Ritter (1991) reports that US firms issuing IPOs from 1975 to 1984 underperformed similarly-capitalised firms, during the three-year period following the closing price on the first day of public trading. Moreover, companies that went public in high-volume years had the worst returns. Ritter concludes that these patterns are consistent with investors being 'periodically overoptimistic about the earnings potential of young growth companies', which take advantage of these 'windows of opportunity'. Loughran and Ritter (1995) further examine the 'new issue puzzle', and conclude that US IPOs have been poor long-run investments for investors over the 1970–90 period.

IPO underperformance is not restricted to the United States; for example, Levis (1993) shows that IPOs in the UK underperformed relevant benchmarks for 36 months after their first day of trading. In contrast, Kiymaz (1999) reports that Turkish IPOs substantially outperform the market in the three years following the first day of trading, while Lee (1993) reported superior IPO performance for Korea based on three-year wealth relatives for firms going public from 1988 to 1990. We reexamine this claim with a larger number of firms over a longer time period.

3. The Korean Case, and Data Sources and Samples

The Korean stock market greatly expanded during the sample period of 1986 to 1995, with the number of listed companies more than doubling from 355 to 721 (Table 1). The Korean stock market composite index rose nearly seven-fold from 138 at the end of 1985 to 934 at the end of 1996. By 1995, the market capitalisation of these equities was $141 trillion won, representing 40 per cent of Korean Gross Domestic Product (GDP).[8]

However, as shown in Table 2, Korean firms have had high debt-to-equity ratios compared to US companies, implying a greater reliance on debt finance. Thus, Korean firms may have gone public to strengthen their balance sheets after a period of growth rather than to fund new investments.

[7] This survey was reported in H.J. Park. 'Survey on the Determinants for Initial Public Offerings', unpublished manuscript, April 1990.

[8] In the aftermath of the 1997–98 crisis, stock market indicators fell substantially, but have since regained much of their lost ground.

Table 1
The Korean Stock Market: Summary Data

	1986	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*
Market Cap. (trillion won)	12	26	65	95	79	73	85	113	151	141
Market Cap./GDP (%)	13	23	48	64	44	34	35	42	49	40
Trading Vo. (trillion won)	10	20	58	81	53	63	91	170	230	143
Num. of Listed Co.	355	389	502	626	669	686	688	693	699	721
Stock Index	227	417	693	918	747	657	587	728	965	934

Source: Monthly Bulletin, Bank of Korea and Financial Statements Analysis, various issues.
Note: Stock index on 4 January 1980 = 100, and 138 in the year prior to the sample (1985).

Table 2
Average Debt to Equity Ratio of Manufacturing Companies (%)

Country	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*
Korea	348	351	340	296	254	286	307	319	295	303	287	317
USA	121	127	133	138	147	149	147	168	175	104	103	107

Source: Bank of Korea, Financial Statement Analysis, various issues.

3.1 Data

In Korea, as in most countries, private firm financial information is not easily obtained. However, the presence of a government 'corporate registration system' for private firms enables us to develop unique ex ante data for firms that go public and for others that, while qualified to go public, choose not to do so. While the eligible list is not public, the selection criteria are in the public domain. Since 1986 the *Korean Companies Annual Report* published by Korea Investors Service Inc. (KIS) has included financial statements for registered firms containing the accounting data necessary for this study.[9] Thus, the sample period begins in 1986 with the initial publication of the KIS Report and runs through 1995, prior to the onset of the recent financial crisis. The 'KIS–FAS Data Base' is the source of data for listed companies. Stock market statistics are drawn from the Korea Stock Exchange (KSE) database, and the 'Monthly Review' published by the Securities Supervisory Board. Sample companies represent 18 Standard Industry Classification (SIC) industries according to the two-digit SIC codes used by the National Statistics Office.

[9] While Maekyung, the daily newspaper publisher, has published a report including financial information of registered firms since 1979, it does not provide sufficiently detailed data for this study.

Separate samples are used for the analysis of ex ante determinants (Sample A), and ex post performance of IPOs (Sample B). For the analysis of ex ante determinants, only companies legally eligible to go public in a given year are included.[10] Thus, our full sample, termed Sample A, is restricted to (non-financial) companies that satisfied the operative listing requirements in a given year.[11]

The Korean government imposed 15 IPO requirements at different times during the sample period. These requirements, which consist of factors both quantifiable (e.g., financial ratios) and non-quantifiable (e.g., audit opinions), were modified several times during the study period (see Table 3). The only publicly available information is the financial statements of companies published by the KIS. Therefore, only quantifiable financial ratio requirements could be applied as sampling criteria. The quantifiable financial ratios are paid in capital, shareholder's equity, sales, return on paid-in capital, and the debt ratio.[12] Applying these criteria, Sample A consists of 2,026 annual firm observations, of which 304 firms went public and 1,722 firms remained private.

Sample B consists of all 325 Korean firms that went public during the study period.[13] This sample is used to assess the ex post impact and stock market performance of IPOs.

3.2 Subsample groups

3.2.1 Chaebol versus Independents

Large conglomerates known as *chaebol* led the Korean economy during the study period. When a parent company was listed, it was likely that all of its

[10] This parallels the methodology of Pagano et al. (1998).

[11] The selection process involved examining the annual financial statements of almost 3,000 registered firms for the 10-year period, and applying government-mandated criteria to each company to select firms eligible for an IPO in each year to create the database.

[12] The minimum return on paid-in capital changed twice during the sample period. The government required a return on paid-in capital of 100 per cent of the time deposit rate for the 1986 to 1989 period and 150 per cent of the time deposit rate for the 1989 to 1995 period. As shown in Table 5, the time deposit rate was fixed at 10 per cent from 1986 to 1992 and ranged from 8.5 per cent to 10 per cent for the final years of the sample. However, it proved necessary to use a 10 per cent cutoff throughout the sample period. Note also that for construction companies, the government imposed stricter criteria than for other industries (paid in capital of 5 billion won and shareholder's equity of 10 billion won in 1992), because the construction industry is considered to be riskier than other industries in Korea; we selected construction companies for our sample by applying these stricter government criteria.

[13] Note that there are 21 fewer IPOs in sample A than in sample B, because some observations had to be deleted due to missing data.

Table 3
Official Listing Requirements

	1983–88	*1989*	*1990–91*	*1992*	*1993–95*
1 Age of Firm (years)	3	3	5	5	5
2 Paid in Capital	0.5	1	2	3	3
3 Shareholder's Equity			3	5	5
4 Sales				20	*A
5 Debt Ratio		*B	*B	*B	*B
6 Return on PIC	*C	*C	*D	*D	*E
7 Loss	None in recent years				
8 Audit Opinion	Acceptable audit during the most recent three years				
9 Bankruptcy	Must be cleared one year before				
10 Litigation	No record of litigation				
11 Merger	Year end balance sheet must reflect any merger activities				
12 Capital Increase	Capital increases due to asset revaluation should be less than 30 per cent of total. Capital increase due to other paid-in capital should be less than 30% of total				
13 Equity Transfer	No record within six months				
14 Transfer Agent	Yes				
15 Standard Form of Equity	Yes				

Source: Official Korean government documents. Average debt ratio of the industry from Financial Statement Analysis, published annually by the Bank of Korea.

Notes: Won in Billions.
*A: Year previous to IPO: over 20 billion
Average of prior three years: over 15 billion
*B: Less than 150% of the average debt ratio of the firms in the same industry
*C: (1) Higher than the time deposit interest rate for two years prior to IPO or (2) higher than the time deposit interest rate for the previous year of IPO and higher than 50% of the previous year's RPIC of IPO for the two years before the previous year of IPO.
*D: (1) Higher than 150% of the time deposit interest rate for two years prior to IPO or (2) higher than the 150% of the time deposit interest rate for the previous year of IPO and higher than the time deposit interest rate for the two years before the previous year of the IPO
*E: Higher than 150% of the time deposit interest rate for the previous year of IPO and aggregate 30% for the three years prior to IPO.

subsidiaries gained some of the benefits and bore some of the costs of going public. Moreover, larger companies had easier access to bank loans than smaller independent companies (this is one of the acknowledged reasons for the 1997–98 financial crisis). As a result, it is likely that *chaebol* subsidiaries had easier access to bank loans to finance investments, mitigating the need to go public. Thus, companies have been divided into two

subsamples: *Chaebol* subsidiaries and independent companies.[14] The top 30 *Chaebols* were selected based on total assets (as defined by the Korean Government's 'Monopoly Regulation and Fair Trade Act').

3.2.2 Financially Healthy versus Marginal Firms

Some firms may manipulate their books to become eligible for an IPO, but would be ineligible given their actual financial conditions. These unobservable conditions could make a difference in ex ante financial characteristics and/or ex post performance across firms. To address this issue, a subsample 'A-1' was selected by imposing stricter criteria on the debt ratio and sales. In particular, a debt ratio of less than 120 per cent of the average debt ratio of the listed firms in the same industry, instead of less than 150 per cent, and sales of 30 billion won instead of 20 billion won, were employed. Thus subsample A-1 is less likely than Sample A to contain firms that are eligible only because of financial manipulation. (This is due both to the difficulty that firms may have in manipulating their financial statements to the degree necessary to meet our stricter criteria; and also because firms had less incentive to manipulate to a point beyond the minimum government criteria.) Subsample A-1 contains 1,606 firm observations with 222 IPOs, a decrease of 82 IPOs (27 per cent) from Sample A. Subsample 'A-2' is comprised of the firms removed from Sample A in creating Subsample A-1.

3.3 Variables

Variables used in the analysis are selected to reflect arguments concerning determinants of going public as explained in Section 2. The logarithm of total firm assets (ASSET) is used as a measure of corporate size; its inclusion is intended to reflect the argument that informational asymmetry, as well as the relative fixed costs of listing, are likely to be smaller for larger firms and these firms are therefore more likely to go public.[15] LEVERAGE is measured as the value of total debt over total debt plus equity; high leverage may induce firms to go public as an alternate source of funding. Return on assets (ROA) is used as a proxy for profitability. COVERAGE is the ratio

[14] The *chaebol* subsidiary IPOs may be comparable to the carve-outs of the Pagano et al. (1998) study because both events reflect the separate market listing of a division that was previously considered exclusively as a part of the parent.

[15] Corporate size can be proxied through various indicators including employment, net worth, sales, and total assets. These measures tend to be highly correlated, as described in Singh and Hamid (1992, 1995). In the probit regressions, sales were used as an alternative measure and the conclusions were not qualitatively affected.

of operating income to interest expense. Unfortunately, in Korea bank credit information for individual companies is not available. Thus, INTEREST is measured by total interest expense divided by total debt as a proxy of the actual interest rate for the company. Clearly, companies with relatively high interest costs would find equity finance more attractive. To construct the MTB value of equity of public companies in the same industry, we first take the yearly average MTB for each company in the industry, and then take the median of these average values as the industry MTB. This is used as a proxy for future investment opportunities and to measure the buoyancy of the relevant market. The growth rate of fixed assets (INVEST) is used to measure firms' requirements for direct productive investment funds for plant and equipment, which would increase the likelihood of an IPO. Finally, GROWTH is the rate of growth of total assets, an alternative variable measuring financing needs, but in much broader terms including acquisitions, channeling funds to subsidiaries, and other equity investments. The role of these variables is interpreted further below.

In Table 4, we present sample statistics for each of these variables, for the full sample, and for each of the subsamples examined. Tests of differences between means across the relevant subsamples are also presented. The results show that the subsamples differ in some important respects. In particular, firms going public have higher assets, greater leverage, and higher MTB, but lower ROA than those remaining private (Table 4a). *Chaebol* subsidiaries have higher assets, MTB, and growth rate of fixed assets, than non-*chaebols* (Table 4b).

Among the 82 IPOs removed in the process of generating subsample A-1, 64 (21 per cent) were removed due to high leverage while the remaining 18 (6 per cent) were removed due to low sales. Table 4c reports summary

Table 4
Sample Statistics, with Tests of Differences between Means

Variable	*Mean*	*Std Dev.*
ASSET (ln)	10.44	1.24
LEVERAGE	0.69	0.13
ROA	0.11	0.06
COVERAGE	6.05	71.47
INTEREST	0.1	40.12
MTB	1.06	0.30
INVEST	0.35	0.35
GROWTH	0.30	2.43

Table 4a
Firms Going Public in Year of IPO (N = 304) versus Firms Remaining Private (N = 1,722)

	IPOs		*Remaining Private*		
	Mean	*Std Dev.*	*Mean*	*Std Dev.*	*T-stat*
ASSET (ln)	10.91	1.47	10.35	1.18	7.26***
LEVERAGE	0.70	0.14	0.68	0.13	2.47***
ROA	0.10	0.05	0.11	0.06	–2.68***
COVERAGE	4.04	6.67	6.41	77.47	–0.53
INTEREST	0.13	0.09	0.14	0.13	–1.34*
MTB	1.20	0.31	1.03	0.29	9.11***
INVEST	0.33	0.31	0.35	0.36	–0.92
GROWTH	0.25	0.23	0.31	2.64	–0.40

Table 4b
Chaebol Subsidiaries (N = 305) versus Non-Chaebols (N = 1,721)

	Chaebol		*Non-Chaebol*		
	Mean	*Std Dev.*	*Mean*	*Std Dev.*	*T-stat*
ASSET (ln)	10.77	1.31	10.38	1.23	1.24*
LEVERAGE	0.70	0.14	0.69	0.14	1.15
ROA	0.12	0.07	0.12	0.06	0.00
COVERAGE	6.85	58.44	5.92	73.55	0.21
INTEREST	0.15	0.19	0.14	0.11	1.15
MTB	1.12	0.31	1.05	0.31	3.76***
INVEST	0.39	0.39	0.35	0.35	1.84**
GROWTH	0.26	0.25	0.32	2.64	–0.40

Table 4c
Summary Statistics for Subsamples A-1 (N = 1,606), and A-2 (N = 420)

	A-1		*A-2*		
	Mean	*Std Dev.*	*Mean*	*Std Dev.*	*T-stat*
ASSET (ln)	10.46	1.24	10.34	1.28	1.77**
LEVERAGE	0.68	0.12	0.72	0.15	–5.61***
ROA	0.11	0.05	0.11	0.07	0.00
COVERAGE	3.54	4.2	16.11	159.39	–3.21***
INTEREST	0.13	0.07	0.16	0.24	–4.56***
MTB	1.05	0.31	1.10	0.27	–3.04***
INVEST	0.34	0.30	0.36	0.48	–1.04
GROWTH	0.22	0.21	0.64	5.42	–3.15***

Notes: Won in millions, %. Whole Sample, N = 2,026.
***, **, and * indicate statistical significance at the 1%, 5% and 10% levels respectively.

statistics of subsamples A-1 and A-2, respectively. The marginal firms assigned to subsample A-2 have fewer assets, but higher leverage, coverage, interest costs, MTB, and growth of total assets, than the rest of the subsample A-1. Firms in subsample A-1 that went public form our subsample B-1.

4. Analysis of Ex Ante Determinants

In this section, a probit model is used to estimate the probability of going public. The model used is:

$$Pr\,(IPO_{it} = 1) = F(a_1 ASSETS_{it-1} + a_2 GROWTH_{it-1} + a_3 LEVERAGE_{it-1} + a_4 ROA_{it-1} + a_5 MTB_{it} + a_6 MTB_{it-1} + a_7 COVERAGE_{it-1} + a_8 INVEST_{it-1} + a_9 INTEREST_{it-1} + \mu_t + V_i) \quad (1)$$

The dependent variable takes a value of 0 if company i remains private in period t and 1 if it goes public; $F(\cdot)$ is the cumulative distribution function of a standard normal variable. Two vectors of dummy variables μ_t account for time and industry effects.

4.1 Specification

Using the sample selection process described in Section 3, 2,026 firm observations meeting the official IPO listing requirements during the sample period (1986–95) were selected for this analysis. Consistent with prior studies, Table 5 shows a large clustering of IPOs in certain years and industries. Of the 304 IPOs, 173 (56 per cent) occurred during just two years, 1988 and 1989. There is also a clustering of some 71 per cent of IPOs (215 firms) in just five industries. Fabricated metal, general machinery, and equipment have the most IPO activity, with 98 IPOs (32 per cent); chemical products is the second most active with 46 IPOs (15 per cent). To control for economic and non-economic factors that may have influenced IPO clustering, year-dummy and industry-dummy variables are used.

To estimate the probit model, we use the available data, which are year-end accounting numbers. However, year-end accounting variables may not properly measure firm characteristics leading up to an IPO, because an IPO can occur at any time during the year. The use of contemporaneous, year-end accounting variables will partly reflect the effects of the IPO rather than exclusively the ex ante determinants of the IPO, particularly when the firm goes public during the early part of the year. Therefore, lagged year-end accounting variables are used as independent variables to avoid this 'timing problem'. Regression results are presented in Tables 6 and 7.

Pagano et al. (1998) also used lagged variables *except* for MTB, for which they used the *current* value.[16] This article explores several alternative

[16] Pagano et al. (1998) do not discuss (or even hint at) their reasons for using a different variable form.

Table 5
Distribution of IPOs in Sample A by Year and Industry

Ind/Year	*'86*	*'87*	*'88*	*'89*	*'90*	*'91*	*'92*	*'93*	*'94*	*'95*	*Total*
1.											0
2.			1	1							2
3.					1						1
4.	1	1	4	6		1			2	1	16
5.	1	1	9	10	3					2	26
6.			2	4	1						7
7.			2								2
8.		1	4	4	3	1			1	2	16
9.		6	16	9	5	3		2	2	3	46
10.	4	1			1			1	2	1	10
11.	2	2	6	6	2	2			2	1	23
12.	2	16	26	28	8	5		3	6	4	98
13.			2	2						2	6
14.				1					1	2	4
15.			2	9		1		1	3	1	17
16.		1	6	9	4	1			1		22
17.						1					1
18.			1	3		1	1	1			7
Total	**10**	**29**	**81**	**92**	**28**	**16**	**1**	**8**	**20**	**19**	**304**

Classification of Industry (by 2 digit SIC code)

Code/Ind	*Code/Ind*
1. Agricultural and Forest	10. Nonmetallic Mineral Products
2. Marine	11. Basic Metal Products
3. Mining	12. Fabricated Metal, General Machinery and Equipment
4. Processed Foods and Tobacco	13. Furniture and Manufacturing
5. Textile and Apparel	14. Electric Power, Water and Gas Supply
6. Leather and Footwear	15. Construction
7. Wood and Wood Producta	16. Wholesaling, Retailing
8. Pulp, Paper and Publications	17. Accommodation and Restaurants
9. Chemical Products	18. Transportation and Communication

Table 6
Determinants of the Decision to go Public, Baseline Regression

Variable	*Full Sample*		*Chaebol*		*Non-Chaebol*	
Intercept	–3.432***	(0.604)	–4.352***	(1.541)	–3.202***	(0.687)
ASSET	0.218***	(0.031)	0.268***	(0.090)	0.203***	(0.034)
LEVERAGE	0.111	(0.289)	0.125	(0.891)	0.155	(0.314)
ROA	–0.970	(0.680)	–2.064	(1.953)	–1.124	(0.752)
COVERAGE	–0.000	(0.000)	–0.001	(0.012)	–0.000	(0.000)
INTEREST	–0.423	(0.384)	–1.515	(1.865)	–0.257	(0.460)
Current MTB	0.974***	(0.329)	0.829	(0.830)	1.062***	(0.377)
Lagged MTB	–1.240***	(0.174)	–1.631***	(0.443)	–1.218***	(0.196)
INVEST	–0.202*	(0.115)	–0.545*	(0.318)	–0.136	(0.132)
GROWTH	–0.018	(0.022)	0.514	(0.479)	–0.020	(0.025)
'86	0.043	(0.268)	1.317**	(0.666)	–0.615	(0.374)
'87	–0.288	(0.176)	0.384	(0.463)	–0.425**	(0.196)
'88	0.369**	(0.158)	0.748	(0.493)	0.307*	(0.172)
'89	0.703***	(0.185)	1.309**	(0.567)	0.624***	(0.202)
'90	0.377**	(0.192)	0.399	(0.569)	0.385*	(0.208)
'91	0.017	(0.209)	0.427	(0.572)	–0.045	(0.232)
'92	–0.762*	(0.403)	–5.711	(15,930)	–0.672	(0.426)
'93	–0.277	(0.228)	0.342	(0.586)	–0.337	(0.254)
'94	0.102	(0.194)	0.241	(0.586)	0.118	(0.210)
Ind 1	–5.465	(6,554)	NA	NA	–5.635	(6,509)
Ind 2	–0.145	(0.505)	NA	NA	0.304	(0.520)
Ind 3	–0.139	(0.650)	NA	NA	–0.273	(0.672)
Ind 4	–0.109	(0.275)	–5.587	(31,163)	–0.245	(0.303)
Ind 5	0.119	(0.275)	–5,520	(17,446)	0.050	(0.307)
Ind 6	0.351	(0.354)	NA	NA	0.180	0.377
Ind 7	0.549	(0.547)	NA	NA	0.370	(0.560)
Ind 8	0.230	(0.285)	0.618	(0.835)	0.066	(0.316)
Ind 9	0.244	(0.254)	1.182*	(0.633)	0.037	(0.287)
Ind 10	0.197	(0.301)	1.814**	(0.755)	–0.350	(0.358)
Ind 11	0.691**	(0.278)	1.707***	(0.660)	0.385	(0.320)
Ind 12	0.592**	(0.300)	1.457*	(0.788)	0.389	(0.342)
Ind 13	0.328	(0.347)	7.950	(76,599)	0.101	(0.378)
Ind 14	0.895*	(0.541)	1.958*	(1.113)	0.631	(0.640)
Ind 15	–0.203	(0.273)	0.011	(0.708)	–0.349	(0.307)
Ind 16	–0.040	(0.292)	0.834	(0.679)	–0.281	(0.340)
Ind 17	–0.529	(0.587)	0.622	(0.907)	–6.283	(7,907)

Notes: Sample A, standard errors are in parentheses.
***, **, and * indicate statistical significance at the 1%, 5% and 10% levels respectively.

Table 7
Summary of Specifications (Sample A)

Panel A: Both time and industry dummies included

Variable	*Assets*	*Lever.*	*ROA*	*Cover.*	*IR*	*Cur. MTB*	*Lag. MTB*	*Invest*	*Growth*
Results with Cur. MTB								–0.099	–0.015
Whole	0.219***	0.174	–0.950	–0.000	–0.229	0.597*		–0.366	0.232
Chaebol	0.247***	0.131	–1.571	–0.001	–0.696	0.582		–0.015	–0.017
Indep. co	0.209***	0.210	–1.151	–0.000	–0.085	0.690*			
Results with Lag. MTB							–1.154***	–0.182	–0.017
Whole	0.221***	0.062	–1.052	–0.000	–0.400		–1.605***	–0.537*	0.492
Chaebol	0.283***	0.033	–2.212	–0.002	–1.408		–1.127***	–0.116	–0.019
Indep. co	0.202***	0.099	–1.197	–0.000	–0.252				
Results with both current and lagged MTB								–0.202*	–0.018
Whole	0.218***	0.111	–0.970	–0.000	–0.423	0.974***	–1.240***	–0.545*	0.514
Chaebol	0.268***	0.125	–2.064	–0.001	–1.515	0.829	–1.631***	–0.136	–0.020
Indep. co	0.203***	0.155	–1.124	–0.000	–0.257	1.062***	–1.218***		
Results without MTB								–0.093	–0.015
Whole	0.219***	0.144	–1.006	–0.000	–0.230			–0.360	0.212
Chaebol	0.259***	0.078	–1.664	–0.001	–0.670			–0.010	–0.017
Indep. co	0.207***	0.174	–1.202	–0.000	–0.098				

(Table 7 contd)

(*Table 7 contd*)

Panel B: Industry dummies excluded

Variable	*Assets*	*Lever.*	*ROA*	*Cover.*	*IR*	*Cur. MTB*	*Lag. MTB*	*Invest*	*Growth*
Result with Current MTB									
Whole	0.208***	0.073	–0.794	–0.000	–0.314	0.810***		–0.062	–0.015
Chaebol	0.228***	–0.578	–1.319	–0.002	–0.578	0.858*		–0.299	–0.017
Indep. co	0.194***	0.179	–0.945	–0.000	–0.200	0.842***		–0.007	–0.017
Results with Lag. MTB									
Whole	0.202***	–0.101	–0.676	–0.000	–0.279		–0.330**	–0.046	–0.015
Chaebol	0.212***	–0.380	–1.237	–0.003	–0.469		–0.595*	–0.346	0.274
Indep. co	0.186***	–0.056	–0.762	–0.000	–0.182		–0.303**	0.008	–0.017
Results with both current and lagged MTB									
Whole	0.211***	–0.010	–0.769	–0.000	–0.483	1.459***	–1.133***	–0.159	–0.018
Chaebol	0.234***	–0.628	–1.571	–0.003	–0.970	1.448***	–1.244***	–0.425	0.218
Indep. co	0.193***	0.089	–0.872	–0.000	–0.345	1.496***	–1.137***	–0.113	–0.019
Results without MTB									
Whole	0.202***	–0.037	–0.696	–0.000	–0.259			–0.028	–0.015
Chaebol	0.216***	–0.389	–1.125	–0.003	–0.449			–0.284	0.093
Indep. co	0.186***	0.013	–0.802	–0.000	–0.163			–0.027	–0.016

Note: ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels respectively.

formulations for the MTB variable. Following Pagano et al., we use current MTB. However, the lagged MTB is also employed in part to address the 'timing problem'. Similar to Pagano et al., we find that current MTB has a significant positive effect on IPO probability. However, we also find that lagged MTB significantly and robustly *decreases* the probability of listing (we interpret this finding further below).

In arriving at the final specification in Table 6, and in examining further the opposite signs of the coefficients on current and lagged MTB, we ran alternative regressions with different combinations of MTB and dummy variables. Table 7 summarises the results of these 16 regressions, with current, lagged, both, and no MTB variables included. Panel A contains the eight regressions with both time and industry dummies included, while Panel B contains results with time dummies only. For all specifications, the coefficient on current MTB is consistently positive and that on lagged MTB is consistently negative and both are individually statistically significant. When both current and lagged MTB are entered together in the regression, each is generally significant. There is one exception to this result: when including industry dummies, the coefficient on current MTB in the *chaebol* subsample is statistically insignificant (we interpret this exception below). Likelihood ratio tests reveal that industry dummies are significant as a group for all specifications as well as for all the sample groups. (It may be worth pointing out that industry remains constant across years but MTB does not, which explains why the inclusion of MTB does not fully account for industry patterns.) Time dummies are also jointly significant. Thus, the selected specification includes both time and industry dummies, and both current and lagged MTB.[17] Nevertheless, it is worth stressing that none of the other qualitative results in the article depend on the specification of MTB.[18]

[17] Additional evidence for the importance of including both MTB variables, and for the robustness of their signs, was found from a modified form of the regression, in which IPO probability is regressed on two differenced variables. In this alternative regression D1MTB, which is current MTB minus lag1 MTB, and D2MTB, which is lag1MTB minus lag2MTB, replace current and lagged MTB as regressors. The results, which are available from the authors, are consistent with the previous findings. The coefficient on D1MTB has a consistently positive sign and that on D2MTB a negative sign; each is statistically significant at the 1 per cent level. Note also that current and lagged MTB are not negatively correlated, which would be very unusual; what is identified is the pattern of relationships between industry MTB and the timing of IPOs. As a strategy for future research, one might examine MTB at the time of the IPO; unfortunately, only end of period data are available to us.

[18] Full results from the alternative specifications are available from the authors.

The regression results provide evidence to support the interpretation that the information content of lagged MTB is different than that of current MTB. Thus, regressions with only one of the two statistically significant MTB variables would appear to have omitted variable bias. In future research it would be useful to determine whether this finding applies to data sets from other countries. As regression results including both MTB variables were selected in the specification, these results, reported in Table 6, will be used in the discussion that follows.

4.2 Results for the full sample

The first column of Table 6 reports results for the full sample, while the second and third columns report results for *chaebol* subsidiaries and independent companies, respectively. MTB is the most significant determinant of IPOs. For the full sample, current MTB increases the probability of launching an IPO and lagged MTB decreases it. MTB is both a proxy for future investment opportunities and a measure of the 'buoyancy' of the stock market in the firm's sector. If the relevant market is buoyant, owners may exploit the overvaluation of their companies by investors as in Ritter (1984); or firms may consider high MTB values as an indicator of future growth opportunities. (Evidence from post-IPO firm operating performance presented in the next section supports the former interpretation.)

Thus, for the full sample and for independent companies, coefficients of both current and lagged MTB are always statistically significant. The only exception is for *chaebol* subsidiaries where the coefficient on current MTB is positive but not statistically significant. We tentatively conclude that the window of opportunity motive is stronger for independent firms than for the *chaebol* subsidiaries; we discuss this interpretation below.

The opposite signs on current and lagged MTB may seem paradoxical at first but we believe that there is a straightforward explanation. Most firms wishing to conduct an IPO would already have done so when MTB has recently been high; these effects would be partly captured by the sign on lagged MTB. Only a relatively small group of firms whose propensity to go public has markedly increased, or which have suddenly met the minimum government criteria for going public, would be expected to conduct an IPO in the period immediately following a high MTB ratio. In other words, the stock of firms with the eligibility and propensity to go public becomes temporarily depleted when MTB has been high, so that lagged MTB has a negative effect on current IPOs. Similarly, firms may postpone an IPO when MTB is low.

In Korea, during 1988–89, there was a clustering of IPOs, which continued to some extent into 1990. As shown in Table 6, rows 13, 14 and 15, the coefficients of these three-year dummies are generally statistically significant, particularly for 1989; these time effects are jointly significant. Three industries, basic metal products, machinery and equipment, and electric power, water and gas supply, are individually significant in the full sample, and these industry effects are jointly significant.[19]

Other than MTB and time and industry effects, our proxy for firm size (ASSETS) is the most important determinant of the probability of listing.[20] As presented earlier, there are several theories supporting the positive impact of firm size on the probability of an IPO. Listing on an exchange provides liquidity and diversification benefits to the initial owners of a firm. The liquidity benefits of listing only accrue above a critical level of trading volume and capitalisation. Further, the informational asymmetry between investors and issuers about the true value of companies going public lead to adverse selection costs, which is more serious for small companies. Listing also carries considerable expenses. Other things remaining equal, only firms above a certain threshold can recover these expenses.

As shown in the ninth row of Table 6 (INVEST), the growth rate of fixed assets has a negative coefficient, statistically significant at the 10 per cent level for the full sample and for the *chaebol* subsample; the effect is negative but insignificant for the independent companies. This is in contrast to Singh's (1995) study, which concluded that the largest Korean firms use IPOs to raise investment funds. In addition, the coefficients of current MTB are statistically significant only for independent companies, suggesting that these firms may have been more likely than *chaebols* to go public to take advantage of windows of opportunity.

The growth rate of total assets is an alternative variable measuring a firm's financing needs, but in much broader terms including acquisitions, channeling funds to subsidiaries, and other equity investments. This variable (GROWTH) is negatively associated with the likelihood of an IPO for the independent firms, and positively for the *chaebol* subsidiaries; but the

[19] The Pseudo R-squared in the regression for all firms in Sample A is 0.1449, which may be compared with the value of 0.100 in Pagano et al. (1998), page 44. The count R-squared's per cent concordant for this regression is 80.0 while per cent discordant is 19.6, which means that 80 per cent of IPO or 243 firms among the actual 304 IPOs were correctly predicted to go public. Test statistics for the other regressions are comparable and are available from the authors.

[20] As a sensitivity test, we replaced assets with sales as a proxy for firm size, and results were qualitatively similar.

coefficients, like that of the remaining variables, are not statistically significant.

4.3 Results for financially healthier and more marginal firms

We also ran separate probits for the financially healthy and marginal firms (subsamples A-1 and A-2, respectively) as described above. These results are reported in Table 8.[21] As with the full sample, current MTB and lagged MTB show opposite signs for all specifications. However, for the healthy firms (A-1), current MTB is not significant, while it is significant for the marginal firms (A-2). We interpret this finding as an indication that the IPO decision of the marginal firms is more driven by the presence of windows of opportunity, and that it is marginal firms driving the positive coefficient on current MTB in the full sample.[22] Among healthy firms, the significance patterns across *chaebol* and independent firms are similar, except that the negative coefficient on INVEST is significant at the 5 per cent level for the *chaebol* and insignificant for the independents, consistent with our earlier reasoning about the (possibly ex post) role of IPOs in financing takeovers for the *chaebols*. For financially healthy firms (A-1), in addition to lagged MTB, significant determinants of the probability of listing are size, profitability, coverage, investment, and the growth rate of assets. The growth rate of total assets (GROWTH) increases the probability of listing in subsample A-1 and this effect is statistically significant at the 1 per cent level. Presumably, faster growing companies are in need of funds for working capital and/or investment and more likely to conduct IPOs to finance their growth. However, there is no significant effect for the more marginal firms. At the same time, the growth rates of fixed assets (INVEST) decreases the probability of listing and is statistically significant at the 5 per cent level for both healthy and marginal firms.

For subsample A-1 only, the probability of an IPO is increasing in coverage (operating income divided by interest cost), and this effect is statistically significant at the 1 per cent level. This implies that among higher quality firms, those with less debt, and perhaps faster growth, are more likely to go public. In contrast to the results on coverage, the probability of an IPO is decreasing in ROA.

[21] Results from the other regressions are not reported here but are available from the authors upon request. Likelihood ratio tests in these cases support inclusion of time and industry dummies but fail to reject the null hypothesis of no differences between independent firms and *Chaebol* subsidiaries.

[22] This finding is an indication that the divergence between current and lagged MTB is not a mere unit root issue or statistical artifact. The findings are highly robust; for example, they hold under first differencing. Rather, the divergence reflects explainable behavioural differences across marginal and healthy firms.

Table 8
Determinants of IPOs for Financially Healthy and More Marginal Firms

Variable	*A-1 Full Sample*		*A-1, Chaebol*		*A-2, Non–Chaebol*		*A-2*
ASSET	0.215***	(0.036)	0.178*	(0.103)	0.200***	(0.041)	0.186**
LEVERAGE	0.505	(0.384)	0.075	(1.105)	0.596	(0.426)	–1.299*
ROA	–1.446*	(0.879)	–0.476	(2.445)	–2.088**	(1.004)	–1.936
COVERAGE	0.030***	(0.010)	–0.033	(0.053)	0.038***	(0.011)	–0.003
INTEREST	–0.120	(0.595)	–3.356	(2.377)	0.121	(0.634)	–0.701
Current MTB	0.478	(0.380)	0.442	(0.896)	0.665	(0.450)	2.429**
Lagged MTB	–1.139***	(0.198)	–1.818***	(0.528)	–1.037***	(0.224)	0.454**
INVEST	–0.330**	(0.161)	–0.559	(0.387)	–0.246	(0.186)	–0.048
GROWTH	0.642***	(0.219)	0.554	(0.550)	0.632**	(0.249)	2.690***
IND. Dummies	YES		YES		YES		YES
TIME Dummies	YES		YES		YES		YES

Note: Standard errors in parenthesis. With intercept, industry, and time dummies not reported.

5. Analysis of Ex Post Performance

For the analysis of ex post performance the model specification is given by

$$Y_{it} = a + \sum_{j=1}^{4} B_j IPO_{t-j} + B_5 IPO_{t-n} + u_i + d_t + e_{it} \qquad (2)$$

In Equation (2), Y_{it} is the i^{th} accounting variable in the t^{th} period, which represents firm operating performance. IPO_{t-j} is a dummy variable equal to one if year $t-j$ is the IPO year, while IPO_{t-n} is a dummy variable equal to one if the IPO took place five or more years ago. Firm specific effects, u_i, and time-specific effects, d_t, are included.

For this analysis, data from 325 non-financial firms that went public during the sample period (1986–95) are used to estimate the impact of an IPO on ex post performance.[23] However, the observation for the year in which firms went public is eliminated to avoid the 'timing problem' discussed previously. The sample statistics for the full sample of firms are presented in Table 9.

[23] Again, there are 21 fewer IPOs in sample A than in sample B, because these observations had to be deleted due to missing values.

Table 9
Effects of the Decision to go Public, Sample B (All IPOs)

Variable/Sample	*IPO + 1*	*IPO + 2*	*IPO + 3*	*IPO + 4*	*IPO > 5*	*p-value > F*
ROA						
Whole sample	–0.0268***	–0.0334***	–0.0355***	–0.0395***	–0.0422***	0.0001
325	(0.0041)	(0.0047)	(0.0052)	(0.0057)	(0.0065)	
Independent	–0.0260***	–0.0290***	–0.0311***	–0.0352***	–0.0359***	0.0001
265	(0.0047)	(0.0054)	(0.0059)	(0.0065)	(0.0074)	
Subsidiaries	–0.0279***	–0.0488***	–0.0511***	–0.0555***	–0.0669***	0.0001
60	(0.0081)	(0.0093)	(0.0104)	(0.0114)	(0.0131)	
LEVERAGE						
Whole sample	–0.0641***	–0.0399***	–0.0139	0.0048	0.0382***	0.0001
325	(0.0085)	(0.0097)	(0.0107)	(0.0118)	(0.0134)	
Independent	–0.0639***	–0.0401***	–0.0153	0.0065	0.0364**	0.0001
265	(0.0094)	(0.0107)	(0.0118)	(0.0129)	(0.0147)	
Subsidiaries	–0.0567***	–0.0291	0.0022	0.0079	0.0545*	0.0001
60	(0.0204)	(0.0233)	(0.0259)	(0.0285)	(0.0329)	
COVERAGE						
Whole sample	0.0162	–0.2307	–0.1621	–0.3907	–0.2702	0.0001
322	(0.2574)	(0.2929)	(0.3233)	(0.3547)	(0.4059)	
Independent	–0.2434	–0.1616	–0.1149	–0.3936	–0.2153	0.0001
263	(0.2671)	(0.3034)	(0.3339)	(0.3658)	(0.4180)	
Subsidiaries	0.8149	–0.7966	–0.4652	–0.4989	–0.6227	0.0001
59	(0.7410)	(0.8499)	(0.9451)	(1.0399)	(1.1989)	
INTEREST						
Whole sample	–0.0124	–0.0145	–0.0126	–0.0265**	–0.0249	0.0001
322	(0.0097)	(0.0111)	(0.0122)	(0.0134)	(0.0153)	
Independent	–0.0118	–0.0144	–0.0128	–0.0298*	–0.0255	0.0001
263	(0.0119)	(0.0135)	(0.0149)	(0.0163)	(0.0186)	
Subsidiaries	–0.0152**	–0.0161**	–0.0139	–0.0154	–0.0241**	0.0001
59	(0.0070)	(0.0080)	(0.0090)	(0.0099)	(0.0114)	
GROWTH						
Whole sample	–0.0377**	–0.0485***	–0.0592***	–0.0455**	–0.0582**	0.0001
322	(0.0158)	(0.0180)	(0.0198)	(0.0217)	(0.0249)	
Independent	–0.0380**	–0.0479**	–0.0565**	–0.0491**	–0.0553**	0.0001
263	(0.0177)	(0.0201)	(0.0222)	(0.0243)	(0.0278)	
Subsidiaries	–0.0344	–0.0536	–0.0719	–0.0376	–0.0747	0.0001
59	(0.0348)	(0.0399)	(0.0444)	(0.0488)	(0.0563)	
INVEST						
Whole sample	–0.0393**	–0.0271	–0.0278	–0.0279	–0.0307	0.0001
313	(0.0189)	(0.0213)	(0.0234)	(0.0261)	(0.0303)	
Independent	–0.0310	–0.0088	–0.0072	–0.0113	0.0037	0.0001
255	(0.0218)	(0.0244)	(0.0267)	(0.0297)	(0.0346)	
Subsidiaries	–0.0745**	–0.1118***	–0.1195**	–0.1045**	–0.1857***	0.0001
58	(0.0370)	(0.0420)	(0.0466)	(0.0522)	(0.0606)	

Note: Standard errors in parenthesis. With intercept, industry, and time dummies not reported.

As shown in Table 9, profitability (ROA) declines monotonically for the full sample following the IPO. This effect is gradual but steady, deteriorating from –2.6 per cent in the first year after the IPO to –4.2 per cent in the fifth year following the IPO. The fall in profitability is statistically significant at the 1 per cent level in each individual year. The magnitude of this effect is stronger for *chaebol* subsidiaries than independent companies, as confirmed by an F-test, which rejects the null hypothesis that the coefficient vectors are the same for the two groups. The fall in profitability after an IPO is consistent with the findings of Jain and Kini (1994), Mikkelson et al. (1997), and Pagano et al. (1998). As Jain and Kini (1994) and Degeorge and Zeckhauser (1993) point out, there are several possible explanations for declines in post-IPO operating performance, including increased agency costs, managers' window-dressing of accounting numbers prior to going public, and the timing of IPOs to coincide with unusually high profitability.

LEVERAGE sharply decreases in the first year (6.4 per cent for the full sample) following the IPO. This effect is larger and lasts longer for independent companies relative to *chaebol* subsidiaries, and is statistically significant at the 1 per cent level for two years after the IPO. For *chaebol* subsidiaries, this effect is statistically significant at the 1 per cent level only for the first year after an IPO.

For the full sample, the decision to go public has a negative impact on the investment growth rate (INVEST). This finding is in contrast to the conclusions of Singh (1995). For the full sample, investment growth rates decline sharply in the first year after the IPO. However, this effect is not significant statistically for independent companies. For *chaebol* subsidiaries, the effect is very strong, with the deterioration ranging from –7.45 per cent for the first year after the IPO to –18.57 per cent for the fifth and later years after an IPO.

A sharp decline in leverage and in investment after an IPO supports the hypothesis that firms substitute their source of funds from debt to equity in order to deleverage. This is more the case for independent companies than *chaebol* subsidiaries. However, this deleveraging effect is not long lasting. Leverage actually increases from five years after an IPO, statistically significant at the 1 per cent level for the full sample. After listing, the growth rate of total assets (GROWTH) decreases for all years; this effect is only significant for independent companies.

The cost of credit may fall after an IPO due to three factors: (*a*) companies become safer borrowers when they reduce their leverage; (*b*) more information becomes publicly available so lenders have more information about creditworthiness; and (*c*) being listed on the stock market offers a company

an outside financing option that improves firm bargaining power with banks (Rajan 1992; Pagano et al. 1998). Moreover, a successful IPO might help to build the firm's credibility more generally. As shown in Table 10, for the full sample an IPO is followed by decreases in the cost of debt (INTEREST),

Table 10
Effects of the Decision to go Public: Subsample B-1

	IPO + 1	*IPO + 2*	*IPO + 3*	*IPO + 4*	*IPO > 5*	*p-value > F*
ROA						
Whole sample	–0.0282***	–0.0387***	–0.0427***	–0.0474***	–0.0516***	0.0001
	(0.0046)	(0.0053)	(0.0058)	(0.0064)	(0.0073)	
Indep. co	–0.0275***	–0.0352***	–0.0405***	–0.0453***	–0.0467***	0.0001
	(0.0054)	(0.0062)	(0.0068)	(0.0075)	(0.0085)	
Chaebol	–0.0277***	–0.0460***	–0.0445***	–0.0496***	–0.0622***	0.0001
	(0.0090)	(0.0103)	(0.0113)	(0.0124)	(0.0141)	
LEVERAGE						
Whole sample	–0.0767***	–0.0519***	–0.0274**	–0.0124	0.0153	0.0001
	(0.0097)	(0.0111)	(0.0123)	(0.0135)	(0.0154)	
Indep. co	–0.0809***	–0.0555***	–0.0330**	–0.0143	0.0138	0.0001
	(0.0109)	(0.0125)	(0.0138)	(0.0151)	(0.0172)	
Chaebol	–0.0424**	–0.0151	0.0216	0.0276	0.0602*	0.0001
	(0.0214)	(0.0242)	(0.0268)	(0.0293)	(0.0333)	
COVERAGE						
Whole sample	0.0582	–0.4360	–0.2965	–0.3465	–0.1717	0.0001
	(0.2704)	(0.3087)	(0.3418)	(0.3755)	(0.4281)	
Indep. co	–0.2396	–0.4194	–0.3212	–0.3757	–0.1131	0.0001
	(0.2451)	(0.2795)	(0.3092)	(0.3398)	(0.3878)	
Chaebol	0.5232	–1.2441	–0.7361	–0.7997	–0.9505	0.0001
	(0.9151)	(1.0429)	(1.1526)	(1.2627)	(1.4321)	
INTEREST						
Whole sample	–0.0060	–0.0134	–0.0127	–0.0284*	–0.0270	0.0001
	(0.0110)	(0.0125)	(0.0139)	(0.0152)	(0.0174)	
Indep. co	–0.0055	–0.0152	–0.0150	–0.0333*	–0.0326	0.0001
	(0.0138)	(0.0157)	(0.0174)	(0.0191)	(0.0219)	
Chaebol	–0.0121*	–0.0105	–0.0104	–0.0189*	–0.0175	0.0001
	(0.0070)	(0.0080)	(0.0089)	(0.0097)	(0.0111)	
GROWTH						
Whole sample	–0.0377**	–0.0550***	–0.0624***	–0.0379	–0.0518*	0.0001
	(0.0184)	(0.0210)	(0.0233)	(0.0256)	(0.0292)	
Indep. co	–0.0413*	–0.0563**	–0.0632**	–0.0453	–0.0486	0.0001
	(0.0212)	(0.0242)	(0.0268)	(0.0294)	(0.0336)	
Chaebol	–0.0179	–0.0488	–0.0520	–0.0109	–0.0652	0.0001
	(0.0378)	(0.0431)	(0.0477)	(0.0522)	(0.0592)	
INVEST						
Whole sample	–0.0135	0.0077	0.0141	0.0163	0.0065	0.0001
	(0.0225)	(0.0254)	(0.0280)	(0.0311)	(0.0361)	
Indep. co	–0.0254	–0.0263	–0.0354	–0.0306	0.0356	0.0001
	(0.0360)	(0.0385)	(0.0401)	(0.0443)	(0.0509)	
Chaebol	–0.0677*	–0.1099**	–0.1115**	–0.0839	–0.1877***	0.0001
	(0.0408)	(0.0462)	(0.0509)	(0.0563)	(0.0644)	

Ex post performance, Subsample B-2

	IPO + 1	*IPO + 2*	*IPO + 3*	*IPO + 4*	*IPO > 5*
ROA	–0.0219**	–0.0148	–0.0165	–0.0225*	–0.0290*
LEVERAGE	–0.0348*	–0.0235	0.0006	0.0301	0.0760**
COVERAGE	–0.0659	1.0635	0.8454	–0.2471	–0.8992
INTEREST	–0.0236	–0.0184	–0.0167	–0.0281	–0.0158
GROWTH	–0.0307	–0.0318	–0.0549	–0.0725	–0.0721
INVEST	–0.0822**	–0.0948**	–0.1175***	–0.1256**	–0.0827

Notes: ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels respectively; standard errors are in parentheses.

but this effect is only statistically significant in the fourth year after the IPO. For *chaebol* subsidiaries, the cost of debt falls after the IPO. This drop is statistically significant for the first two years after the IPO, and again in the fifth year after the IPO and thereafter, when the cost of debt decreases even more. For independent companies, an IPO decreases the cost of debt for all years after the IPO, but this effect is only statistically significant in the fourth year after the IPO. Despite these apparent differences the F-test cannot reject the null hypothesis that the coefficients for INTEREST are the same across *chaebol* subsidiaries and independent companies.

Comparing the ex post IPO performance of financially healthier and marginal firms assists in the interpretation of the reasons for going public. As seen in Table 10, several notable differences are found between the two samples. Profitability falls for both sets of firms, but interestingly the effect is statistically and quantitatively greater for the healthy firms. On the other hand, leverage falls more in the ex ante healthier firms, and substantially rises for the more marginal firms five years and more after the IPO. The fall in growth of total assets is larger and more significant for the healthier firms. Finally, for the healthier firms, investment in fixed assets is unaffected by the IPO, but falls substantially for the first four years following an IPO by the marginal firms.[24]

In sum, we can reject the hypothesis that firms go public to fund future increases in fixed asset investments, but there is substantial evidence that

[24] There was no statistical difference between the regressions for the *chaebol* subsidiaries and independent companies for subsample A-2.

both independents and *chaebol* subsidiaries went public to take advantage of windows of opportunity, while the *chaebol* subsidiaries also went public to fund takeovers and other equity investments.

6. Stock Market Performance of Korean IPOs

In this section, we examine the stock market performance of Korean IPOs, using the Korea Securities Research Institute daily stock return database (KSRI-SD).[25] First, we calculate buy-and-hold returns for each IPO from the close of the first KSE-listed day to the first, third, and fifth anniversary date of the offering. The percentage buy-and-hold return for firm i is given by:

$$R_{iT} = \left[\prod_{t=s}^{T}(1 + r_{it}) - 1\right] \times 100\% \qquad (3)$$

where s is the first listing date, r is the annual return, and T is the end of the one-year, three-year, and five-year holding periods.

Second, the average equally weighted holding-period returns for IPOs issued in calendar year j, for the average one-year, three-year, and five-year buy-and-hold return, ($j = 1, 3, 5$) are calculated as:

$$R_{jT} = \frac{1}{n}\sum_{i=1}^{n} R_{iT} \qquad (4)$$

where R_{iT} is the percentage buy-and-hold return on firm i for holding period T.

The buy-and-hold returns from the KSE–Korea Composite Stock Price Index (KOSPI) index are used as benchmarks assuming that the KOSPI portfolios have the same trading period as the IPOs. The buy-and-hold return of the KOSPI is calculated by compounding the daily returns for the index from the starting day of the KOSPI to the same ending date of one-year, three-year and five-year anniversary of the IPOs.

Finally, wealth relatives are defined as the ratio of the end-of-period wealth from holding a portfolio of IPOs to the end-of-period wealth from

[25] In the KSRI-SD, individual stock returns include dividends and stock splits. For an overview of the literature on stock market performance methodology, see Barber and Lyon (1997), Kothari and Warner (1997), Lyon et al. (1999), and the references therein.

holding the KOSPI portfolio. Wealth relatives are ratios of average gross returns, given by

$$[(\Sigma(1 + R_{it}))/(\Sigma(1 + R_{mt}))] \qquad (5)$$

where R_{it} is the holding-period return on firm i for holding period t, R_{mt} is the holding-period returns on KOSPI over the same holding period (with the same starting date) as firm i for holding period t, and the summations are over the N observations in a cohort year. For example, the 1988 one-year wealth relative of 0.95 is computed as (1.633/1.727), with 1,633 being the terminal wealth per Korean won invested after having gained 63.3 per cent on the IPO portfolio.

Focusing on the five-year returns averaged over the 1986–95 period, shown in the last row of Table 11, the average holding-period return of IPOs is 117.8 per cent, while the average holding-period return on the KOSPI is 40.5 per cent. Wealth relatives are typically greater than unity in all years except 1988. Following Loughran and Ritter (1995), the average

Table 11
Stock Market Performance of IPOs by Cohort Year (1986 to 1995, Sample B)

Holding Period		1 Year			3 Years			5 Years		
Cohort Year	Number of IPOs	IPOs	KOSPI	W/R	IPO	KOSPI	W/R	IPO	KOSPI	W/R
1986	9	293.4	132	1.70	555.9	455.9	1.18	365.3	301.9	1.16
1987	29	188.7	170.3	1.07	262.3	168.1	1.35	184	120.1	1.29
1988	82	63.3	72.7	0.95	19.4	25.7	0.95	87.1	37.7	1.36
1989	98	16.8	–23.6	1.53	14.8	–37.1	1.83	118.6	8.0	2.02
1990	34	–27.3	–28.9	1.02	8.6	–21.8	1.39	74.9	3.6	1.69
1991	18	6.1	–9.1	1.15	57.1	37.0	1.15	–6.9	38.6	0.67
1992	2	19.7	18.1	1.01	62.5	31.4	1.24			
1993	8	109.2	33.4	1.57						
1994	23	28.5	7.7	1.19						
1995	22	35.8	–12.9	1.56						
1986–95	325	50.7	27.2	1.18	62.9	27.3	1.28	117.8	40.5	1.55

T-statistics for difference between means of buy-and-hold returns, Sample B (IPOs)

	1 Year	3 Years	5 Years
IPOs	0.50	0.63	1.28
KOSPI	0.27	0.27	0.46
T-statistics for Difference	2.98	2.67	3.93

five-year buy-and-hold return of 40.5 per cent on the KOSPI implies that one Korean Won (KW) invested in the KOSPI grows to 1.405 Korean Won after five years. Since the average five-year buy-and-hold return on IPOs is 117.8 per cent, an investment of only KW0.66 is required to receive the same KW1.405 at the end of the holding period (1.405/2.117 = KW0.66).[26]

Table 11 reports wealth relatives based on buy-and-hold periods. The overall one-year, three-year, and five-year wealth relatives are 1.18, 1.28 and 1.55 respectively. Thus, IPOs outperformed the KOSPI in all three periods considered, with a continuously widening performance gap. In the second panel of Table 11, t-statistics are reported for the null hypothesis of difference in buy-and-hold returns between the IPOs and the KOSPI. The null hypothesis can be rejected at the 5 per cent level of statistical significance for each holding period.

The systematically superior stock market performance of Korean IPOs is a puzzle. Why do markets not capitalise on the information that Korean IPOs consistently show superior performance with an immediate rise in their prices, rather than leave a predictably widening gap over a period of several years? In an emerging market, it is natural to wonder whether government intervention or regulation might be the cause. The Korean government regulated the IPO market through listing requirements (as discussed in Section 3), and also intervened in the initial pricing of IPOs and their stock prices thereafter. This intervention has changed over time from a promotional policy to a restrictive policy, depending on the strategy of the government. From 1968 to 1982, the government promoted IPOs to expand the capital market by providing tax benefits for IPOs. Then, beginning in 1983 the government began a period of deregulation of the IPO market and from 1988 to 1990 the IPO market was highly deregulated. IPOs were probably clustered in this period because of deregulation as well as the rapid economic expansion in Korea. However, a slowdown of the economy and an oversupply of new issues caused a decline in the stock market in 1990, and a return to government regulation followed. In 1990, the government began a policy of intervention in IPO pricing, in which a penalty was imposed on agents or underwriters if the IPO price was overvalued compared to the firm's actual earnings or if the stock price fell below the IPO price within three months of the IPO. Thus, government intervention could have been a cause of initial IPO underpricing, and there was an incentive for further manipulation during the first three months after listing. However, Lee (1993) examines firms that went public during the 1988 to 1990 deregulated period and concludes that IPOs were underpriced even without government regulation. In any case, government intervention cannot explain our finding of increasingly superior performance of IPOs from one to three, and then from three to five years after issue.

[26] Thus, an investor buying IPOs at the first closing market price could invest 40 per cent less than purchasing the KOSPI at the same time in order to achieve the same wealth level five years later.

Note that the superior performance of IPOs in the stock market is consistent with the ex post financial performance of the IPO. As shown in the ex post analysis in Section 5, financial performance of IPOs was deteriorating over time. However, IPOs' average annual ROA for 10 years from 1986 to 1995 was 0.083, substantially higher than the market average of 0.049. Moreover, the average debt ratio of IPOs for same period of time was 200 per cent, well below the market average of 303 per cent. Thus, even though IPOs' profitability was deteriorating over time, IPOs remained relatively more profitable than the market average.

Taken together, government intervention and higher profitability may offer important clues to the systematically superior stock market performance of IPOs in Korea, but they do not fully explain why this gap in market returns persisted even well after three years had passed.

7. Conclusions

In this article, we have examined alternative explanations of why emerging market companies go public with the use of a unique data set from Korea. Contrary to widely held views about the role of stock markets in emerging markets (Singh 1995), we find overwhelming ex ante and ex post evidence that firms do not go public to fund investment in fixed assets. All firms, especially financially more marginal firms, apparently go public to take advantage of windows of opportunity. Financially healthier independents also go public to rebalance their portfolios. *Chaebol* subsidiaries apparently use IPOs to fund equity investments (takeovers) as well as to take advantage of windows of opportunity. None of this means that stock markets do not play any role as an engine of growth in emerging markets, but the evidence suggests that any such role is likely to operate through improvements in market and firm efficiency, such as through provision of liquidity or risk diversification, rather than accumulation of capital per se.

We also examine buy-and-hold returns and find that Korean IPOs outperformed the stock market—with the divergence widening over time—in contrast to patterns observed in developed markets.

In particular, we identify the determinants of listing for Korean companies by examining both ex ante characteristics and ex post financial performance

of IPOs. Our measures and methodologies for the determinants of listing for Korean firms are similar to those in Pagano et al. (1998). However, this study differs from Pagano et al. in several key respects. First, the 'timing problem' in which year-end accounting variables partly reflect the effects of the IPO rather than its ex ante determinants is addressed in both the analysis of ex ante characteristics and the analysis of ex post performance. Second, lagged MTB is used in addition to the current MTB as a regressor in the analysis of ex ante characteristics, and is found to have opposite and jointly statistically significant effects. For all subsamples, the lagged MTB robustly *decreased* the probability of an IPO, likely because most firms with a high propensity and eligibility to conduct an IPO have already done so when there has been a recent hot market. This distinction proves highly robust; for example, it held under first differencing. In all subsamples, larger firms are more likely to go public. Third, industry effects are taken into account in the determinants of IPOs. Fourth, in part because Korean firms historically have had a high debt ratio compared to those of other countries and are chronically short of funds to support their rapid growth, firms not meeting official requirements may have manipulated their financial statements to become eligible for an IPO. To explore this possibility, a subsample of financially healthier firms was created, and significant differences are found relative to more marginal firms.

Again, we conclude that both independents and *chaebol* subsidiaries go public to take advantage of windows of opportunity. However, this effect was especially strong for the independents, while the *chaebol* subsidiaries also appear to go public to fund takeovers and other equity investments. For independent firms the current industry MTB ratio robustly *increased* the probability of an IPO, suggesting that these firms went public to take advantage of windows of opportunity; no significance for this variable was found for *chaebol* subsidiaries. After an IPO, all subsamples had lower returns on assets. The fact that profitability declined, for both *chaebol* subsidiaries and independent firms, supports the view that both were taking advantage of windows of opportunity. However, several other pieces of evidence suggest that the subsidiaries were also seeking to fund expansion through takeovers and equity investments for their group. *chaebol* subsidiaries experienced a fall in interest rates, statistically significant at the 5 per cent level one, two, and more than five years after the IPO. This is consistent with an IPO motive of lowering the cost of capital to fund takeovers. In contrast, the independents experienced a decline that was only significant in one period, and then only at the 10 per cent level. After an IPO, there is a statistically significant decrease in fixed investments among *chaebol* subsidiaries, while

there is no significant effect on the rate of growth of total assets (total asset growth fell significantly among the independents). Moreover, also consistent with funding takeovers, *chaebol* subsidiaries increased their leverage ratios, five and more years following the IPO, to a larger degree than the independent firms; this contrast is especially strong when omitting the financially marginal firms.

Of course, one potential problem with interpreting the IPO motives for *chaebol* subsidiaries is that funds raised may be fungible across affiliated firms, such as through the use of transfer pricing. While this is indeed part of the reason the takeover and equity investments motive is plausible, this could possibly also skew both ex ante and ex post results for this subsample. However, taken as a whole the evidence is certainly strongly suggestive that *chaebol* subsidiaries use IPOs to fund takeovers or other equity investments. It seems likely that some of the funds raised, both directly from equity and indirectly from additional debt, are finding their way to investments in or by affiliated firms. This is an important subject for future research.

Thus, we conclude that *chaebol* subsidiaries did not go public to fund fixed investments, but it is likely they used IPOs to finance company growth through such measures as equity investments in other firms. While not completely inconsistent with Singh's (1995) conclusion that large Korean firms went public to fund new investments, our study sheds important light on the meaning of that finding. In addition, *chaebol* subsidiaries may also have gone public, as did the independent firms, to take advantage of windows of opportunity.

Financially healthier firms and more marginal firms were also found to have different motives for conducting an IPO. The evidence supports the conclusion that the marginal firms were more opportunistic, taking advantage of windows of opportunity, while the financially healthier firms were also rebalancing their portfolios after growth. In particular, leverage actually has a negative effect on the probability of going public for the marginal firms, while it is positive (though not significant) for healthier firms; this makes rebalancing of portfolios an unlikely motive for the marginal firms. In addition, a higher operating income to interest expense (coverage) ratio had a positive and highly significant effect on the probability of going public for the healthier firms, but it had a negative (though not significant) effect for the marginal firms. Further, a higher current MTB value had a positive and significant effect on the probability of going public for the marginal firms, but this effect was not found for the healthier firms. Moreover, higher growth was associated with going public among the healthier firms, but not the marginal firms. Each of these findings is consistent with the conclusion

that the marginal firms were more opportunistic. In addition, while an initial decline in leverage following the IPO was observed for all firms, the decrease was smaller for more marginal firms; moreover, only the marginal firms showed the later increase in leverage, five and more years following the IPO.

Finally, in Korea, a portfolio of IPOs outperforms the stock market average in the long run. This finding is consistent with the superior average ex post financial performance of IPOs, and government intervention also helps to partially explain these results. However, because the performance gap occurs well after the initial trading day, and even widens as performance is compared over one, three, and five-year intervals, the findings represent a new puzzle that will be important to address in future research.

Stephen C. Smith is at The George Washington University, Department of Economics, 624 Funger Hall, 2201 G St. NW, Washington, D.C. 20052. E-mail: scsmith@gwu.edu.
Hesuk Chun is at Merril Lynch, New York, USA.

REFERENCES

Atje, R. and **B. Javanovic** (1993), 'Stock Markets and Development', *European Economic Review*, April, 37(2-3): 632–40.

Barber, B.M. and **J.D. Lyon** (1997), 'Detecting Long-Run Abnormal Stock Returns: The Empirical Power and Specification of Test Statistics', *Journal of Financial Economics*, March, 43(3): 341–72.

Chen, Hsuan-Chi and **J.R. Ritter** (2000), 'The Seven Percent Solution', *Journal of Finance*, June, 55(3): 1105–31.

Degeorge, F. and **R. Zeckhauser** (1993), 'The Reverse LBO Decision and Firm Performance: Theory and Evidence', *Journal of Finance*, 48(4): 1323–48.

Jain, B.A. and **O. Kini** (1994), 'The Post-issue Operating Performance of IPO Firms', *Journal of Finance*, December, 49(5): 1699–726.

Kiymaz, H. (1999), 'Long Run IPOs Pricing: Evidence from an Emerging Market', *Journal of Emerging Markets*, Fall-Winter, 4(3): 43–58.

Kothari, S.P. and **J.B. Warner** (1997), 'Measuring Long-Horizon Security Price Performance', *Journal of Financial Economics*, March, 43(3): 301–39.

Lee, S. Kyu (1993), 'A Study on the Underpricing of Initial Public Offerings in Korea', Ph.D. dissertation, Yonsei University.

Levine, R. and **S. Zervos** (1998), 'Stock Markets, Banks, and Economic Growth', *American Economic Review*, 88(3): 537–58.

Levis, M. (1993), 'The Long-run Performance of Initial Public Offerings: The UK Experience 1980–1988', *Financial Management*, Spring(1): 28–41.

Loughran, T. and **J.R. Ritter** (1995), 'The New Issues Puzzle', *The Journal of Finance*, 50(1): 23–51.

Lyon, J.D., B.M. Barber and **Chih-Ling Tsai** (1999), 'Methods for Tests of Long-Run Abnormal Stock Returns', *Journal of Finance*, February, 54(1): 165–201.

Mikkelson, W.H., M.M. Partch and **K. Shah** (1997), 'Ownership and Operating Performance of Companies that Go Public', *Journal of Financial Economics*, 44(3): 281–307.

Pagano, M., F. Panetta and **L. Zingales** (1998), 'Why Do Companies Go Public? An Empirical Analysis', *The Journal of Finance*, February, 33(1): 27–63.

Park, H.J. (1990), 'Survey on the Determinants for the Initial Public Offering', mimeo, April.

Rajan, R.G. (1992), 'Insiders and Outsiders: The Choice between Informed and Arms' Length Debt', *Journal of Finance*, 47(3): 1367–400.

Ritter, J.R. (1984), 'The Hot Issue Market of 1980', *Journal of Business*, 32(2): 215–40.

——— (1987), 'The Cost of Going Public', *Journal of Financial Economics*, 19, North-Holland, 269–81.

——— (1991), 'The Long-run Performance of Initial Public Offerings', *Journal of Finance*, March, 46(1): 3–27.

Securities Supervisory Board (1988), 'The Results of the Survey—The Factor which has Impact on the Decision for Listing', *Monthly Review* (Korea), November.

Singh, A. (1995), 'Corporate Financial Patterns in Industrializing Economies–A Comparative International Study', *IFC Technical Paper No. 2*, Washington: IFC.

Singh, A. and **J. Hamid** (1992), 'Corporate Financial Structures in Developing Countries', *IFC Technical Paper No. 1*, Washington: IFC.

UNCTAD (1993), 'Portfolio Equity Investment and New Financing Mechanisms: Foreign Portfolio Equity Investment in Developing Countries: Current Issues and Prospects', New York: UNCTAD Secretariat.