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경영학석사 학위논문

Persistence and the Cross-Section of Corporate Capital Structure: Case of South Korea

기업 자본구조의 횡단면과 지속성: 한국 기업을 중심으로

2013년 2월

서울대학교 대학원
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이 논문을 경영학석사 학위논문으로 제출함

2012년 12월

서울대학교 대학원

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2012년 12월

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Abstract

This thesis aims to study the persistence and cross section of corporate capital structure in South Korea from 1987 to 2011. In our analysis, we find that there have been differences in leverage across Korean firms, i.e. very high levered, medium levered, very low levered firms. In addition, firms tend to maintain their level of capital structure persistent over a long period of time.

These differences in leverage reveal the existence of firm fixed effects, which in our examination captures the majority of the variation in leverage. It contributes over 80% to the total explained sum of squares in the analysis of co-variance (ANCOVA) of leverage. Furthermore, from studying the regression model to find the speed that firm adjusts its leverage to the optimal, the speed of adjustment increases to double if we include firm fixed effects.

Lastly, the thesis finds that estimated coefficients on the determinants of book leverages are largely different from those on the corresponding determinants of market leverage. The results of test on market leverage

from Korean data seem to match with the results achieved using the similar methodology with the data in the U.S.

Keywords: Capital Structure, Firm Fixed Effects, Cross-section, South Korea.
Student Number: 2010-24038

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Introduction

In the literature of corporate finance, there have been debates on the persistence of capital structure and the existence of so-called *optimal leverage ratio*. While *trade off theory* suggests that firms pursue target capital structure based on balancing the cost and benefits of debt; *Pecking order theory* (Myer and Majluf 1984) and *Market Timing* (Baker and Wurgler 2002) deny the existence of the target leverage and explain the behavior of capital structure by the effects of information asymmetry. Also, regarding to the *optimal leverage*, Leary and Roberts (2005) mention that most firms rebalance their capital structure after 2 or 4 years after shock. And this theory is against by Baker and Wurgler (2002) with their conclusion on long lasting-effect of shocks on capital structure. Our research, similar to Lemmon, Robert and Zender's paper, find that capital structures are significantly stable over a long period of time, thus consistent with trade off theory.

Our research is also associated with many previous literatures on the determinants of capital structures. Tim Wessels (1998) and Rajan and Zingale (1995) on their analysis chose the determinants as firm size, tangibility, market-to-book and industry variables. Toy.et.al (1974)

found growth, profitability and international risks to be the plausible indicators of leverage. Kim and Berger in their paper published on the Multinational Business Review 2008, titled "*A comparison of Capital Structure Determinants: The United States and The public of Korea"* concluded that there are similarities of the determinants of capital structure between the U.S and Korea and that profitability, among other independent variables, was the only significant determinant of the leverage ratios across two countries. On the other hand, Fattough in his paper in 2003 titled *"Capital Structure in South Korea: A quartile regression"* proposed the significant correlations of all explanatory variables: income variability, growth, tangibility, size, profitability, time trend variable, industry indicator and financial crisis with leverage ratios.

Taking notes from those studies, our paper conducts a research on the determinants of capital structure that have been defined by previous literature, as well as the importance of firm fixed effects in determining the capital structure. The results of our paper are mostly consistent with Lemmon, Robert and Zender's paper: there is *time invariant effect* that has the major contribution to the variation of leverage, by far greater than the contribution of the other determinants.

The paper is designed as follow: the next section describes data and sample selection. The following section would be the test for

persistence and cross-section of corporate capital structure. Section 3 gives an analysis of the effect of historical leverage on future leverage. Section 4 performs the ANCOVA to quantify the importance of firm fixed effects in the variation of leverage. Final test is the test on the speed of adjusting to target leverage.

1. Research Design

1.1 Data

The data used in the paper is from KISValue (a corporate information database provided by the Korea Information Service), consisting yearly data of all non-financial firms listed on KOSPI/KOSDAQ from 1987 to 2011, with non-missing data for book assets. For the OLS and ANCOVA analysis, we delete the missing observations. Lemmon, Robert, Zender paper concerns the *survivorship bias*, happening when firms might naturally exit from our sample as moving towards event time. We also address this concern by creating a subsample, including firms with no less than 15 years of non-missing data on book leverage, also referred as “Survivors”. The definitions of all variables used are detailed in the appendix.

1.2 Portfolio Formation & Empirical Findings

For each year in the sample period of 1987-2011, which we indicate as event time "0", four portfolios are formed based on the quartiles of firms' leverage ratio: Very high, High, Low, Very Low levered portfolios, and then we calculate the leverage average of those portfolios for the following 15 years. For example, starting in 1987, we form portfolios based on the quartile of leverages in that year, and holding those portfolios, we compute the average of each portfolios towards 1987 to 2001. We do the same formation and computation in 1988 and so on, finally, we would get 25 set of event time averages for four portfolios. The last step is to take the average of those 25 set of event time, and the result is the average leverage of four portfolios in 15 time events, as presented in *Figure 1*. To the concern that the analysis might reduce its validity if firms drop out of our sample when moving towards time, we also perform the test for the Subsample (defined above).

The graph shows some interesting features of Korean financial market. High level of leverage has been observed for the total sample firms

(The average of leverage for total sample firm-years were 53.33% and 50.03% for book and market leverage). Compared to others developed financial market, Korean market have been criticized for their high leverage, especially in the period prior to the financial crisis in 1997. A major reason is attributed to the government's interventionist development strategies in the 1960s and 1970s in securing the necessary capital to promote certain industries and export. These policies lead Korean firms to become the very high levered firms and with highest growth of leverage ratios amongst East Asian companies during 1980s (Claessens et al., 1998). Only until 1997 with the hit of Asian credit crunch, Korean government pushed the restructuring program to reduce firm's reliance on debt, the leverage ratios of Korean firms began to decrease dramatically. Although our figure does not present calendar year, we still can observe the down -trend of the capital structures along event time: after 15 years, all of four portfolios leverage averages have declined: from 92% to 51% in Very high Leverage Portfolio and from 46% to 36% in Very Low Leverage Portfolio.

The most important attention in this figure is the difference of average leverage across the portfolios. The result in Figure 1 for book leverage

and market leverage are quite similar, so we could focus on book leverage. Although the range between the Very high and Very Low leverage portfolio in panel A decrease from 40% at the first event time to 16% after 15 years, it is still relatively large when compared to the within firm standard deviation of book leverage (19%).

Regarding to the surviving bias, the same analysis was also repeated for our subsample of Survivors, giving the equivalent results, presented Panels B and D of figure 1.

Lemmon, Robert, Zenders, also previous literature, has defined the determinants of capital structure as firm size, tangibility, profitability and industry indicator. Since the topic of our research is to examine the effect of time invariant variables on the variation of leverage, we would want to eliminate those above factors in our analysis. So, instead of sorting firms based on their actual leverage as being done in Figure 1, we take the alternative method of forming portfolio, in which requires to rank firms based on the residuals from the regression on leverage with the four determinants. The next steps of averaging across 15 event time are similar to those in the first test. Figure 2 presents the result: The range across portfolios average leverages are becoming less

significant than in figure 1 as moving towards event time. Panel B for Book Leverage data shows almost no difference between Very high and High Leverage Portfolios. So, the underlying factors, such as size, tangibility, etc. have indeed been captured in our cross-section analysis.

However, there are some points worth noting in Figure 1 and Figure 2: Firstly, despite the dilution of differences across Very high and High leverage portfolios in figure 2, we notice that the Very Low leverage portfolios always remain significantly lower than the others portfolios. For example, in year 15, the Very Low leverage portfolio is 12% lower than the Very high Leverage portfolios in term of book leverage (While standard deviation of book leverage within firm is 17%).. Secondly, Korean financial markets have always been the government-managed markets. In the financial crisis in 1997, the very high levered firms have been forced strongly by the government to reduce their debt ratio. The formation of firms and the calculation of leverage averages based on data around these years might be affected by the temporary low leverage level of highly levered firms. Thirdly, consistent with Lemmon, Robert, Zender paper, Korean data also shows the within firm standard deviation of book (market) leverage of 17% (13%), which is less than

the between firm standard deviation of 23.9% (20.6%), suggesting that variation across firms' means is significant larger than variation within firms over time.

In summary, there have been relatively differences in leverage across Korean firms, which part of them is captured by the traditional underlying factors: size, tangibility, profitability and industry indicators. However, those factors still does not explain the significant gap between Very Low leverage portfolio and the others. We could expect the existence of some firm fixed effects, which are also revealed in the following tests.

1.3 The Transition of Firms across Leverage Stage

Another way to test the persistence of the capital structure is to examine the probability of firms switching from one leverage portfolio to another through time. Portfolios are sorted based on the residuals from the regression of leverage on defined determinants (as in context of Figure 2) each year across our sample period 1987-2011. We then compute the fraction of firms remaining in the same portfolios or

making transition to another portfolio over one year and five year. The result is presented in table 1. We find that 50% of firm stays in the same leverage portfolio in the following year, and this percentage for five year span is 39%. Table 2 also shows that when firm make step to another portfolio; it is mostly to the adjoining state. Only small fraction of firms 8% (18%) move to non-adjoining state in one (five) year. In conclusion, firms indeed maintain their (high/low) level of capital structure persistent over time.

2. The Effect of Initial Leverage

The previous statement about the persistence of leverage should also indicate that former leverage ratio could be the determinant of future leverage. In order to investigate this relation, we set up a regression test, as following:

$Leverage_{it} = \alpha + \beta X_{it-1} + \kappa Leverage_{io} + \varepsilon_{it}$

i denotes firm. *t* denotes years. *X* is a set of specified control variables, including variables suggested in Zender, Robert, Lemmon paper: Firm size, Book-to-Market, Profitability, Tangibility, Industry Median Leverage and Cash Flow Volatility. Also, we include *growth* variable,

which was found to be significantly correlated with leverage by Fattough (2003) in his paper *Capital Structure in South Korea: A quartile regression Approach*. ε, is random error. Leverage_{i0} is the first non-missing value of firm *i*'s leverage in our sample. We include year fixed effects in our analysis to eliminate any common effect on leverage shared by firms in the same year. Presented in table 2, all of our independent variables show the significant correlations with leverage in both all- and sub-sample sets. The first columns of Book and Market Leverage sets in two panels show the result of our regression on leverage with only initial leverage, all giving large values of parameter and statistical significance. The next columns show some interesting outcome: Firstly, *Initial Leverage*'s estimated coefficient just slightly decrease when we include year fixed effects, meaning time variance seems not to be the major factors of leverage variation.

Secondly, in both Panels A and B, there are significant differences of the contribution of the explanatory variables between test on book leverage and market leverage: while *Initial Leverage* and *Industry Median Leverage* give the largest marginal effects on book leverage, revealed in the great value of the parameters and statistical significance; their effects dilute in the test for market leverage: the estimated

coefficient on *Profitability* and *Tangibility* become larger. These differences in the contribution of explanatory variables in the test for book and market leverage also exist in our following ANCOVA and OLS tests. Kim and Berger in their paper "A comparison of Capital Structure Determinants: The United Structures and Republic of Korea" mentioned that *Market Leverage* is more plausible for test on Korean companies because of the substantial differences between market and book value of real assets, such as real estate, and this paper chose *Market Leverage* as the dependent variables to find the determinants of leverage. This matter is above the scope of this paper and does not significantly change the major finding of our paper, so we do not make the further investigation.

This analysis mainly concerns the effects of firm past leverage on its future leverage. Although the contribution of *Initial Leverage* to the market leverage variation is not as large as its contribution to the book leverage variation, the tests of correlation are all statistically significant, suggesting firm's past leverage is an important determinant of its future leverage.

3. Analysis of Covariance

Previous sections reveal that firms in Korea tend to maintain their level of capital structure, meaning high (low) levered firms remain so after a period of time, and this finding suggest the existence of firm specific effects. The questions now lies on the importance of the firm specific effects on the variation o leverage, compared to the other defined determinants such as firm size, profitability, tangibility, etc. To answer this question, we use ANCOVA test to quantify those effects, as following:

$Leverage_{it}=\alpha + \beta X_{it-1} + \Delta_i+\mu_i+\varepsilon_{it}$

When Δ is a time invariant component and μ is a firm invariant component of leverage. X is still the set of control variables (same as table 2). As suggested by Lemmon, Robert, Zender's paper, we use type III partial sum of squares to present the fraction of each variable's sum of square in the total test's, that makes each column of Panel A (except the last row showing adjusted R-squared) sums to 1.Look at column (a) and (b) Book Leverage data sets :when we do the regression with only the firm fixed effect and the year fixed effect, the estimations certainly both equal to 1 (or 100%), and adjust R-squared is 0.47 or 47% for

Firm FE and 0.18 or 18% for Year FE. The differences in R-squared of these two tests are even larger with Market leverage datasets: 0.59 or 59% and 0.09 or 9%.It demonstrates that time invariant factor is by far more important than firm invariant factor in capturing the variation of leverage. However, there is some interesting point worth discussing in this figure: the effect of firm invariant effects in our analysis is noticeably larger than the same figure in Lemmon, Robert, Zender's paper (adjusted R-square 1%). Our finding, in fact, consistent with Fattough (2003) paper, that shows time trend variable has a correlation with leverage ratio of Korean firms, and the coefficient for financial crisis variable (year 1997) to be highly significant and negatively, because the crisis makes it more difficult to raise debt when banks tried to tighten credit policy. Our OLS test in the next part also finds almost all the time dummies statistically significant.

The designs of next columns are inspired by Lemmon, Robert, Zender's paper. Similar to their finding, our result shows that firm fixed effects is the major effect on capital structure variation, with the attribution of about 80% to the total sum of square. Also, the adjust R-quared increase dramatically when we include Firm FE, for i.e.: from 23% to

62% in Book leverage set column (d) to (e), emphasizing the importance of firm fixed effects on the variance of leverage. In this model, we introduce *Chaebol Indicator* as another variable, as suggested by Kim, Heshmati paper, in which we define *Chaebol* as 30 largest business groups and their affiliated firms. Since the loaning policies for Chaebol firms in Korea are known to be easier than non-chaebol firms, we would expect their effect on leverage. In the result for Book Leverage Panels, *Growth* and *Chaebol Indicator* account more explanatory power in this specification than the other defined determinants, such as Size, Book to Market, Profitability, and Tangibility. If we notice, similar to what happened in table 1, there shows differences results in the contribution of explanatory variables on leverage between the test for Book Leverage and Market Leverage data. While the traditional determinants have no contribution to the variation of book leverage, they do account for variation in market leverage. These differences also appear in t-test in Panel B, as explained earlier in table 2.

Panel B gives coefficient estimates and T-statistics for the determinants on capital structures that have been defined in our earlier analysis, with

two sets of result: One with the OLS and another with Firm Fixed Effects included. The statistical significance of all variables in the OLS tests (d) and (f) are similar to Fattough (2003) paper, except for *Tangibility* and *Growth.* In Fattough (2003), these variables were found to have negative relationship with leverage before crisis and positive relationship after crisis. In our paper, we found an ambiguous effect of *Tangibility* and a positive effect of *Growth*. R, our focus is on the changes of estimated coefficients on variables when we include Firm fixed effects on the OLS test. These changes are dramatic, even more than 100% in the parameter value of Firm size on Market Leverage data, implying that in the cross-sectional regression settings for leverage, omitted variables bias might happen without firm fixed effects included. This panel, again, emphasizes the importance of firm fixed effects in capturing the capital structure specification.

4. Adjustments Speed of Leverage

Once we define that capital structure follow a persistent pattern, one of the common concern is to identify the speed of adjustments to its target leverage ratio. Similar to Lemmon, Robert, Zender's paper, we take the

regression settings as:

$$\Delta Leverage_{it} = \alpha + y(Optimal^{*}_{it-} - Leverage_{it-1}) + \Delta_i + \upsilon_t + \varepsilon_{it}$$
$$Optimal_{it}^{*} = \beta X_{it-1}$$

with all the notations identical to previous test. The value of y denotes the speed of Adjustment, which is presented in table 4 to be dramatically high in value and statistical significance. For example, Pooled OLS test alone gives y of 0.171 while the regression including Firm FE and Year FE gives y of 0.422- meaning firm close 17.1% (42.2%) in closing the gap between last period's leverage and this period's leverage.

The most important finding in this figure is the changes in the value of y when we add Year FE , Firm FE, together with controlled variables. While adding Year FE and other controlled variables only increases the speed of adjustment by only 3%, in absolute value, adding Firm Fixed Effects makes a increase of 17%. Thus, time invariant factor is the most important factor to determine the optimal leverage.

5. Conclusion

This thesis proposes that there have been relatively differences in leverage across Korean firms, and firms tend to maintain their level of capital structure persistent over a long period of time. A small portion of leverage variation is captured by the underlying factors that have been defined by previous literature, such as: size, tangibility, profitability, industry indicators and growth; and the majority is due to firm specific effects, which contributes over 80% to the total explained sum of squares in fixed firm effects regression settings. In addition, when we include firm fixed effects, the test on how firms adjust its leverage to the optimal shows a double value of the speed of adjustment

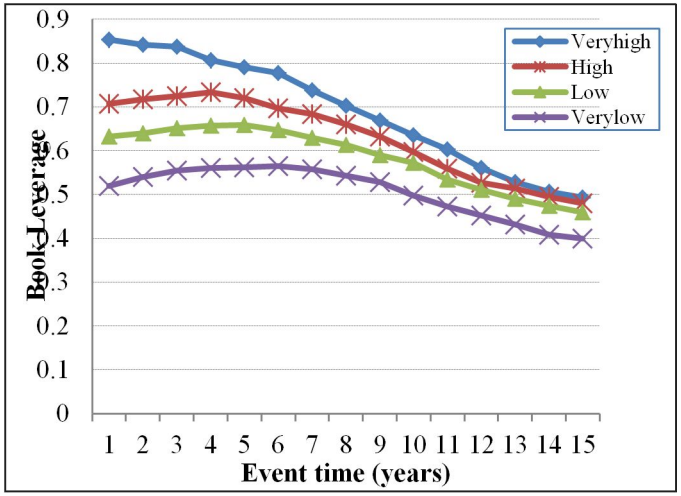
The thesis finds that estimated coefficients on the determinants of book leverages are largely different from those on the corresponding determinants of market leverage. The results of test on market leverage from Korean data seem to match with the results achieved using the similar methodology with the data in the U.S. Inspired by previous studies the paper introduced Chaebol as a determinant for leverage; however, the variable does not show a profound explanatory power in explaining the variation of leverage. In summary, we present the significant results, which are consistent with Lemmon, Robert and Zender's work.

Figure 1

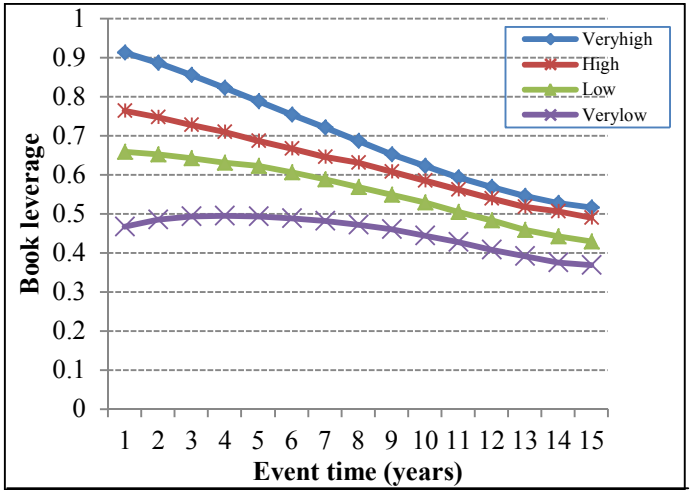
Average Leverage in Event Time, Actual Leverage Portfolio

The sample is all firms listed in KOSPI/KOSDAQ (excluding financial firms) from 1987-2011. For each year in the sample period, we form four portfolios based on the quartiles of firms' leverage ratio: Very High, High, Low, Very low levered portfolios, and then we calculate the leverage average of those portfolios for the following 15 years. For example, starting in 1987, we form portfolios based on the leverage of firms in that year, and holding those portfolios, we compute the average of each portfolios towards 1987 to 2001. We do the same formation and computation in 1988 and so on. After performing this sorting and averaging for each year from 1987 to 2011, we then average the average leverage across "event time" to obtain the lines in the figure. The results for book leverage /market leverage are presented in Panel A/C. Panel B/D present similar result for book leverage/market leverage, but for a subsample of firms required to exist for at least 15 years.

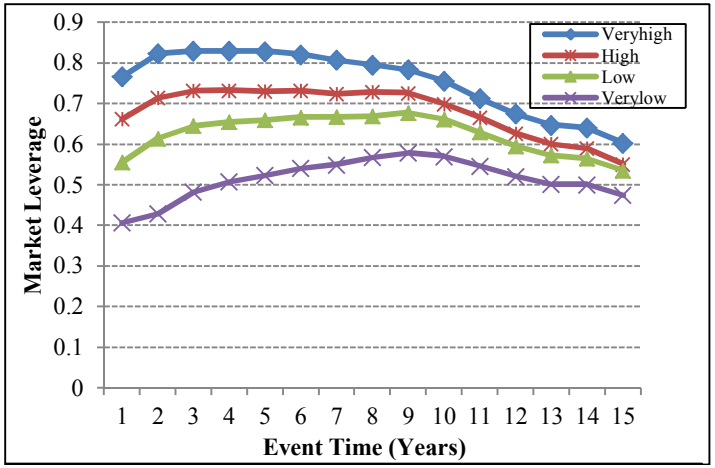
Panel A: Book leverage Portfolios



Panel B: Book Leverage Portfolios (Survivors)



Panel C: Market Leverage Ratio Portfolios



Panel D: Market Leverage Portfolios (Survivors)

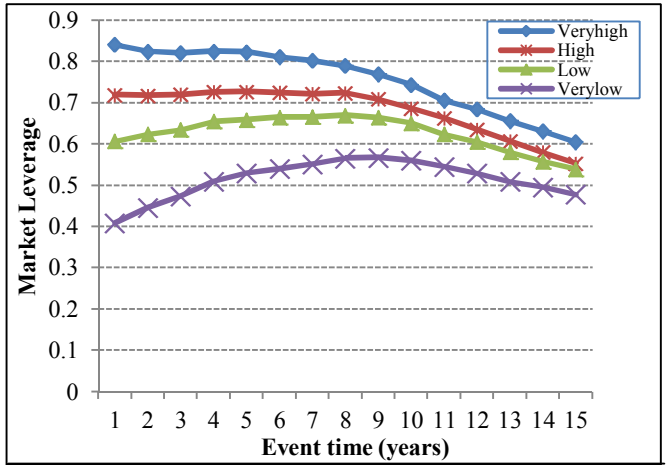
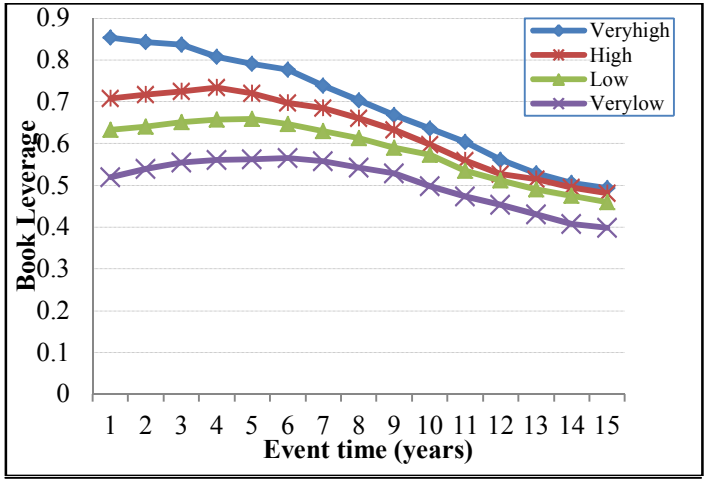


Figure 2

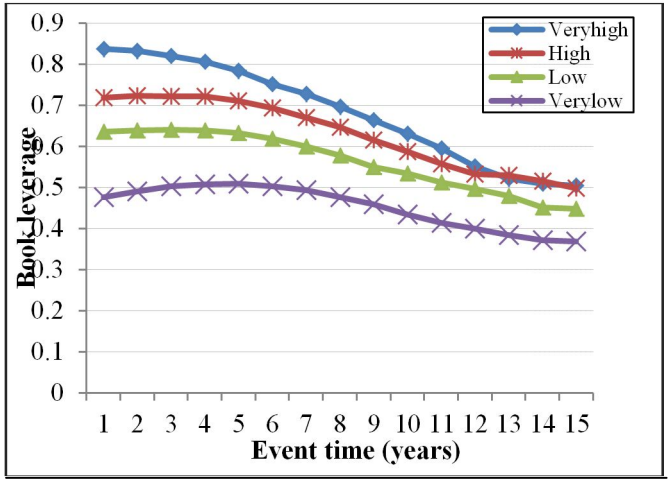
Average Leverage in Event Time, Residual Leverage Portfolio

The sample is all firms listed in KOSPI/KOSDAQ (excluding financial firms) from 1987-2011. For each calendar year, we form four portfolios based on the residuals from the regression on leverage with the four determinants: size, profitability, market-to-book, and tangibility. Then we calculate the leverage average of those portfolios for the following 15 years. For example, in 1990, we sort firms into four groups based on their residuals from the regression defined above. For each year from 1990 to 2004, we compute the average actual leverage for each of those portfolios. We repeat this sorting in 1991 and averaging from 1991 to 2005 and so on for every year in our same horizon. After performing this sorting and averaging for each year from 1987 to 2011, we then average the average leverage across "event time" to obtain the bold lines in the figure. The results for book leverage /market leverage are presented in Panel A/C. Panel B/D present similar result for book leverage/market leverage, but for a subsample of firms required to exist for at least 15 years.

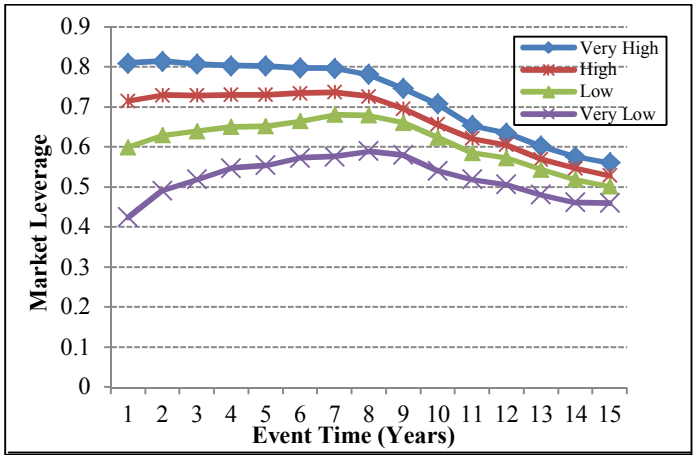
Panel A: Book leverage Portfolios



Panel B: Book Leverage Portfolios (Survivors)



Panel C: Market Leverage Ratio Portfolios



Panel D: Market Leverage Portfolios (Survivors)

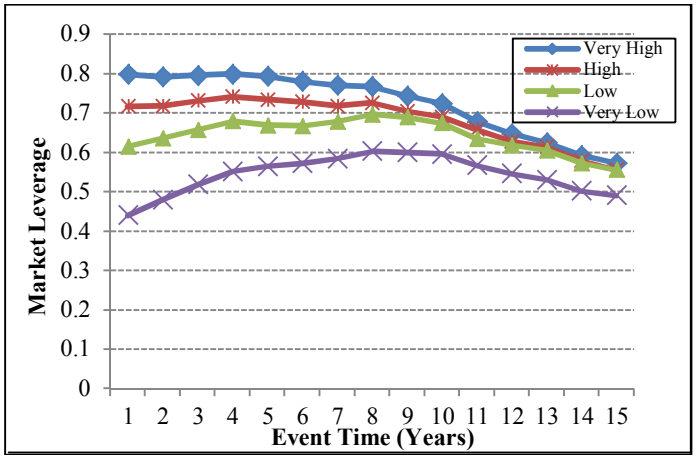


Table 1

The Transition of Firms across Leverage Stage

The sample is all firms in the KOSPI/KOSDAQ (excluding financial firms) from 1987-2011. Portfolios are sorted based on the residuals from the regression of leverage on firm size, profitability, book to market and tangibility each year across our sample period 1987-2011. The table presents the probability estimates of firms remaining in the same portfolios or making transition to another portfolio over one year (Panel A) and five years (Panel B).

Panel A: 1-Year Transition Matrix

Period *t*-1 State	Period *t* State			
	Lowest	Low	High	Highest
Lowest	0.175	0.05	0.015	0.01
Low	0.05	0.125	0.06	0.015
High	0.015	0.06	0.125	0.05
Highest	0.01	0.015	0.05	0.175

Panel B: 5-Year Transition Matrix

Period *t*-1 State	Period *t* State			
	Lowest	Low	High	Highest
Lowest	0.11	0.07	0.04	0.03
Low	0.08	0.08	0.05	0.04
High	0.035	0.06	0.09	0.065
Highest	0.025	0.04	0.07	0.115

Table 2

The Effect of Initial Leverage

The sample is all firms in the KOSPI/KOSDAQ (excluding financial firms) from 1987-2011. The parameter values for the panel regressions of book and market leverage on different sets of independent variables. Year fixed effects indicates that the test include year dummies. Panel A presents results using the entire sample. Panel B presents results using a subsample of firms required to survive for 15 years. Variable definitions are provided in the Appendix.

Panel A: All Samples

Variable	Book Leverage		Market Leverage	
Intercept	0.31	-0.22	0.38	-0.65
	(69.82)	(-6.72)	(106.11)	(-21.99)
Initial Leverage	0.26	0.19	0.25	0.09
	(44.51)	(32.66)	(39.38)	(13.73)
Log (Assets)		0.01		0.03
		(8.45)		(30.28)
Book-to-Market		0.00		0.00
		(1.83)		(20.80)
Profitability		0.01		-0.35
		(0.16)		(-23.65)
Tangibility		-0.02		0.24
		(-2.20)		(29.62)
Growth		0.02		0.01
		(11.62)		(6.27)
IndustryMedian Leverage		0.60		0.33
		(17.08)		(10.77)
Cash Flow Vol		0.00		-0.00
		(1.32)		(-2.87)
Year Fixed Effects	No	Yes	No	Yes
Adj. R-squared	0.0916	0.2542	0.0725	0.3908
Obs.	19593	19593	19593	19593

Panel B: Survival Sample

Variable	Book Leverage		Market Leverage	
Intercept	0.37	-0.69	0.23	-0.65
	(63.29)	(-21.57)	(55.64)	(-18.62)
Initial Leverage	0.18	0.15	0.25	0.24
	(24.31)	(22.96)	(68.49)	(48.01)
Log (Assets)		0.02		0.03
		(20.64)		(19.68)
Book-to-Market		0.00		0.00
		(21.66)		(20.20)
Profitability		-0.40		-0.36
		(-22.94)		(-21.37)
Tangibility		0.10		0.22
		(11.71)		(24.89)
Industry Median Leverage		0.01		0.52
		(63.49)		(15.52)
Growth		0.02		0.02
		(11.78)		(7.89)
Cash Flow Vol		0.00		0.00
		(-7.48)		(-14.92)
Year Fixed Effects	No	Yes	No	Yes
Adj. R-squared	0.03	0.2542	0.2504	0.4596
Obs.	17312	17312	17312	17312

Table 3

ANCOVA and OLS Tests

The sample is all firms in the KOSPI/KOSDAQ (excluding financial firms) from 1987-2011. Panel A presents ANCOVA test on leverage. We use type III partial sum of squares to present the fraction of each variable sum of square in the total test, that makes each column of Panel A (except the last row showing adjusted R-squared) sums to1. For example, in model (d) for book leverage, 1%of the explained sum of squares is attributed to Log (Assets). Panel B presents the parameter estimates and t-statistics. We also present the change in of the coefficient when including Firm FE in our model (d) to (e) and from (f) to (g). Firm FE are firm fixed effects. Year FE are year fixed effects. Variable definitions are provided in the Appendix.

Panel A: Variance Decomposition

	Book Leverage							Market Leverage						
Variable	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Firm FE	1.00	.	0.81	.	0.86	.	0.85	1.00	.	0.85	.	0.81	.	0.79
Year FE	.	1.00	0.19	0.72	0.15	0.14	0.07	.	1.00	0.15	0.56	0.12	0.32	0.14
Log (Assets)	.	.	.	0.02	0.00	0.03	0.01	.	.	.	0.08	0.02	0.19	0.04
Book-to-Market	.	.	.	0.00	0.00	0.00	0.00	.	.	.	0.04	0.01	0.09	0.01
Profitability	.	.	.	0.00	0.00	0.00	0.00	.	.	.	0.06	0.02	0.10	0.02
Tangibility	.	.	.	0.00	0.00	0.00	0.00	.	.	.	0.10	0.01	0.19	0.01
Growth	.	.	.	0.02	0.01	0.10	0.07				0.00	0.02	0.00	0.00
Industry Med Lev	.	.	.	.	.	0.01	0.00	.	.	.	.	0.00	0.00	0.00
Cash Flow Vol	.	.	.	.	.	0.00	0.00	.	.	.	.	.	0.00	0.00
Chaebol Indicator	.	.	.	0.04	.	0.14	.				0.00	.	0.00	.
Dividend Payer	.	.	.	.	.	0.03	.	.	.	.	.	.	0.00	.
Industry FE	.	.	.	0.20	.	0.55	.	.	.	.	0.16	.	0.11	.
R-squared	0.47	0.18	0.59	0.23	0.62	0.24	0.62	0.59	0.09	0.62	0.37	0.71	0.38	0.71

Panel B: Coefficient Estimates and T-statistics

	Book leverage						Market Leverage					
Variable	Pooled OLS (d)	Firm Fixed Effects (e)	(d) to (e) % change	Pooled OLS (f)	Firm Fixed Effects (g)	(f) to (g) % change	Pooled OLS (d)	Firm Fixed Effects (e)	(d) to (e) % change	Pooled OLS (f)	Firm Fixed Effects (g)	(f) to (g) change
Log(assets)	0.012	0.017	41%	0.015	0.018	20%	0.035	0.092	162%	0.034	0.070	105%
	(8.81)	(16.12)		(8.42)	(2.20)		(22.61)	(28.89)		(30.41)	(28.55)	
Book-to Market	0.001	0.001	-37%	0.000	0.000	-33%	0.003	0.001	-66%	0.002	0.001	-60%
	(7.30)	(5.75)		(2.74)	(3.18)		(22.56)	(16.20)		(22.54)	(14.95)	
Profit.	0.089	0.117	31%	-0.002	0.012	-700%	-0.270	-0.140	-48%	-0.347	-0.260	-25%
	(4.470)	(6.740)		(-0.16)	(0.750)		(-13.09)	(-9.23)		(-22.15)	(-16.91	
Tangibility	0.027	-0.020	-174%	-0.001	-0.002	90%	0.299	0.220	-26%	0.284	0.240	-15%
	(2.62)	(-1.66)		(-0.13)	(0.15)		(27.27)	(18.09)		(32.54)	(21.29)	
Growth	0.02	0.02	50%	0.02	0.03	25%	(0.00)	0.00	-340%	0.00	0.00	-240%
	(7.39)	(14.16)		(10.40)	(16.12)		(-0.83)	(1.56)		(0.79)	(2.38)	

Panel B: Coefficient Estimates and T-statistics (Cont)

	Book leverage						Market Leverage					
Variable	Pooled OLS (d)	Firm Fixed Effects (e)	(d) to (e) % change	Pooled OLS (f)	Firm Fixed Effects (g)	(f) to (g) % change	Pooled OLS (d)	Firm Fixed Effects (e)	(d) to (e) % change	Pooled OLS (f)	Firm Fixed Effects (g)	(f) to (g) change
Median Leverage				0.93	0.879	-5%				0.78	0.057	-92%
				(64.49)	(54.91)					-53.83	-54.03	
Cash Flow Vol				0.00	0.00	-44%				0.00	0.00	149%
				(1.52)	(-0.01)					(0.96	(0.18)	
Obs	16,163	16,163	16,163	16,163	16,163	16,163	16,163	16,163	16,163	16,163	16,163	16,163

Table 4

Speed of Adjustment

The sample is all firms in the KOSPI/KOSDAQ (excluding financial firms) from 1987-2011. The table provides estimates for the following autoregressive model of book leverage:

$\Delta Leverage_{it} = \alpha + y(Optimal^{*}_{it-} - Leverage_{it-1}) + \Delta_i + \upsilon_t + \varepsilon_{it}.$

$Optimal_{it}^{*} = \beta X_{it-1.}$

Where X is a set of predetermined covariates, Δ is a time-invariant effect correlated with X,υ is a firm-invariant effect correlated with X, and ε is a random error term. Pooled OLS exclude firm fixed effects or Δ_i=0. The first columns of each panel imply β=0: the regression is without controlled variables . The Variable definitions are provided in the Appendix.

	Estimation Method			
Variable	Pooled OLS		Firmed Fixed Effects	
Speed of Adjustment (y)	0.171	0.208	0.333	0.422
	(39.12)	(39.72)	(55.21)	(60.82)
Log(Assets)		0.006		0.038
		(7.95)		(15.19)
Book-to-Market		-0.004		-0.001
		(-5.64)		(-1.82)
Profitability		-0.041		-0.737
		(-3.53)		(-5.29)
Tangibility		0.007		0.030
		(1.16)		(2.95)
Median Leverage		0.110		0.045
		(5.97)		(1.47)
Year Fixed Effects	No	Yes	No	Yes
Obs	16,163	16,163	16,163	16,163

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Appendix

Total Debt = short term debt (34) + long term debt (9).

Book Leverage = total debt / book assets (6).

Firm Size = log (book assets), where assets are deflated by the GDP-deflator.

Profitability = operating income before depreciation (13) / book assets.

Cash Flow Volatility = the standard deviation of historical operating income requiring at least three years of data.

Market Equity = Stock Price (199) * Shares Outstanding (54)

Market Leverage = Total Debt / (Total Debt + Market Equity).

Market-to-Book = (market equity + total debt) / book assets.

Tangibility = tangible assets / book assets.

Industry Dummies = KisValue Level of Industry (KSIC-9) Middle Grouping/0A1132.

Growth = (Book $Asset_t$-Book $Asset_{t-1}$)/Book Assets

Chaebol Indicator= indicator for 30 largest business groups and their affiliated firms.

국문초록

기업 자본구조의 횡단면과 지속성: 한국 기업을 중심으로

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무구조의 횡단면의 지속성에 관한 연구이다. 분석 결과, 한국 기업들의 레버리지에는 큰 편차가 있으며, 기업들의 자본구조는 장기간에 걸쳐 일정하게 유지되는 경향이 발견되었다.
이러한 레버리지 차이는 기업고정효과(firm fixed effects) 때문인 것으로 분석되며, 기업고정효과는 레버리지의 공분산분석 결과 총 제곱합의 80% 이상을 설명한다. 또한, 기업들이 최적의 레버리지 수준에 도달하는 속도를 알아보기 위한 회귀분석에서, 기업고정효과를 포함시켰을 때 그 조절속도가 두 배로 빨라지는 것을 발견하였다.

마지막으로 논문에서는 레버리지를 결정하는 요소들에 대한 회귀분석에서 시장 레버리지와 장부레버리지의 결정요소들의 계수값이 서로 크게 다름을 발견하였다. 한국 기업의 시장 레버리지에 대한 분석 결과는 유사한 방법론을 사용하여 미국 기업의 자료를 분석한 결과와 일치하는 것으로 나타났다.

Keywords: Capital Structure, Firm Fixed Effects, Cross-section, South Korea.

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