Does Ownership Concentration Affect Firm Value in Taiwan? A Panel Threshold Regression Analysis

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Abstract: Using a panel of 266 Taiwanese listed companies for the 1996-2006 period, we apply an advanced panel threshold regression model to test whether there is an “optimal” ownership concentration which causes threshold effects and asymmetrical relationships between ownership concentration and firm value. Market-to-book value of equity is used as a proxy for firm value. We find that the negative entrenchment effect is dominant when ownership concentration is less than 12.32% or greater than 12.61%, while the 12.32% to 12.61% ownership concentration level reflects the positive incentive effect.

Keywords: Market-to-Book Ratio, Panel Threshold Effect, Ownership concentration

1. Introduction
The effect of ownership concentration on firm value could be either positive or negative. A positive incentives effect may come about because large shareholders have greater power and stronger incentives to exercise effective oversight to ensure shareholder value maximization (Jensen and Meckling, 1976; Holderness and Sheehan, 1988; Lehman and Weigand, 2000; Maury and Pajuste, 2005). A negative effect may occur if ownership concentration above a certain level leads to the entrenchment of owner-managers that expropriate the wealth of minority shareholders (Fama and Jensen, 1983; Shleifer and Vishny, 1997; Facio et al., 2002; Atanasov, 2005). Thus, the overall impact of ownership concentration on firm value depends upon the trade-off between incentives and entrenchment as faced by investors holding large blocks of ownership in a firm.

The present study applies a panel threshold regression model to test whether there is an optimal level of ownership concentration at which point the threshold effect and asymmetrical relationship between ownership concentration and firm value may be determined. In contrast to traditional linear models, this nonlinear threshold model is able
to determine whether the positive incentive effect or the negative entrenchment effect dominates. Taiwan is characterized by highly concentrated ownerships, a lower level of investor protection, and influential large shareholders who presumably have considerable incentives to oversee managers. Thus, Taiwan provides a natural setting for examining the influence of ownership concentration on firm value.

The paper proceeds as follows. Section 2 provides the sample data and the variables and describes the methodology. Section 3 discusses the empirical results, and Section 4 concludes.

2. Data and methodology

2.1. Sample description

We use a balanced panel data selected Taiwan Stock Exchange (TSE)-listed companies in Taiwan covering the period from 1996 to 2006 obtained from the Taiwan Economic Journal (TEJ) database of Taiwan. We exclude financial and insurance firms, because the nature of capital and investment in these industries is not comparable to those of non-financial firms. The final sample is 266 public trading companies, distributed across the eighteen industry sectors as follows: Electron (55), Textiles (30), Plastics (18), Steel and Iron (18), Construction (18), Chemical (17), Food (16), Transportation (12). The residual 82 companies are from the remaining sectors.

2.2. Variables

As the proxy for firm value, we adopt the ratio of market-to-book value (MTB) which is the most common measure in empirical corporate governance research (e.g., Morck et al., 1988; Himmelberg et al., 1999) rather than accounting-based measures because it takes risk into account and is not as likely to distort the results as other measures, such as the return on assets (Lindenberg and Ross, 1981). The threshold variable, ownership concentration (OC), the percentage of equity owned by the top 10 largest shareholders who are non-managerial and non-board members, is the key variable that we use to investigate whether there is an asymmetric threshold effect of ownership concentration on firm value. We also include four control variables commonly used in the analysis of firm value, namely, the natural log of the book value of total assets (Size) to capture intangibles related to the firm’s size; the ratio of total liabilities to total assets (Leverage); the rate at which a firm is growing (Growth), which is calculated as the annual percentage change in sales; and the ratio of annual change in net fixed assets to that of total assets (Capital spend).

Table 1 presents the MTB is more evenly distributed with a pooled mean (median) of 1.57 (1.17). The pooled mean (median) OC is 13.84% (12.5%). As for the control variables, on average for the pooled sample, the Leverage is 40.12%, the Sales growth is 9.9%, the
Capital spend is 3.54%, total assets distribution is also skewed by the large differences between mean (18582 million NT$) and median (7470.36 million NT$). On the basis of the Jarque-Bera test results, we reject the normality of all the variables.

2.3. Research Methodologies
2.3.1. Panel Unit Root models

Hansen’s (1999) panel threshold regression model requires that the variables in the model be stationary in order to avoid spurious regressions and go further estimations of the panel threshold regression. Thus, we first perform the panel unit root test by the Levin-Lin-Chu (LLC) (Levin et al., 2002), the Im-Pesaran-Shin (IPS) (Im et al., 2003), the Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979), and the PP - Fisher Chi-square (Phillips and Perron, 1988) approaches. Based on the results of the unit root test of each panel, the variables have stationary characteristics since the nulls of the unit root are mostly rejected.

Table 1: Sample Descriptive Statistics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Maximum</th>
<th>Median</th>
<th>Minimum</th>
<th>Jarque-Bera</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTB</td>
<td>1.57</td>
<td>1.47</td>
<td>28.88</td>
<td>1.17</td>
<td>0.04</td>
<td>484469.1***</td>
</tr>
<tr>
<td>OC</td>
<td>13.84</td>
<td>11.15</td>
<td>74.2</td>
<td>12.5</td>
<td>0</td>
<td>813.71***</td>
</tr>
<tr>
<td>Leverage</td>
<td>40.12</td>
<td>16.15</td>
<td>98.99</td>
<td>39.56</td>
<td>1.55</td>
<td>124.32***</td>
</tr>
<tr>
<td>Sales growth</td>
<td>9.9</td>
<td>53.04</td>
<td>1451.04</td>
<td>4.47</td>
<td>-96.6</td>
<td>9262786***</td>
</tr>
<tr>
<td>Capital spend</td>
<td>3.54</td>
<td>5.01</td>
<td>43.56</td>
<td>1.73</td>
<td>0</td>
<td>19488.33***</td>
</tr>
<tr>
<td>Total assets (New Taiwanese $ millions)</td>
<td>18582</td>
<td>38297.63</td>
<td>507539.8</td>
<td>7470.36</td>
<td>485.65</td>
<td>247601.2***</td>
</tr>
</tbody>
</table>

Notes. The sample size is 266 firms for each of the 1996-2006 period and is a total of 2926 firm-year observations results. MTB is measured as the ratio of market-to-book value of equity. Ownership concentration (OC) is defined as percentage of total stock held by the top 10 largest shareholders who are non-managerial and non-board members. Leverage is measured as the ratio of total liabilities to total assets. Sales growth is calculated as the annual percent change in sales. Capital spend is measured as the ratio of annual change in net fixed assets to that of total assets.

2.3.2. Panel Threshold Autoregressive Model

We introduce the procedures briefly as follows. According to Hansen (1999), we set up the panel threshold regression model with fixed effects as follows:

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1 For the detailed illustration, please refer to Hansen (1999).
The Empirical Economics Letters, 7(7): (July 2008)

\[
\kappa_{it} = \begin{cases} 
\mu_i + \lambda' \omega_{it} + \alpha_1 T_{it} + \varepsilon_{it} & \text{if } T_{it} \leq \gamma \\
\mu_i + \lambda' \omega_{it} + \alpha_2 T_{it} + \varepsilon_{it} & \text{if } T_{it} > \gamma 
\end{cases}
\]

(1)

where \( \kappa_{it} \) represents firm value, and the ratio of market-to-book value (MTB) is used as the proxy; \( T_{it} \), ownership concentration, is a threshold variable; and \( \gamma \) is the specific estimated threshold value. There are four control variables (\( \omega_{it} \)) that may affect firm value, and these are \( S_i \): Size; \( l_{it} \): Leverage; \( g_{it} \): Sales growth; \( c_{it} \): Capital spend. Besides these, there is \( \mu_i \): the fixed effect which represents the heterogeneity of companies under different operating conditions. We assume the errors \( \varepsilon_{it} \) are independent and identically distributed, with the mean zero. The finite variance is \( \sigma^2 (\varepsilon_{it} \sim iid (0, \sigma^2)) \); \( i \) represents different companies; and \( t \) represents different periods.

For the estimation procedures, we first eliminate the individual effect \( \mu_i \) using the ‘within transformation’ estimation techniques in the traditional fixed effect model of panel data. By using the ordinary least squares and minimizing the concentrated sum of squares of errors, \( S(\gamma) \), we can obtain the estimators of our threshold value and the residual variance, \( \hat{\gamma} \) and \( \hat{\sigma}^2 \), respectively.

For the testing procedures, first, we have to go on to test the null hypothesis of no threshold effect, \( H_0 : \alpha_1 = \alpha_2 \), which can be based on the likelihood ratio test:

\[
F_1 = \frac{S_0 - S_1(\hat{\gamma})}{\hat{\sigma}^2},
\]

where \( S_0 \) and \( S_1(\hat{\gamma}) \) are sum of squared errors under null and alternative hypotheses, respectively. However, as the asymptotic distribution of \( F_1 \) is non-standard, we use the procedure of bootstrap to construct the critical values and p-value. Upon the existence of threshold effect, \( H_0 : \alpha_1 \neq \alpha_2 \), we should test for the asymptotic distribution of threshold estimate, \( H_0 : \gamma = \gamma_0 \), and adopt the likelihood ratio test:

\[
LR_1(\gamma) = \frac{(S_1(\gamma) - S_1(\hat{\gamma}))}{\hat{\sigma}^2}
\]

with the asymptotic confidence intervals:

\[
c(\alpha) = -2 \log \left(1 - \sqrt{1 - \alpha}\right).
\]

Furthermore, if the single threshold is indeed exists, we can extend the panel threshold regression model with single threshold to the double as follows:

\[\text{Note that } LR_1(\gamma_1) \text{ is testing for } H_0 : \gamma = \gamma_0, \text{ while } F_1 \text{ is testing } H_0 : \alpha_1 = \alpha_2.\]
\[ \kappa_{it} = \begin{cases} 
\mu_i + \lambda_i \omega_{it} + \alpha_1 T_{it} + \epsilon_{it} & \text{if } T_{it} \leq \gamma_1 \\
\mu_i + \lambda_i \omega_{it} + \alpha_2 T_{it} + \epsilon_{it} & \text{if } \gamma_1 < T_{it} \leq \gamma_2 \\
\mu_i + \lambda_i \omega_{it} + \alpha_3 T_{it} + \epsilon_{it} & \text{if } T_{it} > \gamma_2 
\end{cases} \quad (2) \]

where threshold value \( \gamma_1 < \gamma_2 \). Following the same procedure, we can go further to the ones with triple or multiple thresholds: \( \gamma_1, \gamma_2, \gamma_3, \ldots \gamma_n \).

3. Empirical Results

We follow the bootstrap method proposed by Hansen (1999) to obtain the approximations of the F statistics and then calculate the p-values. The bootstrap procedure is repeated 1000 times for each of the three panel threshold tests. Table 2 presents the test statistics \( F_1, F_2, \) and \( F_3 \), along with their bootstrap p-values. We find that the test for a single threshold \( F_1 \) and a triple threshold \( F_3 \) is insignificant with a bootstrap p-value of 0.236 and 0.618, respectively; only the test for a double threshold \( F_2 \) is significant with a bootstrap p-value of 0.053. Thus, we conclude that ownership concentration has two threshold effects on firm value. The point estimates of the two thresholds (\( \hat{\gamma}_1 \) and \( \hat{\gamma}_2 \)) are 12.32% and 12.61% and they separate all of the observations into three regimes.

<table>
<thead>
<tr>
<th>Threshold -value</th>
<th>Single threshold effect test</th>
<th>Double threshold effect test</th>
<th>Triple threshold effect test</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.4</td>
<td>12.32</td>
<td>12.61</td>
<td>0.99</td>
</tr>
<tr>
<td>12.32</td>
<td>12.61</td>
<td>0.99</td>
<td>12.32</td>
</tr>
<tr>
<td>12.61</td>
<td>0.99</td>
<td>12.32</td>
<td>12.61</td>
</tr>
</tbody>
</table>

Critical Value of F

<table>
<thead>
<tr>
<th>Critical Value of F</th>
<th>Single threshold effect test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>43.373</td>
</tr>
<tr>
<td>5%</td>
<td>37.475</td>
</tr>
<tr>
<td>10%</td>
<td>23.9</td>
</tr>
<tr>
<td>10%</td>
<td>20.549</td>
</tr>
<tr>
<td>10%</td>
<td>15.362</td>
</tr>
</tbody>
</table>

Notes: F Statistics and p-values result from repeating the bootstrap procedure 1000 times for each of the three bootstrap tests. ***, ** and * represent significance at the 1, 5 and 10% levels, respectively.

Table 3 illustrates the coefficients of three regimes, \( \hat{\alpha}_1, \hat{\alpha}_2, \) and \( \hat{\alpha}_3 \), all significant at the 1% level, while only \( \hat{\alpha}_2 \) is positive. In the first regime, where the ownership concentration is less than 12.32%, the estimate of coefficient \( \hat{\alpha}_1 \) is -0.0283, which indicates that a 1% increase in the ownership concentration decreases market-to-book ratio by 0.0283%. In the second regime, where the ownership concentration is greater than 12.32% and less than
12.61%, the estimate of coefficient \( \hat{\alpha}_2 \) is 0.0586, which denotes that a 1% increase in the ownership concentration increases market-to-book ratio by 0.0586%. In the third regime, where the ownership concentration is greater than 12.61%, the estimate of coefficient \( \hat{\alpha}_3 \) is -0.0074, which implies that a 1% increase in the ownership concentration decreases market-to-book ratio by 0.0074%. Therefore, the negative entrenchment effect is dominant when ownership concentration is less than 12.32% or greater than 12.61%, while the 12.32% to 12.61% ownership concentration level reflects the positive incentive effect.

Table 3: Estimation of Coefficients

<table>
<thead>
<tr>
<th>Coefficient Estimate</th>
<th>OLS SE</th>
<th>( t_{OLS} )</th>
<th>White SE</th>
<th>( t_{White} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \hat{\alpha}_1 )</td>
<td>-0.0283</td>
<td>0.0079</td>
<td>-3.5671***</td>
<td>0.0072</td>
</tr>
<tr>
<td>( \hat{\alpha}_2 )</td>
<td>0.0586</td>
<td>0.0186</td>
<td>3.1562***</td>
<td>0.0834</td>
</tr>
<tr>
<td>( \hat{\alpha}_3 )</td>
<td>-0.0074</td>
<td>0.0028</td>
<td>-2.6428***</td>
<td>0.0025</td>
</tr>
</tbody>
</table>

Note: \( \hat{\alpha}_1 \), \( \hat{\alpha}_2 \) and \( \hat{\alpha}_3 \) are the estimated coefficient for regimes of \( T_1 \leq \hat{\gamma} < T_2 \), \( \hat{\gamma} < T_1 \leq \hat{\gamma}_2 \) and \( T_1 > \hat{\gamma}_2 \).

In the estimations of the coefficients of the control variables, shown in Table 4, we note that firm Size is significantly and negatively related to market-to-book ratio. The interpretation here is that larger firms can be less efficient than smaller ones because of the loss of control by top managers over strategic and operational activities within the firm (Himmelberg et al., 1999). The Leverage is significantly and positively related to market-to-book ratio and, stated briefly, the higher the leverage that a firm has, the higher is its firm value. This result is consistent with the argument in the areas of corporate tax (Modigliani and Miller, 1963) and information asymmetry (Ross, 1977). Finally, Sales Growth and Capital Spend are not significantly related to market-to-book ratio.

Table 4: Estimation of Coefficients of Control Variables

<table>
<thead>
<tr>
<th>Coefficient Estimate</th>
<th>OLS SE</th>
<th>( t_{OLS} )</th>
<th>White SE</th>
<th>( t_{White} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \theta_1 )</td>
<td>-1.4311</td>
<td>0.0616</td>
<td>-23.2395***</td>
<td>0.0905</td>
</tr>
<tr>
<td>( \theta_2 )</td>
<td>0.0074</td>
<td>0.0025</td>
<td>2.9100***</td>
<td>0.0063</td>
</tr>
<tr>
<td>( \theta_3 )</td>
<td>0.0003</td>
<td>0.0005</td>
<td>0.5418</td>
<td>0.0006</td>
</tr>
<tr>
<td>( \theta_4 )</td>
<td>0.0034</td>
<td>0.0056</td>
<td>0.6191</td>
<td>0.0049</td>
</tr>
</tbody>
</table>

Notes:***, ** and *, represent significance at the 1, 5, and 10% levels, respectively. \( \theta_1 \), \( \theta_2 \), \( \theta_3 \) and \( \theta_4 \) represent the estimated coefficients: Size, Leverage, Sales Growth and Capital spend.
4. Conclusion

In this study, using Hansen’s (1999) panel threshold regression model, we find that there are two threshold effects between ownership concentration and firm value in Taiwanese companies during the 1996-2006 period, and these are 12.32% and 12.61%. When the ownership concentration is less than 12.32% or greater than 12.61%, the negative entrenchment effect is dominant. While the 12.32% to 12.61% ownership concentration level reflects the positive incentive effect, a 1% increase in the ownership concentration increases market-to-book ratio by 0.0586%, which predicts that ownership concentration of top 10 shareholders have greater power and stronger incentives to exercise effective oversight to ensure shareholder value maximization (Jensen and Meckling, 1976). Our results shed light on the functioning of corporate governance, particularly, on the role of ownership concentration and investor protection. Our results should also provide a new perspective for the ongoing debate on corporate governance reforms.

References


