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DETERMINANTS OF CAPITAL EXPENDITURE DECISIONS IN THE MALAYSIAN COMPANIES

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ABSTRACT

This study examines Malaysian companies' decisions to invest in capital expenditure in the context of Managerial and Pecking Order Hypothesis. The main objective of this research is to determine the impact of internal cash flows, insider ownership, and investment opportunity on the capital expenditure decisions based on the two competing theories. The Managerial Hypothesis predicts a negative relationship between the insider ownership and capital expenditure. It also suggests that investment opportunity does not affect capital expenditure. The Pecking Order Hypothesis, on the other hand, proposes a positive relationship between investment opportunity and capital expenditure since shareholders' wealth is maximized when managers optimize investment opportunities. However, this hypothesis predicts that the insider ownership does not affect capital expenditure. This study focuses on manufacturing companies listed on Bursa Malaysia. This study period covers the year 2009 until 2013, and a total of 109 companies were chosen using purposive sampling. Therefore, the 5 year study period consists of 545 data. To test the hypotheses, multiple and ordered logistic regression model were used, where capital expenditure is categorized into five ordinal categories and the control variable is divided into four groups which are ranked to capture the variability of the capital expenditures variable. The data was analyzed using STATA program. The main finding of this research provide evident that the internal cash flow has positive and significant effect on capital expenditure and thus, supports both studied hypotheses. However, insider ownership and investment opportunity show a negative and significant effect on capital expenditure. Moreover, in the Malaysian context, the issue of conflicting interest between managers and shareholders does exist and the impact is significant.

JEL Classifications:
Keywords: Capital expenditure, managerial style, Malaysian public listed companies, ordered logistic regression
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INTRODUCTION

Capital expenditure *(capex)* is one of the most crucial managerial decisions whether at the institutional (macro) or the organizational (micro) levels. At the macro level, *capex* affects aggregate demand and gross national product, economic development, and business cycles (Dombusch and Fisher, 1987). At the micro level, it influences production decisions (Nicholson, 1992) and strategic planning (Bromiley, 1986). McConnell and Muscarelle (1985) reports that *capex* affects and is affected by firm performance. Several studies examine factors which influence the *capex* level (e.g., Nair (1979), Berndt et. al., (1980), Larcker (1983), Fazzari dan Athey (1987), Fazzari et. al., (1988), Waegelein (1988), Madan dan Prucha (1989), Gaver (1992), and Griner and Gordon (1995)). In general, their work extend several earlier conceptual discussions of *capex* including Kuh and Meyer (1957), Dusenberry (1958), Jorgenson (1963), Kuh (1963), Jorgenson and Siebert (1968), Grabowski and Mueller (1972) and Elliot (1973).

One of the most widely discussed determinants of c*apex* decisions is the Internal Cash Flow *(ICF)* of the firms (e.g., Myers (1984); Myers and Majluf, (1984); and Griner and Gordon, (1995)). Managerial Hypothesis *(MH)* and Pecking Order Hypothesis *(POH)* represent two popular theoretical explanations for the relationships (Griner and Gordon (1995)**.** Both theories suggest a positive effect of *ICF* on the level of *capex*. However, *POH* and *MH* hold different explanations and thus, contrasting predictions with respect to the relationships between Insider Ownership *(I_O)* and Investment Opportunities *(IOP)*, and the level of *capex*.

Kim (2006) studies the impact of family ownership and capital structure on the performance of Korean manufacturing firms and reports a significant positive association between the two variables. Maury (2006) also finds increased performance due to family ownership in Western European firms. It was further documented that firms with high government and institutional ownerships are generally profitable and have low leverage (Fraser et. al., 2006). In Malaysia, the importance of family-share ownership should not be under-estimated. In addition to government ownership which is at 11% (average), institutional ownerships stand at an average of 62% (Fraser et. al., (2006)). This unique characteristic of firms' ownership in Malaysia provides one of the motivations for this study. Furthermore, empirical results are inconclusive with respect to the association between *I_O* and *capex*. Thus, the main objective of this study is to determine which of the two hypotheses *(MH or POH)* dominates the c*apex* decisions in Malaysia.

The remainder of the paper is organized as follows. Section two presents the literature review of *capex* decisions and the proposed hypotheses. Comparison between the *POH* and *MH* is presented in section three.

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Section four discusses the methodology and sample data. Discussion and analysis are covered in section five while section six summarizes the paper and provides suggestion for future research.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Capital expenditure decisions and firm performance have been shown to be positively related (McConnell and Muscarella, 1985). Sartono (2001) investigates the impact of *ICF* and *I_O* on c*apex* for companies listed on Bursa Efek Jakarta (BEJ) using a sample of 223 companies (1994 to 1998). He reports *ICF* to be positively related to *capex*. However, in the case of *I_O*, the effect on *capex* is not significant. This finding implies that *POH* prevails in the Indonesian context. A study by Marchica and Mura (2007) using a sample of UK non-financial listed firms (1991 to 2001) examine how alternative cash-holding policies influence the firm's ability to invest. They conclude that a cash-rich firms show a strong positive impact on *capex* while those persistently display low cash policy invest less in *capex*. Masulis et. al. (2007) conclude that the scaled change in *capex* has a significantly positive effect on excess stock returns, indicating that on average, capital investments add to shareholders value.

Pecking Order and Managerial Hypotheses

In explaining the influence of *ICF* on *capex* decision, *POH* assumes the superiority of shareholders' wealth concept. Therefore, the level of insider ownership *(I_O)* is insignificant in managerial *capex* decisions. *POH* assumes that agency problems do not influence *capex* decision making process (Griner and Gordon 1995; Sartono 2001). Since shareholders' wealth is the main managerial priority, the level of *CE* will increase with the increase in *IOP*. This is further strengthened in the absence of conflicts between managers and owners. It is assumed that beneficial investments to the owners will also benefit managers through financial rewards and career advancement (Aggarwal and Samwick, 2003). In addition, according to Griner and Gordon (1995), managers are motivated to utilise *ICF* rather than external funds due to the information asymmetry. Since managers are more informed than owners regarding both *ICF* and *IOP*, the former are in a better position to over or under invest at the expense of limited information of the owners (Stulz, 1990),

Contrary to *POH, MH* emphasizes the significance of managers' ownership and conflict of interest between managers and stockholders in *capex* decision, termed as agency cost (Jansen and Meckling, 1976). In this view, managers' decisions are influenced by self interests and profit maximization (Scott, 2003). *Capex* entails financing risk which may jeopardize firm's survival and affects the portion of managerial ownerships. It follows that large managerial stockholdings tend to result in under-investment using internal cash flow. Thus, this theory predicts a negative relationship between *I_O* and *capex*. In addition, *MH* argues that *capex* decision is not determined by the availability of *IOP* but the personal interest of managers.

Griner and Gordon (1995) suggest three main reasons why managers with small stocks ownership prefer to finance *capex* using ICF rather than external financing: (i) *ICF* carries low risk since firms are not committed to pay interest and thus, low bankruptcy risk; (ii) using *ICF* implies manager's performance is reliable since shareholders are willing to sacrifice dividend from retained earnings; and (iii) further investment of *ICF* signals the perception of a long term investment opportunity and firm survival. Thus, managers would be loyal to the firm and owners would be interested in the survivorship of the firm.

The above discussion reflects the importance of *ICF* in deciding the *capex* level. However, these relationships need further examination to understand the interplay of managerial relationship, especially between the managers and the owners. To date, studies of this nature are relatively scant especially in developing economies (see for example, Fazzari and Athey, 1987; and Fazzari et. al., 1988)

Internal Cash Flow *(ICF)* and Capital Expenditure *(CE)*

Elliot (1973) performs a cross-section time series of 184 manufacturing and non-manufacturing companies. He concludes that *capex* is affected by liquidity, which in turn is determined by *ICF*. Fazzari and Athey (1987) and Fazzari, et al., (1988) provide further evidence that liquidity significantly strengthens the effect of *ICF* on c*apex*. Similarly, Fazzary and Athey (1987) and Fazzary, et. al.,(1988) report that *ICF* is an important factor in *capex* decisions.

POH's explanations on the use of *ICF* for *capex* financing is based on the argument that managers and current stockholders do not have conflicting interests (e.g., Myers (1994) and Myers and Majluf (1984)). Rather, asymmetric information is the main motivation for managers' preference to use *ICF* in financing *capex*. Potential investors believe that managers possess and use information not available to outsiders in attempting to maximize the current stockholder's welfare. Thus, using *ICF* to finance *capex* signals a positive effect on the wealth of current shareholders.

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Contrary to *POH*, the basis for *MH's* explanation is the managers-shareholders' conflict of interest. Marris (1964) studies *ICF* and *capex* as focal points for this conflict and argues that managers prefer to retain and re-invest a large portion of earnings that is in the best interest of shareholders. Jansen (1986) states that the agency conflict increases with excess cash flow since managers attempt to increase their authority by over investing in non-core activities. These activities may not be parallel with the shareholders' interests. Meanwhile, other researchers argued that although agency conflict can be reduced, it can not be eliminated by the market mechanism (Jansen and Menkling, 1976; Fama, 1980; Jensen and Ruback, 1983; Hart, 1983; Jensen 1986).

More recently, a study by Dalbor & Jiang (2013), using a sample of U.S restaurant industry (2002 to 2012) examine how free cash flow influence the firm's capital expenditure. They study found that free cash flow and size were positive determinants of *capex,* whereas the economic recession was a negative determinant of *capex.*

Based on the explanation above, both *POH* and *MH* propose that *ICF* is an important determinant of *capex*, whereby the two variables are positively related. Accordingly, this lead to our first hypothesis (in alternative form):

H1: Internal cash flow (ICF) has a positive effect on the level of firms' capital expenditure (capex).

Insider Ownership *(I_O)* and Capital Expenditures *(capex)*

Even though previous empirical research has investigated the effect of *I_O* on many issues, none has documented the relationship between *I_O* and *capex*. For example, Haugen and Senbet (1981) study the effect of *I_O* in options trading. Morck et al. (1988) look at the correlation between *I_O* and financial performance, and report a significant non-linear effect. Further, Wu and Wang (2005) conclude that *I_O* positively affects firm value. The empirical findings of Jensen et al. (1992) suggest that there exists interdependency among *I_O*, debt level, and dividend policy. Walkling and Long (1984), Benston (1985), Agrawal and Mendelker (1987), and Sicherman and Pettway (1987) have also provided evidence that *I_O* influences the levels and characteristics of mergers and acquisitions.

A more recent study by Kim (2006) involving Korean manufacturing firms (1991 to 1998) investigates the impact of family ownership and capital structure on firms' performance. His findings suggest a positive association between the two variables. Maury (2006) also finds increase performance due to family ownership in Western European firms. In particular, where families hold at least one of the top two positions, profitability is improved. This suggests that family ownership lowers the classical agency problem between managers and owners. In Malaysia, where the government and institutional ownerships are relatively high, the ownership impact on business decisions may be underestimated. Fraser et. al., (2006) documents that firms with high government and institutional ownerships are generally profitable and have high leverage. *POH* assumes no conflicting interest between managers and the current stockholders and thus, there is no effect between *Capex* and *I_O*. In contrast, *MH* argues that managers increase their self-interest in deciding the c*apex* level. Low managerial ownership may provide incentive for them to take risk in committing to high level *capex*. In other words, increase *I_O* is expected to reduce managerial over-investment in *capex*. Accordingly, *MH* predicts a reverse relationship between *Capex* and *I_O*. In line with *MH* argument, our second hypothesis is:

H2: Insider ownership (I_O) has a negative impact on the level of firms' capital expenditure (capex).

Investment opportunity *(IOP)* and Capital Expenditure *(Capex)*

Following Myers (1977), *IOP* is defined as a combination of real assets (assets in place) and future investment options. According to Graver and Gaver (1992), future investment option is implied by projects supported by research and development as well as the company's relative ability to determine viable investment opportunities (in comparison to others) within its industry. Myers (1977) suggests that company's ability is negatively correlated with firm value which in turn depends on future *IOP*. Furthermore, managers tend to reach a debt ratio target to asset from *IOP*. A high asset proportion implies a high debt ratio and these findings support Smith and Watts (1992).

Gaver (1992) argues that in determining the investment opportunity sets, companies adopt a long-term view to balance management incentive and stockholder's interest. In general, the literature shows that *capex* is influenced by policies and compensation plans that are incentive-based, designed to align the interests of managers and stockholders. Wu and Wang (2005) report a strong positive relationship between announcement effects and *IOP* but fail to uncover the effect for issuing firms with high *IOP*. According to Brailsford and Yeoh (2004), the growth opportunities are significantly important to explain the market reaction to capital expenditure announcements.

Jung et. al., (1995) conclude that managers of growth-oriented companies prefer to increase capital through equity financing since it allows firms to increase capital without commitment to pay interest as in the

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case of debt financing. They argue that companies with profitable *IOP* tend to issue equity while those with poor *IOP* prefer to issue debt. In addition, they report that stock price reacts favorably to equities issued by companies with good *IOP*. According to Chung et. al. (1998), share price reactions to a firm's c*apex* decision reflects the market's assessment of the firm's quality of *IOP*.

On the contrary, Donaldson (1961) as cited in Brigham and Gapenski (1996) summarizes that firms prefer to utilize internal rather than external financing (from retained earnings and non-cash depreciation). Those with *ICF* greater than *capex* requirement will invest the excess *ICF* in marketable securities, increase the payout ratio, or buy the treasury stocks. Whenever the *ICF* is insufficient to finance new projects, it will be reflected by decreasing the size of marketable securities portfolio, followed by selling bonds, convertible bond, and common stock as the last resort. In Hong Kong, Fan and So (2004) conclude that the pecking order principle is practiced to maintain target debt-equity mix. Internal equity was ranked first, followed by bank debt and new common equity. In the US, Graham et. al., (1992), Kester et. al., (1994), Wivattanakantang (1999), and Arsiraphongphisit et al., 2000) provide support for this conclusion.

MH argues that managers tend to over-invest if the future *IOP* is better than the current condition without considering the stockholders' welfare. According to this view, there is no impact of *IOP* to company's *capex*. On the contrary, the *POH* predicts that in this condition, managers will increase the level of capex to improve stockholders' welfare. Therefore, c*apex* is positively related to *IOP*. This argument leads to our third hypothesis:

H3: Investment opportunities (IOP) have a positive impact on the level of firms' capital expenditure (capex).

RESEARCH METHODOLOGY

Data, Samples and Measurements

This research uses secondary data drawn from manufacturing companies listed on Bursa Malaysia. Data are acquired from published company reports covering a period of 5 years (2009 - 2013). The study focuses primarily on manufacturing companies since they are more likely to invest heavily in property, plant, and equipment compare to those in service industries. The data are selected using purposive sampling method. Following Emory & Cooper (1995 p.228), the following criteria were used to select the sample companies: (i) legally registered as public companies with Bursa Malaysia during the study period; (ii) having insider ownerships (i.e., the CEO and the board of directors are listed as shareholders); and (iii) having complete financial reports published by Bursa Malaysia during the 5-year period.

A total of 157 manufacturing companies was obtained and based on the above criteria, 48 companies were excluded since their dates of incorporation was later than the year 2009. The final sample of 109 companies represents various sectors as presented in Table 1.

TABLE 1: COMPANIES REPRESENTATION BY SECTOR

Sector	Number	%
Food	1	0.91
Petroleum Refineries	4	3.67
Rubber	4	3.67
Plastic	5	4.58
Wood	14	12.84
Iron and Steel	11	10.09
Furniture and Fixtures	11	10.09
Paper	2	1.83
Fabricated Metal	11	10.09
Machinery and Electrical Machinery	4	3.67
Equipment	10	9.17
Other Manufacturing	19	17.43
Unspecified	13	11.93
Total	109	100%

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Variables and Measurements

Capital Expenditure (capex)

Capex as explained by Griner and Gordon (1995) represents the amount of fund disbursed by management to acquire property, plant and equipment. *Capex* can also be described as the amount paid for additional assets to support firm development (Sartono, 2001). As defined by Griner and Gordon (1995) and Sartono (2001), *capex* might be stated as the difference between total fixed assets in the current period and total fixed assets in the previous period. The mathematical form can be stated as follows:

$$\text{Capex}_{it} = \text{TFA}_{t} - \text{TFA}_{t-1}$$

Where:
Capex = Capital Expenditure of company (i) for period (t);
TFA_t = Total Fixed Asset at time (t); and
TFA_{t-1} = Total Fixed Asset at time (t-1).

Capex is categorized into 5 ordinal categories. In ordered logit model, observed response categories of capital expenditure (y_i) are tied to the latent variable (y_i^*) by a measurement model that divides y_i^* into 5 ordinal categories according to the following estimates of cut-off-points:

$$Y = \begin{cases} 0 = \text{"negative capex"} & \text{if } y_i^* = 0 \\ 1 = \text{"positive first 25\%"} & \text{if } 0 < y_i^* \le 56.32 \\ 2 = \text{"positive between 25\% and 50\%"} & \text{if } 56.32 < y_i^* \le 152.63 \\ 3 = \text{"positive between 50\% to 75\%"} & \text{if } 152.63 < y_i^* \le 481.98 \\ 4 = \text{"positive above 75\%"} & \text{if } 481.98 < y_i^* \end{cases}$$

The categorization of *capex* is based on a simple arithmetic procedure. Companies with negative capex are categorized as group zero[1]. On the other hand, firms with positive capex values are divided into four different categories using the median value as the cut-off point. Companies having c*apex* value below and above the median value is further divided into two different categories with "25 percent and below" and "75 percent and above", respectively.

The above categorization separates companies into more homogeneous groupings. This allows for better comparison in terms of firms' capacity and growth performances among the different categories. The classifications simply follow an ordinal categorization of firm performance. It assumes that, the lower (higher) ordered the firm, the lower (higher) its utilization (performance).

Internal Cash Flow (ICF)

Free cash flow has been defined as the cash flow remaining after firms' have invested in all positive NPV projects' (Lang et al., 1991, p. 319). The liquidity measure used in this study is described as Internal Cash Flow *(ICF)* rather than free cash flow, although its operational definition is identical. In this study, following Lehn and Poulsen (1989) and Lang et. al. (1991), ICF is defined as:

$$\text{ICF} = \text{INC} - \text{TAX} - \text{INTEXP} - \text{PFDIV} - \text{COMDIV}$$

Where:
INC = operating income before depreciation;
TAX = total income taxes;
INTEXP = gross interests expense on short and long-term debt;
PFDIV = total amount of preferred dividend requirement on cumulative preferred stock and dividends paid on noncumulative preferred stock.

[1] Almost 54 percent of the total usable capex observations recorded negative values. According to accounting and finance approach (Griner and Gordon, 1995 and Sartono, 2001), a negative value of capex is not an indication of loss to a company but only reduces its total fixed asset holding. Therefore, the decision to regroup a negative capex into lowest ordinal category is simply to avoid the elimination of such observations from the analysis.

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COMDIV = Total value of dividends declared on common stock

Insider Ownership (I_O)

I_O is the percentage of shares owned by managers and executive boards of company (i) during period (t) for each observation period. It is mathematically formulated as follows:

$$I\_O_{it} = \frac{D \& C\ SHRS_{it}}{TOTSHRS_{it}}$$

Where:

$TOTSHRS_{it}$ = Total value of shares issued; and

$D \& C\ SHRS_{it}$ = Shares owned by managers and executives of company (i) during period (t)

(Chen and Steiner, 1999; Crutchley & Hansen, 1989; Wiwattanakantang, 1999).

According to the *MH*, *I_O* is expected to reduce the tendency of managers to over-invest in *capex* by forcing them to support more of the financial consequences of their actions. Thus, an inverse association between *Capex* and *I_O* would support the *MH*. *POH*, however, believes that there is no conflict of interest between managers and the current shareholders and thus, no association is predicted between *Capex* and *I_O*. The *POH* argument is taken as the null hypothesis and analyzed against the alternative hypothesis of an inverse association as implied by the *MH*.

Investment Opportunity (IOP)

IOP is a combination of real assets (assets in place) and future investment option (Myers, 1977). The measure used is the book value of gross property, plant, and equipment (PPE) ratio with the book value of the asset (BVA) (Sami et. al., 1999).

$$IOP_{(t+1)} = PPE_{t\_/}\ BVA_t$$

Where:

IOP = Investment Opportunity;

PPE_t = book value of property, plant and equipment in year (t) and

BVA_t = book value of total assets in year t.

Interaction Effects

The Managerial Hypothesis predicts a positive interaction coefficient between *ICF*, *I_O* and *IOP* and in this study, the effect is estimated by the following:

$$\left[\frac{ICF(it).IOP(t+1)}{I\_O(it)}\right]$$

Total Sales

According to Griner and Gordon (1995), *sales* is normally used to control for firm size and measured by total revenues generated by company (i) during period (t). Haller and Murphy (2012) also find that firm size is one main determinant of *Capex*. This variable also acts to isolate the impact of *ICF*, *I_O*, and *IOP* on *Capex* and thus, reduce the minimum rate of bias (Gordon and Griner, 1995, Sartono 2001 and Myers and Majluf 1984). Without the isolation process, the correlations between *Capex* and *ICF* may not be recognized, because *Capex* and *ICF* may be positively correlated with the company's size, as well as *IOP*. Furthermore, the correlations between *Capex* and *I_O* could be unexpected since the existence of the *I_O* in large companies is usually small.

In this study, total annual sales are used as a proxy to control for firm size. Therefore, sales are also grouped into 4 different categories based on simple arithmetic procedure. All groups are equally divided so that the effects of sales become easily identified. The cut-points are estimated as follow:

$$D = \begin{cases} 1 \text{ if total sales } \le 25\% \\ 2 \text{ if } 25\% < \text{total sales} \le 50\% \\ 3 \text{ if } 50\% < \text{total sales} \le 75\% \\ 4 \text{ if total sales } > 75\% \end{cases}$$

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Group "1" represents the first 25 percent of the sales distribution and the second 25 percent of the data is grouped as "2". Group "3" falls between 50 to 75 percent of the distribution and finally, the upper 75 percent of sales is categorized as Group "4". Each group is identified as an ordinal category. It is assumed that, the higher (lower) the order of the group, the higher (lower) the total annual sales.

Model Development

The ordinary regression model assumes that the distances between categories of responses are equal. In order to avoid this basic assumption, the Ordered Logit Model (OLM) is utilized. The OLM or proportional odds models have been widely used to analyze a latent variable model (i.e., responses dependent variable). This model assumes that the categories of an ordinal response can be ranked, but the distances between the categories are unknown. The ordered logistic regression model with multiple independent variables is expressed as:

$$y^* = X_t b + e_t \quad e_t \sim NID\ (0,1)$$

The vector of X_t variables could be a combination of interval, ratio and categorical variables. In the ordered logistic model observed response categories (y_i) are tied to the latent variable (y_i^*) by a measurement model that divides y_i^* into J ordinal categories so that J-1 cut-points are estimated. The unobserved cut-points (threshold value) are depicted as below.

$$Y = \begin{cases} 0 & \text{if } y^* \le 0 \\ 1 & \text{if } 0 < y^* \le \gamma_1 \\ 2 & \text{if } \gamma_1 < y^* \le \gamma_2 \\ \vdots & \\ J & \text{if } \gamma_{J-1} \le y \end{cases}$$

In the latent variable model, the dependent variable y* could be divided by some thresholds parameters (i.e., limited, known, number of values), which usually must be estimated (i.e., $\gamma_1, \gamma_2, \gamma_3, \cdots, \gamma_J$), and it is essential that $\gamma_1 < \gamma_2 < \gamma_3 < \cdots < \gamma_J$.

In general, the latent variable model with multiple independent variables is express as:

$$\ln\left(Y_j\right) = \ln\left(\frac{p_j(x)}{1 - p_j(x)}\right) = g_j + \left(b_1 X_1 + b_2 X_2 + \cdots + b_n X_n\right)$$

Where parameters γ_j and β_p are those to be estimated.

However, since the ordered logistic model estimates one equation over all levels of the dependent variable, a concern is whether a one-equation model is valid or a more flexible model is required. A parameterization of each of the parallel equation when a constant is present in the model is assumed homogenous across other individual parallel model.

The final OLR model with total annual sales as a dummy variable is as depicted below:

$$\ln\left(Y_j\right) = \ln\left(\frac{p_j(x)}{1 - p_j(x)}\right) = g_j + \left(b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + d D_{X5}\right)$$

Where, the coefficients for each variable are as follows:

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γ_j Cut - point (intercept)

β_1 ICF

β_2 I_O

β_3 IOP

β_4 interaction ICF * I_O * IOP

δ if D $\begin{cases} 1 \text{ if total sales } \leq 25\% \\ 2 \text{ if } 25\% < \text{total sales} \leq 50\% \\ 3 \text{ if } 50\% < \text{ total sales} \leq 75\% \\ 4 \text{ if total sales } > 75\% \end{cases}$

In the proportional odds model, the covariates have the same effect on the odds as the response variable has at any dividing point. Different values of the covariates are regarded as shifting the response distribution to the right (or left) without changing its spread or shape. In the proportional odds model, the cumulative logistic model the effect of covariates on odds of response below or equal to the cut-point *m* in the latent variable. First, the odds that an outcome is less than or equal to *m*, versus being greater than *m*, given **x** is defined as follow:

$$\Omega_{\leq m|>m}(X) \equiv \frac{P(y \leq m \mid X)}{P(y > m \mid X)} \qquad \text{for m} = 1, \cdots \text{J -1}$$

The log of the odds is defined as follows:

$\log \Omega_{\leq m|>m}(X) = \tau_m - X\beta$ where τ_m is a cut-point of m, so that

$P(y = m \mid X) = F(t_m - Xb) - F(t_{m-1} - Xb)$ and $P(y \leq m \mid X) = F(t_m - Xb)$

The estimation of J-1 cut-points and the intercept for each individual parallel equation is achieved by equating the intercept to zero.

Model specification

Measuring goodness of fit in the OLM is one that needs to be cautiously interpreted. Since the logistic regression does not have an equivalent of the R-squared value in OLS regression, the fitted model in this study is evaluated using (i) Akaike information criterion, AIC; (ii) The Bayesian information criterion, BIC; and (iii) McFadden's R^2.

According to (Long and Freese, 2001), there is no convincing evidence that the selection of a model which maximizes the value of a given measure necessarily results in a model that is optimal in any sense other than the model having a larger (or smaller value) of that measure. However, it is still helpful to examine any differences in their level of goodness of fit, and hence provide some guidelines in deciding the appropriateness of the model. Brant (1990) test is employed to test the individuality of each parallel equation. Whenever a significant p-value is obtained, then the parallel regression assumption is violated, and a more robust technique is required.

Results and Discussion

This research focuses on the capital expenditure *(capex)* decisions by Malaysian manufacturing companies listed on the Malaysian Bourse. Four independent variables are examined, namely, internal cash flows (ICF), insider ownership (I_O), investment opportunities (IOP), interaction terms between ICF, I_O and IOP and total annual sales being treated as the control variable. Capex is categorized into 5 ordinal categories while total sales are ranked into 4 groups. According to Griner and Gordon (1995), using sales as the control variable captures the variability of the interaction terms between ICF, I_O and IOP.

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TABLE 4.1: RESULTS OF ORDERED LOGISTIC REGRESSION WITH ODD-RATIOS

	Form Level		Odd-ratio Level	
$\ln\left(\frac{p_j(x)}{1-p_j(x)}\right)$	Coef	Z-value	Coef	Z-value
g_1	-0.1764		-0.1764	
g_2	0.4491		0.4491	
g_3	1.1173		1.1173	
g_4	2.1225		2.1225	
b_1	0.0009	3.09***	1.0009	3.09***
b_2	-0.0277	-2.17**	0.9726	-2.17**
b_3	-0.9226	-1.79*	0.3975	-1.79*
b_4	0.00003	1.58	1.0000	1.58
d_2	0.4292	1.83*	1.5360	1.83*
d_3	0.5287	2.21**	1.6967	2.21**
d_4	0.6913	2.34**	1.9963	2.34**
LR Chi-sq (7)	57.30***			
McFadden R-sq	0.0413			
AIC	1353.692			
BIC	1399.396			
Brant (1990) test	23.44 (**0.321**)			

Notes:
****,**,* denotes a significant value at 1%, 5% and 10%, respectively.*
Values in parenthesis denote p-value.
Brant test: test conducted to identify the parallel regression equation for each of the individual model. A significant test signifies that parallel regression assumption is violated.
McFadden R-square should be interpreted cautiously, since in limited dependent variables, the measurement of goodness of fit is incomparable with the OLS.

Table 4.1 demonstrates that a unit increase in ICF (b_1) results in the ordered log-odds of a higher c*apex* group to increase by 0.0009 unit (significant at 1% level) and thus, supports the first hypothesis. However, the proportional odds ratio for ICF (b_1) is 1.0009 times higher for high *capex* group as compared to other *capex* group, *ceteris paribus*. The proposed sign of ICF is consistent with both theory (i.e., POH and MH) and also provide support for Griner and Gordon (1995), and Sartono (2001).

b_2 , the coefficient for Insider ownership (I_O), shows a reverse relationship with c*apex* (significant at 5 percent level). This result suggests that a unit increase in b_2, the ordered log-odds of being in a higher *capex* category decreases by 0.0277 units, *ceteris paribus*. In terms of proportional odds ratio, it is found that an increase in b_2 reduces the effect of higher c*apex* group compared to others by 0.9726 times. The significance of I_O towards *capex* is assumed to follow the managerial hypothesis and consistent with Scott (2003). This implies that conflict of interest between managers and shareholders do exist, and provide the incentives for over-investment on the part of the managers.

This study hypothesizes that investment opportunity (IOP) is positively related to *capex*. Rather, the findings show that the IOP coefficient is negatively correlated and significant at 10 percent level. This particular result demonstrates that companies in Malaysia tend to behave according to the argument of the managerial hypothesis. In other words, managers attempt to capitalize on the investment opportunities more for personal wealth maximization rather than for shareholders' value (Mansor & Hamidi, 2008). The proportional odds ratio indicates that a unit increase in b_3 would lower the higher *capex* group utilization by 0.3975 times in comparison to the other groups.

Table 4.1 also shows that as predicted by the managerial hypothesis, the interaction terms between ICF, I_O and IOP are positive but insignificant. Compared to other groups, the effect of the interaction terms increases the proportional odds ratio of higher *capex* group nearly one time. This finding is similar and consistent to study conducted by Fazzari and Athey (1987), Fazzari et. al. (1988), and Griner and Gordon (1995).

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At 10 percent level, the sales variable is statistically significant and the level improves as sales progress to a higher than the basic group. In short, sales within group "2" affect higher c*apex* level at 0.4292 units compared to group sales "1". Similarly the effect of sales of group "2" towards higher *capex* group is recorded at 1.5 times higher compared to others. Moreover, the proportional odds ratio increases to about 1.7 times for sales group "3", and almost 2 times higher for the highest sales group. Overall, annual sales and *capex* are positively correlated. This result thus, supports Griner and Gordon (1995), and Myers and Majluf (1984).

The consistency of each of the parallel regression is tested using the procedure proposed by Brant (1990). According to Brant (1990), if each of the coefficients is found to be similar for each single equation, then the OLR assumption is violated. As reported in Table 4.1, the chi-square value is 23.44 (not significant) and therefore, confirms that the coefficients across the four parallel individual regressions were homogenous.

CONCLUSION

This research extends the previous work on the capital expenditure *(capex)* decisions by Malaysian manufacturing companies (Mansor and Hamidi, 2008). Based of the gap in expectations between the arguments of the Pecking Order Hypothesis *(POH)* and the Managerial Hypothesis *(MH)*, four main hypotheses are proposed. Four independent variables are examined, namely, internal cash flows *(ICF)*, insider ownership *(I_O)*, investment opportunities *(IOP)* and *sales* as the control variable. Unlike the earlier study which used the OLS method, this research applies the Ordered Logistic Regression (OLR) model. The independent variable (capex) is categorized and ranked into five (5) ordinal categories. The control variable is divided into four (4) groups, which are also ranked ordinarily to capture the variability of the independent variables. This study also provides mixed support for the two hypotheses and reveals interesting characteristics with regards to the managerial style among the Malaysian PLCs.

As predicted by both *POH* and *MH*, the results show positive and significant impact of *ICF* on higher *Capex* group. Both theories, however, predict different outcome with respect to the relationship between *I_O* and *IOP*. The *POH* predicts no effect of *I_O* on *Capex* while the *MH* argues for a negative relationship between the two. In this study, *I_O* is found to have a significant negative impact on higher *Capex* group (at 5 percent) and thus, supports the MH. With respect to *IOP*, the *POH* suggests that it is positively related to *Capex* since managers attempt to maximize shareholders' wealth. However, the *MH* holds that *Capex* is not affected by *IOP*. Contrary to both the *MH* and *POH*, this study documents a significant negative effect of *IOP* on higher *Capex* group.

As predicted, the results suggest that *ICF* and c*apex* are positively related and thus, provide further support for the importance of *ICF* in *capex*. In contrast to the argument of *POH*, there is no evidence that the use of *ICF* to finance *capex* is due to information asymmetry. Rather, such action is motivated by managerial intention to optimize personal benefits. The conflict of interest between managers and shareholders is detected from the negative (significant at 5%) coefficient for *I_O*. This finding is consistent with Kim (2006) and supports the MH. It reflects that in Malaysia, even in publicly owned companies, the family-effect may still dominate. To a certain extent, the family-ownership effect influences the directors' *capex* decisions and helps to reduce the significance of agency cost in capital expenditure decisions. Also, unlike the case of Indonesia (Sartono, 2001), the study provides mixed results as to the dominance of *POH* and *MH* in Malaysia. More specifically, the results partially support the *MH* and not fully neglect the *POH*, providing evidence of the significance of agency conflict between managers and shareholders in *Capex* decisions.

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