The impact of leverage on firm investment: evidence from Dutch listed firms

Author: Mahmut Ince
University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands

ABSTRACT,
This paper analyses the impact of leverage on a firm's investment decisions. Information on Dutch listed firms are used. This paper makes a distinction between firms with high and low growth opportunities and uses a pooled regression to estimate the relationship between leverage and investment. The results show that leverage is negatively related to investment, regardless of growth opportunities. The difference for the relationship between leverage and investment is small for firms classified as high and low growth firms. Overall, the results are consistent with the expectations based on the underinvestment and overinvestment theory.

Graduation Committee members: Dr. s. Zubair
Professor Dr. Rezaul Kabir
Dr. Xiaohong Huang
Dr. Henry Van Beusichem

1. INTRODUCTION

In a perfect ´´Miller-Modigliani´´ world Modigliani and Miller (1958), the main determinants of investment would be the future state of demand, the firm's production technology, the market interest rate, profitability, cash flow and net worth. Miller-modigliani (1985) demonstrate that leverage is irrelevant to a firm in making investment decisions. However, the impact of leverage may not be denied considering a world with significant agency problems, Aivazian et al. (2005a), Firth et al. (2008) The neo-classical position of Modigliani-Miller is theoretically and empirically challenged in the literature. In theory, incomplete markets and agency problems arising from the interaction between management, shareholders and debtholders cause incentives for underinvestment as well as overinvestment Aivazian et al. (2005a) This implies the existence of financing considerations affecting the investment relationship, since the agency problems; transaction costs and asymmetric information, lead to incomplete markets Aivazian et al. (2005a). Myers (1997) shows the significance of underinvestment in highly levered firms, which is caused by a debt overhang. The debt overhang in a firm induces management incentives to invest in net present value projects because the potential benefits of the net present value project may flow to debt-holders first. On the other hand, Jensen (1986) emphasizes the disciplinary and monitoring role of a high leverage. Highly levered firms have less cash flows to invest, thus the overinvestment initiatives of management caused by agency problems will be limited. Aivazian et al., (2005); Firth et al. (2008) supports the overinvestment and underinvestment theories by measuring the impact of leverage and by making a distinction in firms with high and low growth opportunities, measured in terms of Tobin's Q.

The aim of this paper is to analyze the impact of leverage in making investment decisions by providing new evidence. The existing literature does not offer evidence from the Netherlands, while the Netherlands is well-known for its contribution to international trade. The Netherlands serves as the home country to a number of large multinationals; Royal Dutch Shell, Unilever, ING Group and Rabobank. The Netherlands is also home to industrial firms like Heineken, Phillips, and KPN. The Dutch open economy, outward focus, public sector, social services and good infrastructure makes The Netherlands an attractive destination for foreign investment. The attractiveness of the Netherlands drives the participation of the Netherlands in the international trade. Thus, the following research question is formulated;

What is the impact of financial leverage on the firms' investment decisions in Dutch listed companies

This paper contributes to the existing literature by analyzing Dutch firms with recent data. Previous studies have mostly been conducted with panel data of firms in the United States and Canada. This paper will resolve a potential endogeneity problem caused by an anticipatory management team. The management of a firm may be anticipating on future investment opportunities by reducing leverage Aivazian et al. (2005a;2005b). Most of the existing literature ignores individual firm effects. By ignoring individual firm effects, the association between leverage and investment may not be fully identified because there might be an unobservable individual firm characteristic that affects the relationship between leverage and investment. However, I will follow Lang et al. (1996) by following their assumption that the unobservable individual firm effect is zero. This assumption is strong due to the large heterogeneity across industries and firms within the same industries. The presented paper uses a pooled

OLS method; a pooling regression. This method is appropriate for panel data.

To examine the relationship between leverage and investment, control variables will be included in the formula. The first control variable will be Tobin's Q. Firm´s with a higher Q value have more valuable growth opportunities. On top of Tobin´s Q, Cash flow is going to be controlled for. Fazzari et al. (1988), Hoshi et al. (1991) and Kaplan et al. (1995) provide evidence that the availability of internal funds (Cash flow) is related to investment. Finally, net sales of a firm are going to be controlled for. Opler and Titman (1994) show that the growth in sales of a firm is related to Leverage. Data from 2008 to 2017 will be analyzed.

This paper is organized as follows: Section 2 studies the literature, shows the link between leverage and investment and introduces the hypotheses. Section 3 describes the used methodology and data. Section 4 discusses the results, i.e. the impact of leverage on investment. Section 5 presents the conclusion.

2. LITERATURE STUDY

The agency theory is based on agency conflicts between managers, owners and debt holders, caused by asymmetric information. The agency theory is conceptualized by the agent and principal, this theory is characterized by the difference in interest that the agent and principal have. Managers are the agents and owners are the principal. The Agency problems arising in organizations regarding the relationship between leverage and investment are the so-called overinvestment and underinvestment incentives by management of a firm.

According to Myers (1977), despite the presence of valuable growth opportunities, highly levered firms are less likely to invest in valuable projects. The so-called debt overhang in highly levered firms reduces incentives of the management team that controls the firm to invest in positive net present value projects. The idea behind this theory is that even if the new investment will have a positive net present value, the return will possibly at first flow to the bondholders instead of to the shareholders. This leads to underinvestment. The underinvestment theory is irrespective of the nature of growth opportunities related to a negative relationship between leverage and investment Lang et al. (1996).

According to Aivazian and Callen (1980), if future growth opportunities are sufficient and recognized early, the effect of potential underinvestment incentives created by a high leverage can be reduced by the management team by anticipating on future growth opportunities. Consequently, the management of a firm will seek for ways to lower the level of debt ex ante the future investment opportunity. Thus, future growth opportunities can play a role within the relationship between leverage and investment. Leverage may be a signal of the management about future investment opportunities. "A negative empirical relation between leverage and growth may arise even in regressions that control for growth opportunities because managers reduce leverage in anticipation of future investment opportunities" Aivazian et al. (2005a). This paper adopts the view of Aivazian et al. (2005a) about the possible endogeneity problem caused by the representation of leverage as future investment opportunities.

A second possible agency problem is the overinvestment theory. The overinvestment theory is supported by Jensen (1986) and McConnell et al. (1995) and states that managers will try to expand their influence in a firm by expanding the scale and scope of the firm its businesses Aivazian et al. (2005a;2005b). The agency problem here is that managers are not acting in the way of the interest of shareholders by investing and undertaking

investment projects, even when they do not have a positive NPV, for the sole purpose of increasing their own influence. Leverage can be a constraint for the managers of a firm in developing such an overinvestment policy. An increased leverage will possibly lead to a lower availability of free cash flow to invest in negative net present value projects. Therefore, leverage can be used as a corporate governance mechanism to prevent this type of overinvestment agency problem. As introduced by Miller and Modigliani (1958), a perfect world would consider future state of demand, the firm's production technology, the market interest rate, profitability, cash flow and net worth to be the determinants of investment. Although this position is challenged in the existing literature because it lacks leverage to be one of the determinants of investment, their position should be considered in examining the impact of leverage on investment by controlling for the determinants of investment as proposed by Miller and Modigliani (1958). Whited (1992) emphasizes the importance of cash flow as a determinant of investment and shows that the sensitivity of investment to cash flow is greater for highly levered firms. Opler and Titman (1994) show that sales and leverage are positively related. Sharpe (1994) finds that the relationship between sales growth and employment was intervened and explained by leverage. Thus, the existing literature shows the importance of cash flow, sales and growth opportunities. Therefore, I will control for cash flow, sales and growth opportunities (Tobin´s Q).

2.1 Hypothesis

The underinvestment theory predicts that leverage is negatively related to investment. Debt overhang causes management to become reluctant to new investment projects. The overinvestment theory also predicts that leverage is negatively related to investment: lower free cash flow leads to a tighter constraint as perceived by management, which leads to low incentives to invest in a project. Empirical studies conducted before are supporting this expectation. Aivazian et al. (2005a); (2005b) and Ahn et al. (2006) found a significant negative relation between leverage and investment. Jensen, (1986); Stulz, (1990); Grossman and Hart, 1982; Aivazian et al. (2005a); Firth et al. (2008) have found that there is a negative relation between leverage and investment, but only for firms with low or no growth opportunities. Mconnel and Serveas (1995) study a large sample of US firms for three different years; 1976, 1986 and 1988. They make a distinction between high and low growth firms for each year, based on growth opportunities. The growth opportunities are measured in Tobin´s Q; a high Tobin´s Q indicates strong growth opportunities and a low Tobin´s Q indicates low growth opportunities. Their results show that the value of US firms is positively correlated with leverage for low growth firms, and negatively correlated with leverage for high growth firms. Lang et al. (1996) found a significant negative relationship between leverage and investment for a sample of US firms over the period 1970-1979. Their result implies only for firms with a Tobin´s Q less than one (firms with low growth opportunities). The existing literature supports both the underinvestment and overinvestment theories. By following the existing literature and expectations based on theoretical and empirical research, as previously in this paper described; I suggest the relationship between leverage and investment for Dutch listed firms to be negative. I expect this negative relationship to be significantly stronger for firms with low growth opportunities than for firms with high growth opportunities.

H1: Leverage is negatively related to investment.

H2: The negative relation between leverage and investment in stronger for firms with low growth opportunities than for firms with high growth opportunities

3. METHODOLOGY

I will use a pooling regression model to investigate the investment equation. The pooling regression model is an often-used regression to investigate the relationship between leverage and investment. The pooled OLS method is appropriate in estimating the relationship between variables when using panel data. The condition of using a pooled OLS is that the independent variables must be exogenous; the unobservable individual firm effects must be zero. Lang et al. (1996) argue that the unobservable individual effect is zero and use the pooled OLS method. Our paper will follow Lang et al. (1996) and other studies using the pooled regression for estimating the relationship between leverage and investment.

3.1 Empirical Model Specification

To examine the impact of leverage on investment, I am going to estimate the following equation which is similar to Lang et al. (1996), but is further specified to a panel setting:

$$I_{i,t} / K_{i,t-1} = \alpha + \beta(CF_{i,t}/K_{i,t-1}) + \delta Q_{i,t-1} + \eta LEVERAGE_{i,t-1} + \varphi(SALE_{i,t-1}/K_{i,t-1}) + \varepsilon_{i,t}$$

To test the impact of growth on the relationship between leverage and investment, the following equation, which is similar to Aivazian et al. (2005a) is going to be used:

$$I_{i,t} / K_{i,t-1} = \alpha + \beta(CF_{i,t}/K_{i,t-1}) + \delta Q_{i,t-1} + \eta LEVERAGE_{i,t-1} + (\gamma D_{i,t-1} \times \eta LEVERAGE_{i,t-1}) + \varphi(SALE_{i,t-1}/K_{i,t-1}) + \varepsilon_{i,t}$$

The two equations are similar to each other to a certain degree; the only difference is the addition of $(\gamma D_{i,t-1} \times \eta LEVERAGE_{i,t-1})$. The equation has a dummy variable which is 1 or 0 depending on $Q>1$. This dummy variable is included in the formula to control for growth opportunities. If $Q>1$, the dummy variable will be 1 and if $Q<1$ the dummy variable will be 0. Aivazian et al. (2005a;2005b) $I_{i,t}$ = net investment of a firm, $K_{i,t-1}$ = lagged net fixed assets, $CF_{i,t}$ = cash flow(earnings before extraordinary items + depreciation), $Q_{i,t-1}$ = is lagged Tobin's Q((total liabilities + market value of common and preferred stocks)/book value of total assets), $LEVERAGE_{i,t-1}$ is lagged leverage, $SALE_{i,t-1}$ stands for lagged net sales of a firm (net sale/lagged net fixed assets) Aivazian et al. (2005a;2005b). To investigate the relation between growth and leverage, control variables are added to the formula. CF and SALE are included in the formula to control for accounting earnings.

Two alternative general measures are used in the literature for leverage. One is $\frac{book\ value\ of\ total\ liabilities}{book\ value\ of\ total\ assets}$ and the other one is $\frac{book\ value\ of\ long\ term\ debt}{book\ value\ of\ total\ assets}$. Opler and Titman (1994) and Lang et al. (1996) show the importance of using book values. The first measure of leverage includes total liabilities as the measure for estimating leverage. The second measure of leverage uses the book value of long term debt and thus emphasizes the value of long term debt in measuring leverage. I will use both measurements of leverage in estimating the relationship between leverage and investment.

3.2 Data description

The data is collected from Orbis. Orbis contains information on more than 275 million companies worldwide. Using Orbis and specifying the search criteria to match my interest in listed Dutch firms results in available data for 90 listed Dutch companies. The collected data consists of a period of 10 years (2008-2017). The reason to analyze this period is because it is the most recent

period. This period has witnessed firms recovering from the financial crisis in 2008. After analyzing for coding errors and missing values, the estimation is based on a remaining sample of 697 firm year observations.

Table 1

Summary statistics for growth, leverage and investment.

	Mean	25th perc.	Med.	75th perc.	St. Dev.
Net investment/Fixed assets$_{t-1}$	- 0.05	- 0.09	- 0.06	- 0.01	0.20
Cash flow$_t$/Total assets$_{t-1}$	0.09	0.03	0.12	0.22	0.84
Tobin´s Q $_{t-1}$	1.06	0.39	0.70	1.22	1.28
(Long term debt/Total assets) $_{t-1}$	0.19	0.02	0.15	0.30	0.19
(Total liabilities/Total assets) $_{t-1}$	0.60	0.44	0.58	0.74	0.33
(Net sales/Fixed assets) $_{t-1}$	3.21	0.58	1.50	3.09	7.97

The sample consists of 90 publicly listed Dutch firms, listed in Orbis. The annual data file covers the period of 2008 – 2017 with an unbalanced panel of 712 observations of 90 firms.

Table 1 shows the descriptive statistics and financial data for the sample that is going to be analyzed. The observations are normally distributed and outliers are filtered out of the data. The mean of net investment to fixed assets is -0.05 while its standard deviation is 0.2. The standard deviation of net investment to fixed assets is four times the mean. The average of Tobin´s Q for the sample is 1.06 with a median of 0.70 and standard deviation of 1.28. The mean ratio of long term debt to total assets is 0.19 and the mean ratio of total liabilities to total assets is 0.60. Overall, a high variation of investment among listed Dutch firms is observable. A mean Tobin´s Q of 1.06 reveals strong growth expectations about the market. However, analyzing the median shows weak growth opportunities; a Q of 0.70. This can be an indication of a mean which is strongly influenced by some very high observations regarding the Tobin´s Q. The mean ratio of the two different measures for leverage show that listed Dutch firms significantly rely on short-term financing; the mean ratio of total liabilities to total assets is significantly higher than the mean ratio of long term debt to total assets. To conclude, the data shows high variances for different key financials among Dutch listed firms for the period 2008-2017. Growth opportunities are strong for the sample when taking the mean in to account, the median shows weak growth opportunities.

4. RESULTS AND DISCUSSIONS

This section provides the regression results of the two equations that are used to estimate the impact of leverage on Investment. This section will first analyze the results of the regression of the investment equation, which is similar to Lang et al. (1996). After analyzing the results of this regression and the impact of leverage

on investment, Growth opportunities will be introduced to estimate the impact of leverage on investment. The second equation is similar to Aivazian et al. (2005a). Table 2 shows the results of the regression for the two different measures of leverage. The results of the pooled regression show the expected signs for leverage for both measures. Leverage is significantly negative related to investment. The results show a negative relationship between leverage and investment for Dutch listed firms for a sample period of 2008-2017. The impact of the other independent variables related with investment do not show the expected signs for the regression with the leverage measure consisting of long term debt to total assets. The results for the measure long term debt to total assets report that Tobin´s Q is negatively related to investment and that the ratio of cash flow to total assets is also negatively related to investment. Lagged sales does not correlate within the first measure of leverage(Long term debt/Total assets). The regression based on the second measure of leverage (Total liabilities/Total assets) does show the expected signs for the control variables. Tobin´s Q, lagged net sales and cash flow to total assets are positively related to investment. To conclude, the negative expectations regarding the impact of leverage on investment are signigicantly found. The other independent variables and their impact do not show significant results and differ among the two types of measurement for leverage.

The results discussed above are regardless of the distinction for growth opportunities which is going to be made in the next part of the results.

Table 2

Regression analysis of investment

	Pooling	
	Leverage=(Long term debt/Total assets)	Leverage=(Total liabilities/Total Assets)
Intercept	-.025(-2.096)*	.001(-.052)
Tobin's Q	-.006(-1.057)	.006(-1.127)
Sale$_{t-1}$/Fixed assets$_{t-1}$	.000(-.088)	.002(.288)
Cash flow$_t$/Total assets$_{t-1}$	-.004(-534)	.006(-.660)
Leverage	-.089(-2.431)*	-.068(-3.268)*
Observations	900	900
Adj. R^2	.004	.009

This table provides the empirical results for the regression of leverage on investment.t-statistics are provided in parenthesis behind the regression coefficient. *=significant at 5% level.

Table 3 shows the correlation among the independent variables. There is no serious collinearity between the independent variables since the correlation values are generally less than 0.30. Except for the correlation between the two alternative types of measurement for leverage, in which the correlation is 0.539.

Table 3
Correlation among independent variables.

	Cash flow/Total assets$_{t-1}$	Tobin´s Q$_{t-1}$	(Long term debt/Total assets)$_{t-1}$	(Total liabilities/Total assets)$_{t-1}$	(Net sales/Fixed assets)$_{t-1}$
Cash flow$_t$/Total assets$_{t-1}$	1	-	-	-	-
Tobin´s Q$_{t-1}$	-.061	1	-	-	-
(Long term debt/Total assets)$_{t-1}$	.141*	-.057	1	-	-
(Total liabilities/Total assets)$_{t-1}$	.124*	-.063	.539*	1	-
(Net sales/Fixed assets)$_{t-1}$	-.111*	.001	.054	.329*	1

*Correlation is significant at the 0.01 level

I have checked for multicollinearity by using the VIF of tolerance. The VIF does not indicate multicollinearity. Table 4 shows the regression results for the impact of leverage on investment, with the introduction of growth opportunities. The addition of D* Leverage implies that firms with high growth opportunities will enter the regression and firms with low growth opportunities will not be taken into the regression since D>1=1 and D<1=0 The addition of growth opportunities did not change the results of the regression for Leverage as a measure of long term debt to total assets. On the contrary, leverage as a measure of total liabilities to total assets shows sensitivity to the addition of growth opportunities. The results report that the negative relation as shown in table 2 was -.068. The results in Table 4 show that the relation is between leverage and investment is significantly negative by -0.64, but less than -0.68.

The existing literature Myers (1977), Jensen (1986), Stulz, (1990) and Grossman and hart (1982) suggest a negative relation between leverage and investment. This paper found a significant negative relationship between leverage and investment. The negative relation was significant over both types of measurement for leverage. The outcome of the results is thus as expected. The estimated model which controlled for growth opportunities gave also the expected significant negative relation between leverage and investment. The results of this paper confirm H1 and rejects H2.

H1: Leverage is negatively related to investment.

H2: The negative relation between leverage and investment in stronger for firms with low growth opportunities than for firms with high growth opportunities

The results show that the negative relation between leverage and investment, with and without growth opportunities, stay significantly the same for one measure of leverage and changes accordingly for the other measure, which consists of long term debt to total assets.

Table 4
Growth opportunity, investment and leverage

	Pooling	
	Leverage= (Long term debt/Total assets)	Leverage= (Total liabilities/Total Assets)
Intercept	-.025(-2.227)*	-.001(-.036)
Leverage	-.089(-2.559)*	-.064(-3.206)*
D* Leverage	.002(-0.75)	-.030(-1.453)
Tobin´s Q	-.006(-1.114)	-.065(-1.101)
Cash flow$_t$/Total assets$_{t-1}$	-.004(-0.563)	-.006(-.711)
Sale$_{t-1}$/Fixed assets$_{t-1}$	.000(-0.93)	.001(.285)
Observations	900	900
Adj. R^2	0.003	0.11

This table provides empirical results of the effects of leverage on investment. The results include growth opportunities(D*Leverage). t-statistics are given in parenthesis behind the coefficient estimates. *=significant at 5% level.

5. CONCLUSION

Two different types of measurement are used to define leverage. A pooled OLS method is used to define the relationship. The existing literature suggests that the relationship between leverage and investment is negative, especially for firms with low growth opportunities. Our findings show that highly levered firms tend to invest significantly less compared to lowly levered firms. Growth opportunities did not show a huge impact on the negative relationship between leverage and investment. This paper contributes to the academic literature by analyzing recent data from the Netherlands. This paper is limited in the amount of observations because the Netherlands has a small amount of listed companies compared to counties like USA and Canada. This paper also ignores the individual and random effect. Future research could control for time considering the crisis in 2008. The crisis might have influenced the relationship between leverage and investment.

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