2012 2nd International Conference on Economics, Trade and Development
IPEDR vol.36 (2012) © (2012) IACSIT Press, Singapore

Does Investment Intensity Impact Company Profitability? A Cross-Country Empirical Study

Svetlana Kotšina[1] and Aaro Hazak[1+]

[1] Department of Economics, Tallinn University of Technology

Abstract. This study focuses on the impact of company's investment intensity on its return on assets. The study is based on a sample of 8,074 companies in six European Union (EU) member states over a nine year period from 2001 to 2009. We use regression analysis as the methodology. Contrary to some previous studies, we have not (yet) identified any strong negative (or positive) impact of investment intensity on future rate of return on assets. This may be explained by the specific time range of our sample, which incorporates both a strong economic boom and a consequent deep crisis. Many of the investments made during the boom years may have had no positive impact on the profitability of the company in a longer perspective, thus representing overinvestment. At the same time, some companies seem to have benefited during the boom years from investments made right before the upswing. Further more detailed research on the relationship between investments and profitability under different phases of the economic cycle would be needed in order to identify what are the drivers of overinvestment, and what could be the measures to prevent investments into assets of limited long term productivity and consequent economic overheating.

Keywords: profitability, investment intensity, European Union

1. Introduction

The economic crisis of recent years has brought to light the variances in companies' resistance to external shocks. One of the possible determinants of the exposure of companies to economic fluctuations might be their investment intensity, i.e. the increase in their long-term (tangible) assets. Due to the fact that investments once made tend to be difficult to be disposed off at favourable terms, any unjustified investments may have a strong adverse effect on companies' sustainability, especially during the time of economic decline.

Investment intensity has been found to work as a signal about future profitability and share prices (Lev and Thiagrajan, 1993). Sometimes the motivation to invest may thus lie in the signalling of expansion and perceived future returns, while the actual profit impact of the investment may receive unduly little attention. Li (2004) has brought out that overinvestment remains often unnoticed by investors, and that companies where management has large free cash flows for investments at their disposal or where leverage is low tend to make more unjustified investments.

Interestingly, several previous studies have identified a rather strong negative relationship between investment intensity and profitability, for example Abarbanell and Bushee (1997, 1998), Hennessy and Levy (2002), Beneish, Lee and Tarpley (2001), and Fairfield, Whisenant and Yohn (2003), among others. Li (2004), based on a large US sample over a 40-year time period, finds that the effect of investments on profitability is negative, but the negative effect decreases over time. The difficulties in establishing empirically the connection between past investment and longer term profits has to be kept in mind though.

Stein (2001) highlights managerial overconfidence as an important driver of overinvestment, meaning that unjustified optimism explains part of unproductive investments. Jostarndt (2002) has found support to the agency theory (Jensen and Meckling, 1976), identifying that some of the investments may be rather in the

[+]Tel.: +372 6204 057; fax: +372 6203 946;
E-Mail address: aaro.hazak@tseba.ttu.ee.

short term interest of management (e.g. leading to increased bonuses) but not increase the wealth of company owners.

The effects of economic fluctuations on the nexus between companies' investments and profitability has received very little attention. In this short pilot paper, we look into the relationship between companies' investment intensity and return on assets in six EU countries under different phases of the economic cycle, with the purpose of gaining some insight into this matter in order to better plan more detailed studies.

2. Data and Methodology

We use data from the Amadeus database. The dataset derived from Amadeus includes data of 8,074 companies over a nine year period from 2001 to 2009. We have used annual data on each company's tangible fixed assets and total assets (balance sheet value as at the beginning and end of each year), depreciation cost, net profit, country (country where the company has been registered) and industry (8 main industries based on the NACE Rev.1.1 classification) for our study. Our dataset covers 6 countries for which the necessary data was available, namely the United Kingdom, Germany, France, Greece, Ireland and Sweden. When forming our sample, we have excluded those companies where tangible fixed assets form less than 20% of total assets, in order to focus on companies where investments into physical assets have a considerable role in the business model. Also, outliers have been excluded (observations falling into top 1% minimum or maximum in terms of fixed assets balance and return on assets margins).

As regards the methodology of our pilot study, we have used regression analysis (pooled OLS), correlation analysis and descriptive statistics to study the relationships between investment intensity and return on assets. For the regression models, we have constructed the following variables based on the Amadeus source data:

- *ROA* (Return on assets; in percentages): net profit divided by total assets balance;
- *INV* (Investment intensity; in Euros): tangible fixed assets as at the end of the year minus tangible fixed assets as at the beginning of the plus annual depreciation cost;
- *TAN* (Tangibility; in percentages): tangible fixed assets divided by total assets.

We have employed the following regression model:

$$ROA_i = \beta_0 + \beta_1 INV_i + u_i, \quad (1)$$

where *i* denotes the *i*-th company in the sample. The results obtained based on this exploratory pilot study should provide a better basis for further research employing more sophisticated econometric models on a broader dataset incorporating more control variables.

3. Empirical Findings

We can observe from Figure 1 (left panel) a decreasing trend in the tangibility of our sample companies from 2003 to 2009. This is explained by lower investment levels into fixed assets (Figure 1, right panel) as well as by the fact that current assets (e.g. trade receivables and inventories) had started to accumulate in comparison to the net increase in the carrying value of tangible fixed assets, a sign of overheating of the economy. The decrease in tangibility is especially sharp in 2008 and 2009, the effect of the global economic crisis, leading to decreased investments, decreased asset values as well as longer receivable collection periods and slower inventory turnovers.

Fig. 1: Average tangibility (left panel) and average annual increase in tangible fixed assets (right panel), Amadeus data.

Overall, average return on assets of the sample companies (Figure 2) appears to have followed quite similar trends compared to the increase in tangible fixed assets balance (Figure 1) over the period from 2001 to 2009. However, there is a difference worth closer attention. Namely, average investment intensity of companies decreased only until 2004, when the economy was booming, and started to decrease afterwards. This means that the increase in average return on assets until 2006 was partially explained by a smaller asset base as opposed to increased productivity of the underlying assets. This seems to indicate that companies had adjusted their investment levels already in early boom years, although in net terms new investments were still higher than depreciation and disposal of existing tangible assets. Identifying the reasons for this decrease in investment intensity remains an interesting topic for future research, potentially helping to understand pro- and contra-cyclicality in the financial behaviour of real sector companies.

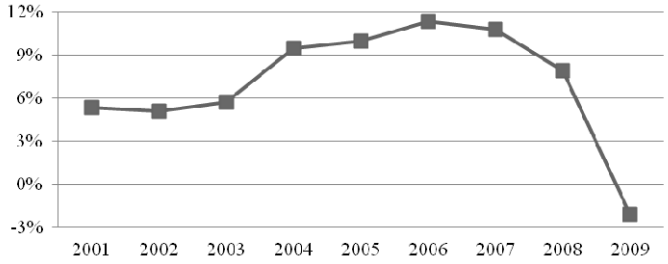

Fig. 2: Average return on assets of the sample companies from 2001 to 2009, Amadeus data.

As investment levels decreased during the economic crisis, there was an even larger decrease in profits, so that each existing unit of assets generated significantly less returns than during the years of the economic boom. This means that the relationship between investment intensity and return on assets may have a nonlinear nature, necessitating the use of more sophisticated panel regression models for future research.

Sample statistics and a correlation matrix of *ROA* and *INV* variables have been presented in Table 1. In order to test for the robustness of results, we have presented the correlation matrixes for the combinations of five *ROA* indicators and three *INV* indicators. The differences in those *ROA* and *INV* variables lie in time lags. For example, INV_0 denotes no time lag, ROA_1 a 1-period time lag and $INV_{Avg\ 1\text{-}3}$ an average of the *INV* variables in periods from +1 to +3 (i.e. average of *INV* with a 1, 2 and 3-year lag).

TABLE I. SAMPLE STATISTICS AND CORRELATION MATRIX

Sample statistics	N	Min	Max	Average	Std Error
ROA	8,074	-98.34%	98.55%	6.2%	9.805
INV	8,074	0	5,944,000	12,561	210.3
Correlation matrix	ROA_1	ROA_2	ROA_3	$ROA_{Avg\ 3\text{-}4}$	$ROA_{Avg\ 3\text{-}5}$
INV_0	-0.0121	-0.0112	-0.0001	-0.0001	-0.0001
$INV_{Avg\ 1\text{-}2}$			-0.0002	-0.0120	-0.0003
$INV_{Avg\ 1\text{-}3}$				-0.0003	-0.0005

It can be noted from Table 1 that the correlation between *ROA* and *INV* remains very low in all cases, irrespective of the time lags used. Replacing *INV* with a relative terms variable (e.g. percentage increase in tangible assets) might give different results (this would be done in future versions of the paper).

Given that out of the tested combinations the correlation, although very weak, was strongest between the INV_0 and ROA_1 variables, we have presented below the results of the pooled OLS regression model for this combination of *INV* and *ROA*.

TABLE II. REGRESSION MODEL

	Coefficient	Std. Error	*t*	*P*
INV_0	-0.000000866	0.0000029	-2.967	0.0031
Constant	18.701	0.111	170.2	0.0000
R^2	0.0001			

We can see that in a model specified as above, investment intensity can explain only a marginal part of return on assets in the following period ($R^2 = 0.0001$). Based on the model results, net investments of EUR 1 million would result on average in a 0.86 p.p. decrease in the return on assets in the following year. Similarly to previous studies, as outlined in the Introduction, the relationship between investments and future return on assets appears to be negative based on this preliminary modelling exercise, but the economic significance of this relationship appears to be small. Further investigation of these issues remains an interesting task for future research. Areas of expanding the model include incorporating additional variables (e.g. year, industry and country dummies or their interactions, and indicators of company age, size and financial behaviour), controlling for company level fixed effects and replacing the absolute terms *INV* variable with a relative one.

4. Conclusions

Based on the preliminary results reached by the current phase of our study, we have not (yet) identified any strong negative (or positive) impact of companies' investment intensity on future rate of return on assets, as opposed to some previous studies. This may be explained by the specific time range of our sample, which incorporates both a strong economic boom and a consequent deep crisis. Many of the investments made during the boom years may have had no positive impact on the profitability of the company in a longer perspective, thus representing overinvestment. At the same time, some companies seem to have benefited during the boom years from investments made right before the upswing.

The results obtained based on this exploratory pilot study provide a better basis for further research employing more sophisticated panel data econometric models on the same or expanded datasets. This study is part of a broader project aiming to identify the drivers and elements of pro- and contra-cyclicality in the financial behaviour of real sector companies (see e.g. Avarmaa et al., 2011 and 2012; Ruubel and Hazak, 2011a, b).

5. Acknowledgment

We are grateful to the Estonian Science Foundation (grant no ETF8796) as well as to the Estonian Targeted Financing (grant no SF0140059s12) and Base Financing (grant no B617) programs for financial support.

6. References

[1] Abarbanell, J., Bushee, B. (1997). Fundamental analysis, future earnings, and stock prices. *Journal of Accounting Research*, 35, pp. 1-24.

[2] Abarbanell, J., Bushee, B. (1998). Abnormal returns to a fundamental analysis strategy. *Accounting Review*, 73, pp. 19-45.

[3] Avarmaa, M., Hazak, A., Männasoo, K. (2011). Capital structure formation in multinational and local companies in the Baltic States. *Baltic Journal of Economics*, 11(1), pp. 125-145.

[4] Avarmaa, M., Hazak, A., Männasoo, K. (2012). Does leverage affect labour productivity? A comparative study of local and multinational companies of the Baltic countries. *Journal of Business Economics and Management*, forthcoming.

[5] Beneish, M., Lee, C., Tarpley, R. (2001). Contextual fundamental analysis in the prediction of extreme returns. *Review of Accounting Studies*, 2/3, pp. 165-191.

[6] Fairfield, P., Whisenant, T., Yohn, T. (2003). Accrued earnings and growth: implications for future profitability and market mispricing. *The Accounting Review*, 78, pp. 353-371.

[7] Hennessy, C. A., Levy, A. (2002). A unified model of distorted investment: Theory and evidence. *Working Paper* [http://www.afajof.org/pdfs/2003program/articles/hennessy_levy.pdf].

[8] Jensen, M. C., Meckling, W.H. (1976). Theory of the firm: Managing behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3, pp. 305-360.

[9] Jostarndt, P. (2002). Financing growth in innovative industries: Agency conflicts and the role of hybrid securities – Empirical evidence from NASDAQ convertible debt offerings. *Working paper* [http://groups.haas.berkeley.edu/fcsuit/Pdf-papers/Jostarndt.pdf].

[10] Lev, B., Thiagarajan, R. (1993). Fundamental information analysis. *Journal of Accounting Research*, 31, pp. 191-215.

[11] Li, D. (2004). The implications of capital investments for future profitability and stock returns - An overinvestment perspective. *Working paper* [www.people.hbs.edu/dbergstresser/rast_richardson.pdf].

[12] Ruubel, R., Hazak, A. (2011a). Is there a relationship between company profitability and salary level? A pan-European empirical study. Lijuan, D. (Ed.). *Innovation, Management and Service*, pp. 332-337, IACSIT Press.

[13] Ruubel, R., Hazak, A. (2011b). Company profitability and labour intensity under different phases of the economic cycle: A pan-European empirical study. Zhang, M. (Ed.). *Economics, Business and Management*, pp. 178-182, IACSIT Press.