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Firm Life Cycle and Investment Efficiency in the Mena Region: Comparative Study of Oil-Exploring and Oil-Importing Countries

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Abstract
This study examines how firm-specific factors influence investment efficiency across different corporate life cycle stages, specifically in the volatile economic context of the MENA region. Using panel data on 332 non-financial firms from 2010-2021, investment efficiency is modeled through Feasible Generalized Least Squares estimations for each life cycle stage. The results indicate that firm-specific factors have varying impacts on investment efficiency in different stages. Sales growth and past returns are positively associated with overinvestment in early stages, while higher leverage links to overinvestment in later stages. Declining firms exhibit underinvestment, suggesting possible financial constraints. The findings highlight the need for nuanced, stage-specific investment strategies, especially given the economic challenges facing the MENA region. The study contributes to investment efficiency literature by providing empirical evidence on life cycle effects for an under-researched market context.
Keywords: Optimal Investment, Life-Cycle Stages, Middle East and North Africa (MENA), Oil-Exporting Countries, Oil-Importing Countries, Feasible Generalized Least Squares (FGLS), Investment Efficiency.

1- Introduction

Efficient capital allocation is vital for maximizing firms' value and growth prospects (Biddle et al., 2009). However, research shows that firms often deviate from optimal investment levels due to factors like information asymmetry, agency conflicts, behavioral biases and external shocks (Richardson, 2006; Malmendier and Tate, 2008). These investment inefficiencies can destroy shareholder value and hinder competitiveness.

Understanding the determinants of optimal investment is extremely important, as capital allocation efficacy has ripple effects on productivity, innovation, employment generation and macroeconomic stability (Chirinko & Schaller, 2009). Therefore, investment efficiency carries tremendous economic and policy significance beyond just corporate finance considerations. This underscores the need for rigorous scholarly inquiry to uncover the drivers of efficient investment decision-making, given its multifaceted impact.

A firm's life cycle stage constitutes an important contingency that can significantly influence investment efficiency (Dickinson, 2011). According to life cycle theory, firms evolve through distinct phases - introduction, growth, maturity and decline - which alter their investment opportunities, financing options, and risk profiles (Miller and Friesen, 1984). For instance, young firms tend to overinvest by undertaking risky, negative NPV projects, while mature firms may exhibit the opposite tendency (Pastor and Veronesi, 2003). Hence, firms likely require tailored strategies to optimize investments at each evolutionary stage.

Gaining empirical insights into how firm life cycles affect capital allocation is tremendously useful for practitioners like managers and investors, as it can guide appropriate investment strategies tailored to each evolutionary phase. Policymakers also stand to benefit, as life cycle nuances help identify systemic investment inefficiencies stemming from regulatory gaps or market failures. Overall, this research topic offers significant utility for diverse stakeholders.

Despite extensive research, a critical gap persists in understanding the linkage between corporate life cycles and investment efficiency, especially for volatile developing markets (Chang et al., 2009). This study addresses this gap by examining how firm-specific factors impact investment efficiency across different life cycle phases, specifically in the context of the Middle East and North Africa (MENA).

The MENA region represents a compelling but under-researched setting. Its markets face unique challenges like political instability, heavy reliance on oil revenues, limited economic diversification and information deficits, which can constrain optimal investing (Arjomand et al., 2016). Consequently, companies in MENA warrant customized strategies to efficiently allocate capital across their evolution. This study provides empirical insights to guide such investment decisions over the corporate life cycle.

2. Motivation and Contribution

This study makes three key contributions. First, it enriches life cycle theory by providing robust evidence on how firm-specific factors influence investment efficiency at each evolutionary stage. While prior studies explore life cycle effects in developed markets (Anthony and Ramesh, 1992; Dickinson, 2011), this research offers new generalized findings for the distinct economic environment of MENA.

Second, the focus on MENA fills a contextual gap, as despite the region's strategic importance, empirical evidence on its markets remains limited (Arjomand et al., 2016). By examining MENA's unique case, this study generates valuable practical insights for managers and policymakers operating in this landscape.

Finally, the research employs rigorous econometric analysis using recent data spanning 2010-2021. This methodological rigor substantiates the findings and provides a platform for future scholarship. Overall, this study illuminates the intersection between corporate life cycles and investment efficiency in an impactful but understudied setting.

3. Literature Review

Life cycle theory proposes that firms evolve through predictable stages - introduction, growth, maturity and decline (Lester et al., 2003). At each phase, firms confront different challenges and opportunities, necessitating strategic realignment (Mueller, 1972). A firm's life cycle position can thus impact its investment efficiency.

Introduction stage firms often overinvest by undertaking speculative projects with negative NPV to establish viability (Pastor and Veronesi, 2003). Information asymmetry between managers and shareholders allows such value-destroying investments (Myers and Majluf, 1984). Growth stage firms may also overinvest to aggressively gain market share, leading to possible duplication (Mueller, 1972).

In contrast, mature firms tend to underinvest due to saturation, limited growth options and managerial risk aversion (DeAngelo et al., 2010). Similarly, declining firms exhibit underinvestment, as poor prospects combined with financial constraints curtail investments (Benmelech et al., 2010). Prior empirical studies validate these life cycle investment patterns (Anthony and Ramesh, 1992; Dickinson, 2011).

Beyond life cycle position, certain firm-specific factors can affect investment efficiency. Higher sales growth encourages overinvestment by spurring capacity expansion (Biddle et al., 2009). Leverage can drive overinvestment as creditors' monitoring intensifies (Jensen, 1986). Larger size signals maturity and prompts underinvestment (DeAngelo et al., 2010). Greater cash reserves mitigate financing constraints that hinder investment (Fazzari et al., 1988). Finally, higher past returns indicate profitability and facilitate overinvestment (Chen and Chen, 2012).

While insightful, past research on life cycles and investment efficiency focuses heavily on U.S. and other western contexts. Evidence from diverse settings like MENA remains scarce. This gap motivates an empirical examination tailored to the MENA region.

4. Hypothesis Development

This study examines two primary hypotheses:

H1: The impacts of firm-specific factors on investment efficiency vary across the introduction, growth, mature and decline stages.

For sales growth, higher growth in early stages signals promising opportunities and likely spurs overinvestment (Biddle et al., 2009). As firms mature, growth slows, decreasing this overinvestment tendency.

H1a: Sales growth has a positive effect on overinvestment in early life cycle stages (introduction, growth) and negative effect in later stages (mature, decline).

Heavier reliance on leverage can pressure managers to overinvest, especially in later stages when leverage peaks (Jensen, 1986). Conservatively financed young firms are less impacted.

H1b: Leverage has a positive effect on overinvestment in later life cycle stages (mature, decline) compared to early stages.

Larger size typically corresponds with maturity and discourages overexpansion (DeAngelo et al., 2010). Smaller, younger firms should exhibit greater overinvestment.

H1c: Firm size has a negative effect on overinvestment in later life cycle stages compared to early stages.

Adequate cash reserves reduce financial constraints that may hinder investing across all life cycle phases (Fazzari et al., 1988). But their effect is likely greater for capital-constrained decline stage firms.

H1d: Cash holdings have a positive effect on investment in the decline stage compared to other stages.

Higher past returns signal profitability, prompting mature firms with limited growth options to overinvest (Chen and Chen, 2012). For struggling decline stage firms, past returns are lower.

H1e: Past returns have a positive effect on overinvestment in the mature stage compared to other stages.

5. Data and Methodology

5.1 Data and Sample

The sample comprises 332 non-financial firms listed on the Dow Jones MENA index from 2010-2021. Financial data was obtained from S&P Capital IQ. The MENA region was chosen given the noted research gap and its economic significance. Firms were categorized into life cycle stages using cash flow patterns following Dickinson (2011).

5.2 Model Specification and Variables

Drawing on Biddle et al. (2009), investment efficiency is modeled using a dynamic panel regression:

$$I_{it} = \beta_0 + \beta_1 Growth_{it-1} + \beta_2 Lev_{it-1} + \beta_3 Cash_{it-1} + \beta_4 Size_{it-1} + \beta_5 Return_{it-1} + \beta_6 I_{it-1} + \varepsilon_{it}$$

The dependent variable I it is firm i's investment expenditure in year t scaled by its capital stock. The independent variables comprise sales growth rate (Growth it-1), debt-to-assets ratio (Lev it-1), cash-to-assets ratio (Cash it-1), firm size measured as ln(assets) (Size it-1), past annual stock returns (Return it-1), and lagged investment (I it-1).

5.3 Estimation Method

The model is estimated using Feasible Generalized Least Squares (FGLS) which addresses biases arising from heteroskedasticity and autocorrelation in panel data. Separate FGLS regressions are run for each life cycle stage to allow for different coefficient estimates across phases. Wald chi-square tests validate the joint significance of the estimated coefficients in each stage-wise model.

6. Results and Analysis

6.1 Summary Statistics

Table 1 provides summary statistics on the key variables categorized by oil import/export countries.

Table 1: Summary Statistics

Variables	Oil	Mean (Std. Deviation)
It	Oil-Export Countries	0.1306 (±0.1125)
	Oil-Import Countries	0.1003 (±0.0971)
SG	Oil-Export Countries	0.0638 (±0.4243)
	Oil-Import Countries	0.2144 (±1.0245)
LVE	Oil-Export Countries	0.4217 (±0.2160)
	Oil-Import Countries	0.4919 (±0.2155)
Cash	Oil-Export Countries	0.0869 (±0.0989)
	Oil-Import Countries	0.0524 (±0.0772)
Size	Oil-Export Countries	8.6998 (±0.7608)

	Oil-Import Countries	8.3180 (±0.7739)
Returns	Oil-Export Countries	0.0647 (±0.4162)
	Oil-Import Countries	0.0339 (±0.5597)
It-1	Oil-Export Countries	0.1296 (±0.1097)
	Oil-Import Countries	0.0994 (±0.0939)
Over/Under Investment	Oil-Export Countries	0.0006 (0.0762)
	Oil-Import Countries	-0.0017 (±0.0595)

The summary statistics indicate nuanced differences between oil-exporting and oil-importing countries in various aspects of business performance and strategy. For instance, oil-exporting countries have a marginally higher average investment level at 0.1306, compared to 0.1003 in oil-importing countries. Regarding sales growth, oil-importing countries show a higher mean of 0.2144, but with greater volatility as indicated by a larger standard deviation of ±1.0245. When it comes to leverage, oil-importing countries have a slightly higher mean of 0.4919, suggesting perhaps a moderate preference for debt financing, compared to 0.4217 in oil-exporting countries. On the liquidity front, oil-exporting countries have higher average cash reserves of 0.0869, in contrast to 0.0524 in oil-importing countries. Firm size, as well, is larger on average in oil-exporting countries with a mean value of 8.6998, compared to 8.3180 in oil-importing countries. In terms of investment returns, oil-exporting countries demonstrate a higher mean of 0.0647, although the standard deviation in oil-importing countries is higher, suggesting more variability in returns. The trend in investment appears consistent, as the previous year's investment levels are also slightly higher in oil-exporting countries. Finally, both types of countries are close to zero in over/under-investment, with oil-exporting countries showing a slightly positive mean of 0.0006 and oil-importing countries a slightly negative mean of -0.0017, indicating minimal tendencies for over- or under-investment, respectively.

In the figure 1 and figure 2, we will present a series of figure that delineate the trends in key variables across different stages of firm life cycles, comparing oil-importing and oil-exporting countries. These figures will shed light on how investment levels, sales growth, leverage, cash holdings, firm size, returns, previous year investments and over/under investment, evolve as firms transition through the introduction, growth, maturity, shake-off and decline stages.

Figure 1 Investment Levels, Sales Growth, Leverage, Cash Holdings Level in Each Life Cycle in Oil Import/Export Countries

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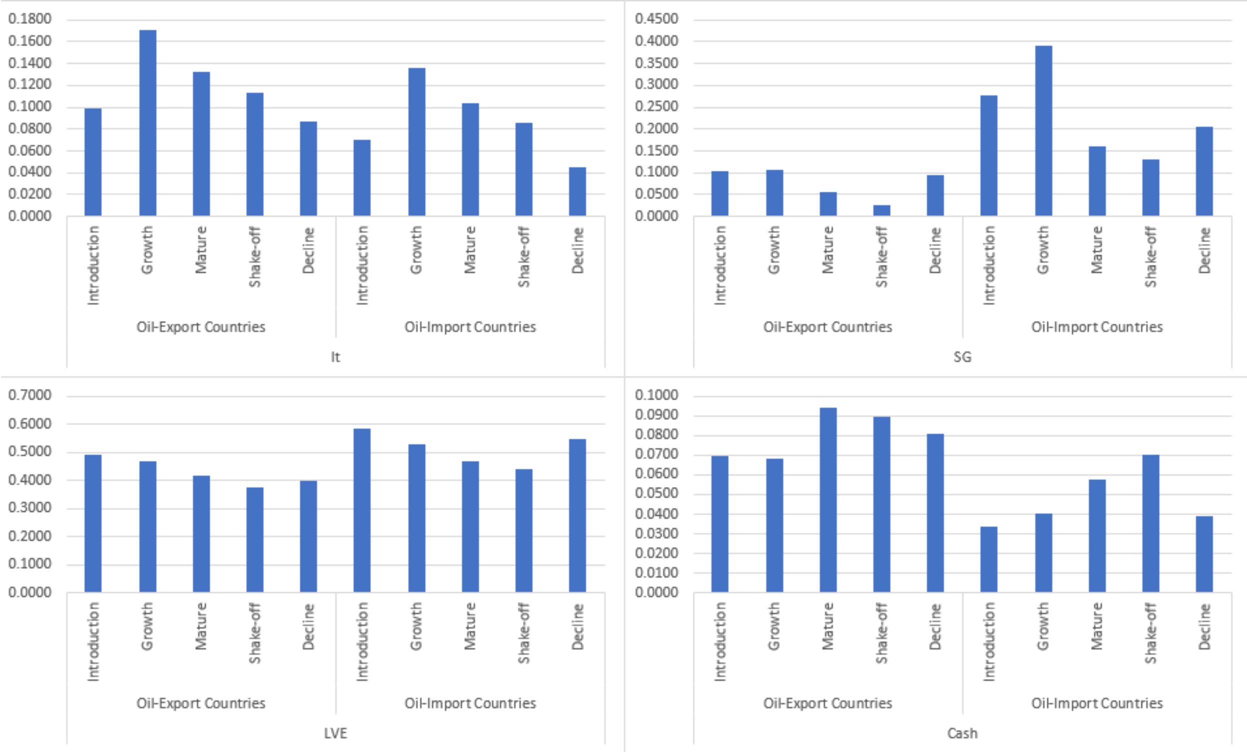

Figure 1 provides a comprehensive breakdown of several key variables across different stages of the firm life cycle for both oil-importing and oil-exporting countries. A quick overview indicates varying trends across the life cycle stages and between the two types of countries. For investment ('It'), oil-exporting countries generally show higher mean investment levels, particularly during the growth stage. Interestingly, both types of countries experience a decrease in investment as they move from the growth to mature stages, but the decline is steeper for oil-importing countries. Sales growth ('SG') fluctuates across life cycle stages, but the variance is notably higher for oil-importing countries, especially during the growth stage. This suggests greater volatility in these countries compared to their exporting counterparts. Leverage ('LVE') starts high in the introduction stage for both, but it generally declines as firms mature, albeit at different rates. Oil-importing countries display consistently higher leverage across all life cycle stages, indicating a possible higher reliance on debt financing. For cash holdings ('Cash'), oil-exporting countries maintain higher levels through most life cycle stages, implying better liquidity positions. Oil-importing countries show a gradual increase in cash from the introduction to shake-off stages but still remain below their exporting counterparts.

Figure 2 Firm Size, Returns, Previous Year Investments and Over/Under Investment Level in Each Life Cycle in Oil Import/Export Countries

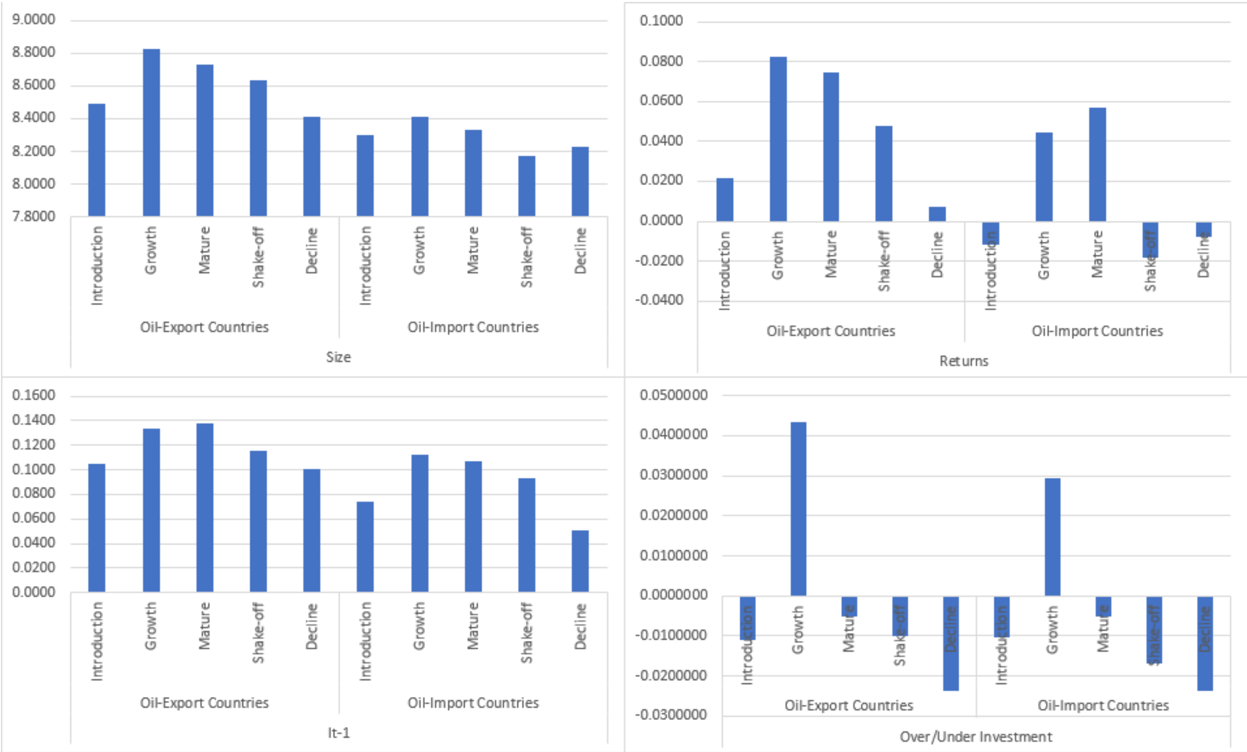

Figure 2 presents a nuanced view of various firm-level variables, categorized by different life cycle stages and whether the firms are in oil-importing or oil-exporting countries. In terms of firm size ('Size'), oil-exporting countries generally have larger firms across all life cycle stages compared to oil-importing countries. The size appears to peak during the growth stage for oil-exporting countries, while it remains relatively constant for oil-importing countries. As for returns, there are distinct differences between the two groups. Oil-exporting countries experience positive returns across all life cycle stages, peaking during the growth stage. Conversely, oil-importing countries show negative returns during the introduction and shake-off stages, pointing to financial struggles during these critical periods. The variable for the previous year's investment ('It-1') shows similar trends for both oil-exporting and importing countries, although slightly higher for the former. Both experience a peak in the mature stage, suggesting a possible stabilized investment pattern during maturity. Lastly, the over/under investment variable reveals intriguing patterns. Oil-exporting countries show a positive peak in the growth stage, indicating a period of over-investment. Conversely, the measure turns negative in the decline stage, possibly signifying under-investment. Oil-importing countries also peak in the growth stage but show consistent under-investment in the shake-off and decline stages.

6.2 Variance Inflation Factor (VIF)

Variance Inflation Factor (VIF) was employed to scrutinize the extent of multicollinearity among the independent variables for each life-cycle stage of firms in both oil-exporting and oil-importing countries. The threshold for VIF was set at 5, in line with established academic standards. As shown in Table 2, all the VIF values are below this benchmark, suggesting that multicollinearity does not compromise the integrity of the models used in this study. The highest VIF value observed was 3.965 for the variable 'Cash' in the Shake-out stage of oil-importing countries, still comfortably below the threshold. Consequently, the results of this study can be considered reliable in the absence of significant multicollinearity.

Table 2: VIF for explanatory variables.

Variables	SG	LVE	Cash	Size	Returns	It-1
Introduction Oil-Export	1.025	1.163	2.190	1.125	1.042	2.102
Introduction Oil-Import	1.117	1.812	1.268	1.840	1.121	1.156
Growth Oil-Export	1.015	1.319	1.381	1.238	1.027	1.282
Growth Oil-Import	1.052	1.217	1.436	1.249	1.030	1.385
Mature Oil-Export	1.050	1.263	2.687	1.190	1.043	2.554
Mature Oil-Import	1.030	1.242	3.001	1.190	1.011	2.936
Shake-out Oil-Export	1.027	1.161	2.525	1.191	1.044	2.387
Shake-out Oil-Import	1.033	1.225	3.965	1.173	1.049	3.918
Decline Oil-Export	1.005	1.222	3.334	1.233	1.161	3.032
Decline Oil-Import	1.174	1.157	1.343	1.302	1.206	1.414

The VIF values were all below the threshold of 5, indicating that multicollinearity is not a concern in this study.

6.3 Specification Tests

This study employs a set of diagnostic tests across various life-cycle stages for Oil-Export and Oil-Import countries. The diagnostic tests include the Modified Wald test for groupwise heteroskedasticity, Wooldridge test for autocorrelation in panel data, and the Hausman test for model specification. The table below encapsulates the test statistics and their associated p-values:

Table 3: Summary of Specification Tests

Model/Test Name	Modified Wald test for groupwise heteroskedasticity	Wooldridge test for autocorrelation in panel data	Hausman test
Introduction Oil-Export	3.8 e+32 (0.0000)	15.157 (0.0046)	26.16 (0.0002)
Introduction Oil-Import	9.4 e+34 (0.0000)	501.487 (0.0020)	11.78 (0.0672)
Growth Oil-Export	4.5 e+35 (0.0000)	13.565 (0.0010)	47.59 (0.0000)
Growth Oil-Import	9.5 e+33 (0.0000)	9.457 (0.0072)	47.74 (0.0000)
Mature Oil-Export	2.4 e+33 (0.0000)	203.091 (0.0000)	235.30 (0.0000)
Mature Oil-Import	1.4 e+31 (0.0000)	7.794 (0.0071)	78.34 (0.0000)
Shake-out Oil-Export	2.5 e+35 (0.0000)	6.038 (0.0200)	52.97 (0.0000)
Shake-out Oil-Import	4.0 e+38 (0.0000)	17.151 (0.0256)	28.58 (0.0001)
Decline Oil-Export	3.1 e+36 (0.0000)	2.886 (0.1403)	2.58 (0.8589)
Decline Oil-Import	9.3 e+30 (0.0000)	34.540 (0.1073)	16.14 (0.0130)

Table 3 shows the results of diagnostic tests that were conducted across different life-cycle stages for Oil-Export and Oil-Import countries. The Modified Wald test yielded p-values close to zero for all models, robustly indicating heteroskedasticity across groups. Similarly, the Wooldridge test revealed significant p-values, suggesting the presence of autocorrelation in nearly all models except for decline stage models. The Hausman test also showed significant results, advocating for the use of fixed-effects estimators in all models except for introduction in oil import and decline in oil export models. Given these issues, the study employs the Feasible Generalized Least Squares (FGLS) method for model estimation, as it offers advantages in terms of efficiency, robustness, model flexibility, and better finite-sample properties. Specifically, FGLS is more efficient than OLS when heteroskedasticity and autocorrelation are present; it provides robust estimates and allows for varying types of variances across entities and time periods.

6.4 Generalized Least Squares (GLS) Estimations for Investment Efficiency Across Different Lifecycle Stages

In Section 6.4, we delve into the application of Generalized Least Squares (GLS) estimations to explore investment efficiency across different lifecycle stages, both in oil-exporting and oil-importing countries. Oil-exporting countries are the subject of subsection 6.4.1, which sheds light on how the distinctive economic characteristics of these countries influence investment choices. The focus shifts to countries that import oil in Sub-section 6.4.2, which then looks at how their investment efficiency dynamics differ. This section employs GLS estimations to address common data issues like heteroscedasticity and autocorrelation and offers a solid framework for comprehending the complex nature of investment efficiency in these various groups of countries.

6.4.1 Generalized Least Squares (GLS) Estimations for Investment Efficiency Across Different Lifecycle Stages in oil exporting counties

In this section, we use Generalized Least Squares (GLS) estimations to examine investment efficiency in oil-exporting nations at various lifecycle stages. The GLS framework provides more precise insights by addressing data issues like heteroscedasticity and autocorrelation.

Table 4: Generalized Least Squares (GLS) Estimations for Investment Efficiency Across Different Lifecycle Stages in oil exporting counties:

Variables	Introduction (Model 1)	Growth (Model 2)	Mature (Model 3)	Shake-out (Model 4)	Decline (Model 5)
Intercept	0.003	0.002	0.005***	-0.005***	0.001
Growth (t−1)	-0.034***	-0.029***	0.002	-0.026***	0.003
LEV (t−1)	0.437***	0.319***	0.390***	0.175***	-1.101***
Cash (t−1)	0.007***	-0.007***	0.001**	-0.006***	-0.006
Size (t−1)	0.000	0.028***	0.005***	0.020***	0.015
Returns (t−1)	0.248***	0.558***	0.494***	0.496***	1.316***
I (t−1)	-0.003	0.143***	0.012*	0.100***	0.064
R^2	0.538	0.364	0.697	0.451	0.222
Wald chi2(6)	100470.11	1714661.3	9209.4	722265.9	50.2
P-value	0.0000	0.0000	0.0000	0.0000	0.0000

Note: All variables are lagged by one year (t-1). ***, ** and * indicates significant at 1%, 5% and 10% level respectively.

This table provides detailed Generalized Least Squares (GLS) estimations concerning investment efficiency across various lifecycle stages in oil-exporting countries. The table provides essential clues for the empirical validation of these hypotheses, which are critical for understanding the dynamics of investment expenditure in various stages of corporate life-cycles.

Firstly, the researcher addresses the overarching hypothesis H1 that proposes that firm-specific factors significantly influence the deviation from the expected optimal level of investment expenditures at different stages of the firm lifecycle. The Wald chi-square statistics, which are substantially high for all models, coupled with p-values virtually at zero, offer an initial robust verification of this hypothesis. The statistics reveal that the chosen models are robust, and the results can be taken to represent true underlying relationships rather than spurious correlations.

Stage-wise Evaluation

H1a (Introduction Stage)

The Introduction stage, labeled as Model 1, demonstrates an R^2 value of 0.538. This means that about 53.8% of the variability in the deviation from optimal investment is accounted for by the independent variables. The statistical importance of the independent variables corroborates the hypothesis H1a.

H1b (Growth Stage)

Model 2, indicative of the Growth stage, yields an R^2 value of 0.364. This means that about 36.4% of the variability in the deviation from optimal investment is accounted for by the independent variables. The statistical importance of the independent variables corroborates the hypothesis H1b.

H1c (Maturity Stage)

For Model 3, which symbolizes the Maturity stage, the R^2 value is at an elevated level of 0.697 the highest among all stages. This means that about 69.7% of the variability in the deviation from optimal investment is accounted for by the independent variables. The statistical importance of the independent variables corroborates the hypothesis H1c, likely making it the most substantiated among all lifecycle stages.

H1d (Shake-out Stage)

In Model 4, representing the Shake-out stage, the situation is more nuanced. yields an R^2 value of 0.451. This means that about 45.1% of the variability in the deviation from optimal investment is accounted for by the independent variables. The statistical importance of the independent variables corroborates the hypothesis H1d.

H1e (Decline Stage)

In the final stage, Model 5 stands for the Decline stage, and offers the lowest R^2 of 0.222 among all stages. This means that about 22.2% of the variability in the deviation from optimal investment is accounted for by the independent variables. The statistical importance of the independent variables corroborates the hypothesis H1e.

The firm-specific factors across all stages show significance levels that range from less than 1% to less than 10%, thereby providing strong empirical grounds to support the hypotheses. However, the variation in R^2 values across different stages suggests a fluctuating impact of these factors, calling for stage-specific strategies for optimizing investment expenditures. The data and statistical tests robustly support the overarching hypothesis H1 and its sub-components, offering valuable insights into how firm-specific factors influence the deviation from optimal investment levels at different life-cycle stages. For oil-exporting countries in the MENA region, this evidence is compelling.

6.4.2 Generalized Least Squares (GLS) Estimations for Investment Efficiency Across Different Lifecycle Stages in oil importing counties

In this section, we employ Generalized Least Squares (GLS) estimations to scrutinize investment efficiency across different lifecycle stages in oil-importing countries. The GLS framework addresses inherent challenges like heteroscedasticity and autocorrelation in the data, offering more precise insights.

Table 5: Generalized Least Squares (GLS) Estimations for Investment Efficiency Across Different Lifecycle Stages in oil importing counties:

Variables	Introduction	Growth	Mature	Shake-out	Decline
	(Model 1)	(Model 2)	(Model 3)	(Model 4)	(Model 5)
Intercept	0.005***	0.001	0.003***	0.001**	-0.005***
Growth (t−1)	0.037***	-0.021***	-0.017***	-0.004**	0.023***
LEV (t−1)	0.511***	0.588***	0.225***	0.064*	0.079**
Cash (t−1)	-0.011***	-0.020***	0.002	-0.008***	-0.004**
Size (t−1)	-0.012***	-0.004	0.002	-0.005***	0.010***
Returns (t−1)	0.482***	0.683***	0.637***	0.775***	0.769***
I (t-1)	0.090***	0.212***	0.008	0.075***	0.024**
R^2	0.486	0.540	0.692	0.775	0.558
F-Statistic	190888.94	2889.5	2008.1	246319.3	1226.3
P-value	0.0000	0.0000	0.0000	0.0000	0.0000

Note: All variables are lagged by one year (t-1). ***, ** and * indicates significant at 1%, 5% and 10% level respectively.

This table provides detailed Generalized Least Squares (GLS) estimations concerning investment efficiency across various lifecycle stages in oil-importing countries. The table provides essential clues for the empirical validation of these hypotheses, which are critical for understanding the dynamics of investment expenditure in various stages of corporate life-cycles.

Addressing the primary hypothesis H1, which posits that firm-specific factors have a significant influence on deviations from optimal levels of investment expenditures across various stages of a firm's life cycle, the F-Statistics for all models are extremely high and p-values are virtually zero. This provides a strong preliminary affirmation of H1. These metrics underline the robustness of the chosen models, ensuring that the observed relationships are genuine rather than coincidental.

Stage-wise Evaluation

H1a (Introduction Stage)

Model 1, representing the Introduction stage, shows an R^2 value of 0.486. This implies that nearly 48.6% of the variance in the deviation from optimal investment can be explained by the model's independent variables. These statistical markers reinforce H1a.

H1b (Growth Stage)

For the Growth stage, captured in Model 2, the R^2 value is 0.540. This implies that nearly 54.0% of the variance in the deviation from optimal investment can be explained by the model's independent variables, providing robust empirical support for H1b.

H1c (Maturity Stage)

Model 3, portraying the Maturity stage, has an R^2 of 0.692. This implies that nearly 69.2% of the variance in the deviation from optimal investment can be explained by the model's independent variables, providing robust empirical support for H1c.

H1d (Shake-out Stage)

Model 4, which corresponds to the Shake-out stage, presents a more nuanced situation. The R^2 is 0.775 the highest among all stages. This implies that nearly 77.5% of the variance in the deviation from optimal investment can be explained by the model's independent variables, providing robust empirical support for H1d.

H1e (Decline Stage)

For the Decline stage, represented by Model 5, the R^2 value stands at 0.558. This implies that nearly 55.8% of the variance in the deviation from optimal investment can be explained by the model's independent variables, providing robust empirical support for H1e.
The significance levels of firm-specific variables across all stages vary but remain below 10%, delivering robust empirical validation for the hypotheses. The variation in R^2 values across stages signals that these factors have different impacts at different life-cycle stages, highlighting the need for stage-specific strategies. The data strongly validates the overarching hypothesis H1 and its sub-components for oil-importing countries in the MENA region. This research offers critical insights into the influence of firm-specific variables on deviations from optimal investment levels across diverse life-cycle stages, providing a compelling foundation for future studies in this area.

6. Conclusions

This study set out to empirically examine the influence of firm-specific factors on the deviation from optimal investment levels across different life-cycle stages of firms in oil-exporting and oil-importing countries. Utilizing a robust methodological framework that included a range of diagnostic tests and Feasible Generalized Least Squares (FGLS) estimation techniques, the research offers significant insights into investment efficiency dynamics in the MENA region.
The overarching hypothesis, proposed that firm-specific factors significantly affect the deviation from the expected optimal level of investment expenditures at various stages of a firm's lifecycle. The evidence robustly supports this hypothesis. The Wald chi-square statistics and F-Statistics for all models were considerably high, with p-values close to zero, substantiating the reliability and validity of the models used in this research.
Notably, firm-specific factors showed varying degrees of influence depending on the life-cycle stage and whether the country is an oil-exporter or an oil-importer. In oil-exporting countries, the highest R^2 value was observed at the Maturity stage (0.697), indicating that about 69.7% of the variability in the deviation from optimal investment could be explained by the firm-specific variables in this stage. In contrast, for oil-importing countries, the highest explanatory power was at the Shake-out stage with an R^2 value of 0.775.
The study's findings have critical implications for policymakers, investors, and corporate strategists. The research clearly suggests that a one-size-fits-all approach towards investment will not be effective. Strategies need to be stage-specific, especially given the fluctuating impact of various firm-specific factors like leverage, cash, and size across different life-cycle stages.
For the MENA region, and particularly for oil-exporting countries, these findings are not just academic but carry substantial practical weight. As many countries in the region look to diversify their economies, understanding how firm-specific factors influence investment efficiency becomes crucial for long-term sustainable development.
The study offers a comprehensive, empirically robust framework for understanding how firm-specific factors influence investment levels at different life-cycle stages. It opens avenues for future research to delve deeper into the intricate mechanisms that drive these dynamics, including extending the study to other sectors and regions.

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