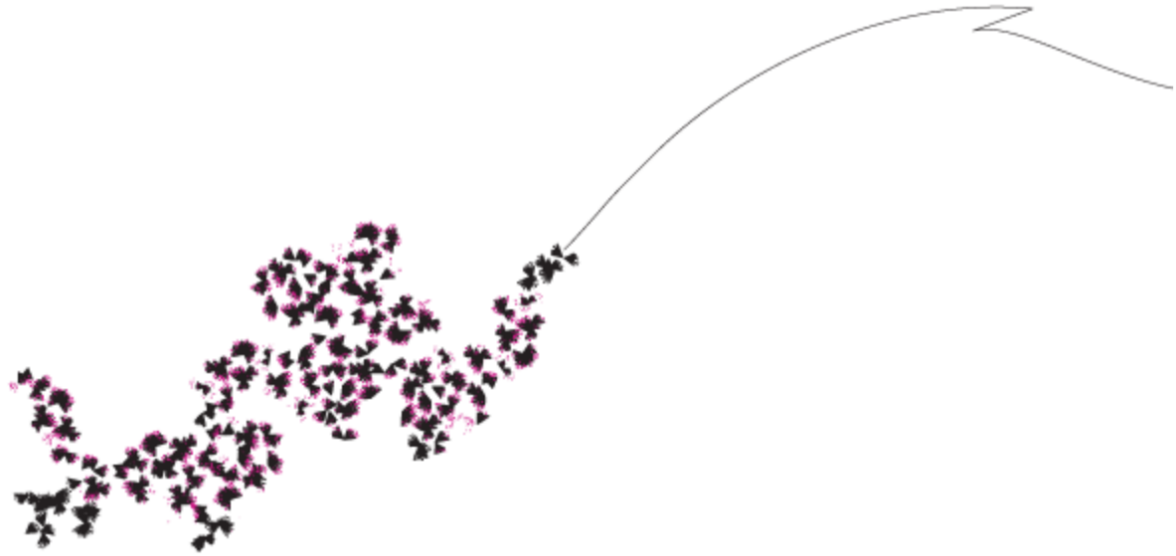
Master thesis

The impact of corporate life cycle on the capital structure of German listed companies



UNIVERSITY OF TWENTE.

Student:	Nirojan Ambalavanar
Student number:	S2030772
Faculty:	Behavioural, Management and Social Sciences
Study:	Master Business Administration
Track:	Financial Management
Version:	Final
Submission date:	03-07-2019
Supervisors:	1. Prof. Dr. R. Kabir
	2. Dr. H.C. van Beusichem

Acknowledgements

This thesis represents the final stage of my master study Business administration with the specialization in Financial Management at the university of Twente. I would like to acknowledge several people for their help and support during this period.

In the first place, I would like to thank Prof. Dr. R. Kabir of the department of Finance and Accounting at the University of Twente. His role as first supervisor has been of great value during the process of writing my master thesis. His critical view and patient guidance made it possible for me to improve my master thesis during the whole process. In the second place, I would like to thank my second supervisor Dr. H.C. van Beusichem of the department of Finance and Accounting. His valuable feedback allowed me to improve my master thesis further. Lastly, I would like to thank my family and friends for their unconditional support and encouragement during my study at the University of Twente.

Nirojan Ambalavanar

July, 2019

Abstract

In this research, the relationship between corporate life cycle and capital structure of German listed non-financial companies is examined. The corporate life cycle is divided into Growth, Maturity and Decline life cycle stages. Both ordinary least squares (OLS) and fixed effects regressions are conducted in order to examine the direct impact of the corporate life cycle stages on the capital structure of the German listed non-financial companies in the period of 2009 until 2017. The final sample of this research consists of 361 listed German non-financial companies. The regression results show that the impact of the corporate life cycle stages on the leverage ratios (i.e. total debt ratio, long-term debt ratio and short-term debt ratio) depends on the industry grouping in which a company operates. However, for the full sample and after performing some robustness tests, the regression results show that the (incremental) impact of the Growth life cycle stage on the leverage ratios, relative to the Maturity life cycle stage, is positive and significant. This implies that moving from the Growth life cycle stage to the Maturity life cycle stage is associated with a decrease in the leverage ratios. Besides that, the (incremental) impact of the Maturity life cycle stage on the leverage ratios, relative to the other life cycle stages, is negative and significant. Further, the (incremental) impact of the Decline life cycle stage, relative to the Maturity life cycle stage, is not significant on the long-term debt ratio even after running some robustness tests. In contrary, the impact on total debt ratio and short-term debt ratio is indeed, as predicted, positive and significant. This result implies that moving from the Maturity life cycle stage to the Decline life cycle stage is associated with an increase in total debt ratio and short-term debt ratio. However, this increase is not significant when performing some robustness tests. Overall, the main findings of this research support partially the predictions that the leverage ratios will follow a U-shaped (high-low-high) pattern along the corporate life cycle of the sample companies. Therefore, this research extends the life cycle literature by directly examining the role of corporate life cycle in influencing the capital structure. There is namely little research conducted with a focus on the direct impact of the corporate life cycle stages on the capital structure of the companies.

Keywords: *Corporate life cycle, corporate life cycle stages, capital structure, leverage, Germany, listed companies, non-financial companies, after crisis.*

Table of Contents

1 Introduction

For more than a half century, the capital structure theories are a hot topic among many scholars in the field of financial management. One of the first study about capital structure was developed by Modigliani and Miller (1958). This is probably also the most widely known study. This study was the starting point for the development of other (capital structure) theories which were followed by several empirical studies to prove or disprove the theories. However, there are still unanswered questions concerning the capital structure policies. For example, the relationship between the capital structure and the stages of the corporate life cycle is a field where less research have been conducted (Hirsch and Walz, 2011; Pinková & Kamínková, 2012; Frielinghaus, Mostert & Firer, 2005; La Rocca, La Rocca & Cariola, 2011; Tian, Han & Zhang, 2015, Ahsan, Wang & Qureshi, 2016).

Modigliani and Miller (1958) reported that, under some assumptions, the value of the firm is not influenced by the way how the company is financed. However, over the years, many studies have challenged these assumptions and concluded that the capital structure is, in fact, relevant for firm value. Agency costs, differences in information and taxes are the main reasons why financing matters. According to Myers (2001) there is no universal theory which explains the optimal debt-equity choice and there is also no reason to expect one. Most of the time the statistical findings are in line with two or more competing capital structure theories. Over the years, the pecking order theory and the trade-off theory emerged as the two key traditional theories in the literature of capital structure. In addition, these theories are considered as mutually exclusive. The market timing theory is a recent theory which is considered as complementary to any of the other two (Huang and Ritter, 2009; Castro, Tascón & Amor-Tapia, 2014).

Financial behaviors are life-cycle-specific. Like humans, organizations pass through some stages during their life cycle. These are also called corporate life cycle stages. A particular stage could be symbolized by its specific characteristics. There are differences between the stages in terms of decision-making style, structure, organization strategy and situation (Miller and Friesen, 1984). According to the lifecycle theory, the appropriate capital capacity and growth strategies differ at different stages of a company's lifecycle (Anthony and Ramesh, 1992). Adizes (1979) argue that specific patterns of behavior arise at each stage of the life cycle. The companies will follow a predictable pattern that is characterized by the different stages of development. As the companies develop over time, the levels of profitability, financial needs, growth opportunities, the availability of the financial resources and the opacity of information asymmetry also change. Accordingly, companies change their capital structures (Berger & Udell, 1998; La Rocca et al., 2011; Tian et al., 2015). So, the companies

make different financial decisions at all of the lifecycle stages and will therefore also have different capital structures.

Several studies have investigated the relationship between capital structure and corporate life cycle in different countries or multiple countries. For example, Italy (La Rocca et al., 2011), China (Tian et al., 2015), Pakistan (Ahsan et al., 2016), South Africa (Frielinghaus et al., 2005), Czech (Pinková & Kamínková, 2012), a wide sample of public companies from UK, Germany, France and Spain (Castro et al., 2014; Castro, Tascón & Amor-Tapia, 2015) and fourteen European countries (Castro, Tascón Fernández, Amor-Tapia, and Miguel., 2016). However, to the best knowledge of the author, there is no empirical evidence specifically from Germany. Furthermore, most of the above-mentioned studies used data which are at least more than seven years old (until 2010). So, these studies did not find empirical evidence about the relationship between capital structure and corporate life cycle after the global financial crisis of 2008.

The purpose of this research is to examine the direct impact of the corporate life cycle stages on the capital structure of the German listed companies in the period of 2009 until 2017. Therefore, the following research question is formulated: "*What is the impact of the corporate life cycle stages on the capital structure of German listed companies in the period of 2009 until 2017*?".

To examine what the direct impact of the corporate life cycle stages on the capital structure of the sample companies is, the firm-level data of German listed companies is collected from Orbis. The panel data is collected for the previous nine financial years (2009-2017). For comparison purposes and since the purpose of this research is almost similar to the research of La Rocca et al. (2011), Akhtar (2012), Tian et al. (2015) and Faff et al. (2016), this study applied both ordinary least squares regressions (OLS) and fixed effects regressions in order to test the hypotheses and to answer the research question. The analyses are performed in SPSS.

In general, there is no consensus about the content and the number of corporate life cycle stages. In the last fifty years, many models have been developed that try to explain the corporate life cycle theory. However, these models differ from each other by mentioning different corporate life cycle stages. While the models have their differences, they mention more or less the same common stages in their own words. Furthermore, they agree upon there being Growth, Maturity and Decline life cycle stages.

Additionally, there is also no consensus with regards to the way in determining the different stages of the corporate life cycle. In the empirical literature, several life cycle proxies are applied in order to identify the different stages of a company's life cycle. Some examples of these life cycle proxies are: based on numerical and descriptive criteria, univariate procedure (one life cycle descriptor, for example retained earnings or number of years listed), multivariate procedure (for example, based on four life cycle descriptors: dividends, sales growth, capital expenditure and firm

age), cash flow patterns, a multiclass linear discriminant analysis (MLDA) or by applying two-step cluster analysis.

In this research, I followed La Rocca et al. (2011), Keasey, Martinez and Pindado (2015) and Faff et al. (2016) to classify the observations into different corporate life cycle stages. They have applied the two-step cluster analysis or the multiclass linear discriminant analysis (MLDA) to classify their observations into different corporate life cycle stages. In this research, I used the two-step cluster analysis as the main life cycle proxy and the multiclass linear discriminant analysis (MLDA) as a robustness check. More specifically, firstly the observations of this research are classified into three groups (Growth, Maturity and Decline life cycle stages) by applying the two-step cluster analysis. Afterwards, this classification is refined by performing the multiclass linear discriminant analysis (MLDA).

This research contributes to the existing literature in several ways. As mentioned earlier, to the best knowledge of the author, there is no empirical evidence specifically from Germany. So, this research contributes to the existing literature by investigating the relationship between the capital structure and the corporate life cycle of German listed companies, but also by making use of more recent data (after the global financial crisis of 2008). The results of this research could be compared between countries with older data. Furthermore, this research extends the life cycle literature by directly examining the role of corporate life cycle in influencing the capital structure. There is namely little research conducted with a focus on the direct impact of the corporate life cycle stages on the capital structure of the companies.

In addition, this research provides practical relevance for financial managers, since they have to take appropriate financial decisions along the different stages of the corporate life cycle. This research gives namely insight in whether the corporate life cycle is an influencing factor in the financing behavior of German listed companies. The main findings of this research, for example, support partially the predictions that the leverage ratios follow a U-shaped (high-low-high) pattern along the corporate life cycle of the sample companies. This implies that moving from the Growth life cycle stage to the Maturity life cycle stage is associated with a decrease in the leverage ratios. While, moving from the Maturity life cycle stage to the Decline life cycle stage is associated with an increase in total debt ratio and short-term debt ratio. Overall, this research helps financial managers in better understanding the principles of capital structure and the financial preferences and the leverage patterns along the life cycle of the German listed non-financial companies.

This paper firstly discusses in chapter two the theories about the corporate life cycle and the capital structure. This chapter also includes the discussion about the current researches on the subject under investigation and the hypotheses which are formulated based on the theories and empirical evidence. This will be followed by a description of the methodology of this research in chapter three.

This chapter firstly presents the research methods that are used to investigate the relationship between corporate life cycle and capital structure or other outcome variables. This will be followed by the description of the research method that is applied in this research in order to test the hypotheses and to answer the research question. Subsequently, the measurement of the dependent, independent and control variables is presented. In chapter four, the data source and the sampling criteria of this research are discussed. This will be followed by the description of the results and the robustness of the findings in chapter five. Lastly, chapter six presents the conclusions and limitations of this research and the recommendations for future research.

2 Literature review

In this chapter the theories about the corporate life cycle and the capital structure are discussed. This chapter also includes the discussion about the current researches on the subject under investigation and the hypotheses which are formulated based on the theories and empirical evidence.

2.1 Corporate life cycle

Like humans, organizations pass through some stages during their life cycle as they grow and mature. These are also called corporate life cycle stages (Miller and Friesen, 1984). According to the lifecycle theory, the appropriate capital capacity and growth strategies differ at different stages of a company's lifecycle (Anthony and Ramesh, 1992). There are differences between the stages in terms of decision-making style, structure, organization strategy and situation (Miller and Friesen, 1984). Adizes (1979) argues that specific patterns of behavior arise at each stage of the life cycle. In general, the companies will follow a predictable pattern that is characterized by the different stages of development.

In the following sub-chapters, I discuss in detail the different corporate life cycle stages that are used in the literature, the determinants of the corporate life cycle and the impact of corporate life cycle on several aspects of finance, accounting and corporate governance.

2.1.1 The corporate life cycle stages

As opposed to common four or five stages, the model of Adizes (1979) consists of ten life cycle stages. These stages are Courtship, Infancy, Go-Go, Adolescence, Prime, Stable, Aristocracy, Recrimination, Bureaucracy and Death. In contrary, Miller and Friesen (1984) identified life cycle stages which are common to most of the literature. According to them, there are five common life cycle stages. These stages are Birth, Growth, Maturity, Revival and Decline (Miller and Friesen, 1984). Mintzberg (1984) mentions in his research that the corporate life cycle includes four stages. These stages are namely Formation, Development, Maturity and Decline. However, Anthony and Ramesh (1992) proposed a life cycle model which consist of three stages: Growth, Mature and Stagnant. According to Dickinson (2011), the corporate life cycle consists of five stages. These stages are Introduction, Growth, Mature, Shake out and Decline.

In terms of number, most empirical studies divided the corporate life cycle of the sample firms into three stages. For example, La Rocca et al. (2011) classified their observations into Young, Middle-aged and Old firms. Ahsan et al. (2016) also divided the corporate life cycle of their sample firms into three stages and classified these stages as Growth, Mature and Decline stage. Furthermore, Castro et

al. (2016) divided the corporate life cycle of their sample firms into three stages and classified these stages as Introduction, Growth and Maturity stage. Frielinghaus et al. (2005) have used the life stage model of Adizes (1979) to determine the life stage of their sample firms. However, later they have reclassified the ten life cycle stages of Adizes (1979) into three broad stages: Early, Prime and Late. Moreover, Keasey et al. (2015) have also differentiated three life cycle stages. These life cycle stages are: Growth, Revival and Maturity. An overview of different corporate life cycle stages, that are used in the literature, is visually represented in figure 1. So, in order to increase the comparability of the results of this research with other empirical studies, this research also classified the corporate life cycle of the sample firms into three stages. Therefore, the following corporate life cycle stages are taken into account in this research: Growth, Maturity and Decline.

Overall, there is no consensus about the content and the number of corporate life cycle stages. In the last fifty years, many models have been developed that try to explain the corporate life cycle theory. However, these models differ from each other by mentioning different corporate life cycle stages. While the models have their differences, they mention more or less the same common stages in their own words. Furthermore, they agree upon there being Growth, Maturity and Decline stages. Besides that, there is also no consensus with regards to the method in determining the different stages of the corporate life cycle. In the empirical literature, several life cycle proxies are applied in order to identify the different stages of a company's life cycle. Some examples of these life cycle proxies are: based on numerical and descriptive criteria, univariate procedure (one life cycle descriptor, for example retained earnings or number of years listed), multivariate procedure (for example, based on four life cycle descriptors: dividends, sales growth, capital expenditure and firm age), cash flow patterns, a multiclass linear discriminant analysis (MLDA) or by applying two-step cluster analysis. The latter is used in this research to identify the different stages of the corporate life cycle of the sample companies which is discussed extensively in the method chapter.

Overview of different corporate life cycle stages										
Adizes (1979)	**Miller and Friesen (1984)**	**Mintzberg (1984)**	**Anthony and Ramesh (1992)**	**Frielinghaus (2005)**	**Dickinson (2011)**	**La Rocca et al. (2011)**	**Keasey et al. (2015)**	**Castro et al. (2016)**	**Ahsan et al. (2016)**	**Faff et al. 2016)**
1. Courtship	1. Birth	1. Formation	1. Growth	1. Early	1. Introduction	1. Young	1. Growth	1. Introduction	1. Growth	1. Introduction
2. Infancy	2. Growth	2. Development	2. Mature	2. Prime	2. Growth	2. Middle-aged	2. Maturity	2. Growth	2. Mature	2. Growth
3. Go-go	3. Maturity	3. Maturity	3. Stagnant	3. Late	3. Mature	3. Old	3. Revival	3. Maturity	3. Decline	3. Mature
4. Adolescence	4. Revival	4. Decline			4. Shake out					4. Shake out/Decline (Shadec)
5. Prime	5. Decline				5. Decline					
6. Stable										
7. Aristocracy										
8. Recrimination										
9. Bureaucracy										
10. Death										

Figure 1: An overview of different corporate life cycle stages that are used in the literature

As mentioned earlier, in the last fifty years, many models have been developed that try to explain the corporate life cycle theory. Below, I discuss in detail the corporate life cycle stages of Adizes (1979), Miller and Friesen (1984) and Dickinson (2011).

2.1.1.1 The corporate life cycle stages of Adizes (1979)

Adizes (1979) argue that specific patterns of behavior arise at each stage of the life cycle. In addition, he mentions that the life cycle stages are defined by the control and interrelationship of flexibility. According to him, these stages are not defined by the number of employees, age, assets or sales. Furthermore, he argues that the companies will follow a predictable pattern that is characterized by the different stages of development. As opposed to common four or five stages, his model consists of ten life cycle stages. These stages are Courtship, Infancy, Go-Go, Adolescence, Prime, Maturity (stable), Aristocracy, Early bureaucracy (Recrimination), Bureaucracy and Death.

During the Courtship life cycle stage, the company has not started operating. In this life cycle stage, the business idea is actually created. Therefore, the company has no capital structure in this stage (Adizes, 1979).

In the Infancy life cycle stage, the companies have hardly any procedures, systems, policies, or even budgets. Additionally, these companies also have no experience or track record. So, any mistake in sales service, financial planning or product design could have fatal consequences. Furthermore, there are hardly any staff meetings and the companies are highly centralized. In addition, the companies in this life cycle stage have a negative cash flow and need access to external financing. This because of the companies use their cash for their investment programs. Furthermore, the companies in the Infancy life cycle stage are typically small and vulnerable to financial shocks (Adizes, 1979).

Once the companies survive the tribulations and the trials of the Infancy life cycle stage, these companies will graduate to the Go-Go life cycle stage. This life cycle stage is similar to a baby who can finally focus and see. During the Go-Go life cycle stage, everything looks like an opportunity and the marketing has a pronounced role. In addition, companies in this life cycle stage need access to even more external financing in order to meet their appetite for growing their sales. Furthermore, in this life cycle stage the companies make often decision based on intuition since they lack experience and nearly each opportunity like to become a priority (Adizes, 1979).

In the Adolescence life cycle stage, the founders of the companies are often supported by professional managers. In addition, in this life cycle stage the management needs to balance the need for profit with the need to grow. The financing method, through which the growth of the companies is supported and pursued, is equally important. Additionally, in this life cycle stage more time is spent on planning and coordinating meetings and the administrative role increases in importance. The

organizational systems and policies are namely crucial for the companies in this life cycle stage in order to survive or to be profitable. Furthermore, the companies in this life cycle stage are mostly more short-run oriented than long-run (Adizes, 1979).

During the Prime life cycle stage, there is a balance between profits and growth. Furthermore, the companies in this life cycle stage have procedures and plans in order to operate with maximum efficiency. In addition, the companies' culture is such as that employees feel comfortable to align themselves with the company. There is also a clear focus and the companies try to pursue their core function with precision. Most essential, in the Prime life cycle stage there is a balance between control and flexibility. In addition, at this life cycle stage the risk profiles of the companies are lowered. Furthermore, the sales growth and the growth in profits are predictable and stable for the companies in the Prime life cycle stage, while these rates are helter-skelter for companies in the Go-Go life cycle stage (Adizes, 1979).

The companies enter the Maturity (Stable) life cycle stage when the companies have less investment opportunities that have a lower cost of capital compared to the expected return. Furthermore, the companies in this life cycle stage are solid and sound. However, there is not much expected from these companies with regard to future performance or growth. Furthermore, leadership of these companies is likely to be satisfied with their size and place in the community. Additionally, the companies in this life cycle stage spend less and less on marketing research and R&D. The budget for adaptation and changes also diminishes (Adizes, 1979).

The companies that enter the Aristocracy life cycle stage are highly liquid, financially strong and operationally successful. However, there is also an obvious increase in rigidity. Additionally, the growth during this stage comes mostly from acquisition since the absence of investment opportunities. In order to maintain the sales growth, companies in the Aristocracy life cycle stage are inclined to increase the prices instead of penetrating new markets or generating new products. As a result of the products' prices, there will be a reduction in the number of products sold. This consequently expresses itself in reduced total revenues (Adizes, 1979).

In the Early Bureaucracy (Recrimination) life cycle stage, the bad results are finally evident and the innovation is less promoted. The market share and revenues hopelessly and steadily fall and the fight for survival begins. In addition, during this life cycle stage external advisors play a role. Furthermore, typically managerial incentives, capital structure changes and new business strategies are employed in this life cycle stage in order to revive companies in recrimination. Especially, the companies need to secure external sources of supporting funds in order to prevent bankruptcy (Adizes, 1979).

The life cycle stage Bureaucracy often indicates the end of the companies. The companies in this life cycle stage mostly slips into a full-blown bureaucracy and is not capable to generate sufficient

resources in order to sustain themselves. Furthermore, these companies are mostly kept alive by artificial interventions instead of by the market forces or they are acquired by a competitor (Adizes, 1979).

At the life cycle stage Death, the companies will stop to exist. However, the death could be also a result of a merger or acquisition (Adizes, 1979).

2.1.1.2 The corporate life cycle stages of Miller and Friesen (1984)

Miller and Friesen (1984) have studied how corporations develop over time and wanted to understand how structures, strategies and environments interrelate. Their aim was to establish whether their rough conceptual typology of the corporate life cycle stages can be used to predict interstage differences in structure, strategy, context factors (situation) and decision-making style. Based on the results of their research, they argue that increasing environmental complexity and organization growth would lead to that every stage shows significant differences compared to all other stages concerning the structure, strategy, context factors (situation) and decision-making style.

In contrary to other corporate life cycle models (theories), Miller and Friesen (1984) identified life cycle stages which are common to most of the literature. According to them, there are five common life cycle stages. These stages are Birth, Growth, Maturity, Revival and Decline. They argue that companies in Birth stage are typically simple, small, dominated by their owners, informal in structure and undifferentiated. In addition, these companies have focus on innovation and face uncertainty over future growth. Companies in the Growth stage achieve rapid growth and are typically medium sized. The separation of ownership and control begins to arise, procedures are formalized and the managers get more decision-making responsibility. Companies in the Mature stage face stabilizing growth in sales. Moreover, these companies are less likely to take on risky or innovative strategies than in the earlier stages and a more bureaucratic organization structure is established. Furthermore, the goal of these companies becomes efficient and smooth functioning. Companies in the Revival stage have a rising product-market scope and face diversification. In addition, in this life cycle stage the companies adopt for the first time divisionalized structures in order to manage the heterogenous and more complex markets. Besides that, there is also importance for more sophisticated planning and control systems. Lastly, the companies in the Decline stage suffer from stagnation and low profitability. This is due to lack of innovation and external challenges (Miller and Friesen, 1984).

2.1.1.3 The corporate life cycle stages of Dickinson (2011)

According to Dickinson (2011), the corporate life cycle consists of five stages. These stages are respectively Introduction, Growth, Mature, Shake out and Decline. The companies in the earliest life cycle stage have likely some resources to draw upon and a mission. However, these companies have presumably nothing more. For example, no standards, existing structure, facilities or internal ideology. In contrast, these companies may have a founding leader, but they have likely no other full-time members. It is namely the job of the founding leader to hire the first employees, to acquire the facilities and to create the initial structure (Mintzberg, 1984). The companies in the Introduction life cycle stage suffer from knowledge deficits about potential costs and revenues and lack established customers. In addition, companies in the Introduction and Growth life cycle stages are more likely to make early investments in order to avert the entries of their competitors into the market (Jovanovic, 1982). However, during increases in efficiency and investment, the profit margins are maximized in the Growth and Maturity stages (Wernefelt, 1985). Furthermore, the companies the Maturity stages invest relatively less compared to the companies in the Introduction and Growth stages. They namely mainly invest to maintain capital (Wernefelt, 1985). Besides that, as the companies mature, the competition intensifies and operational importance shifts to improved capacity utilization and cost reduction. Furthermore, mature companies have fewer investment opportunities. For these reasons, these companies have less need for additional borrowing. Even though, these companies are able to borrow more since these companies are mostly in the best financial position (Barclay & Smith, 2005). As the company enter the Decline stage, the growth rates as well as the prices will decline (Wernefelt, 1985). In addition, the companies in the declining stages liquidate assets in order to support operations and to service existing debt (Dickinson, 2011).

2.1.2 The determinants of corporate life cycle

According to Dickinson (2011), companies evolve with the path of evolution which is determined by external and internal factors. Some examples of the external factors are macro-economic factors and competitive environment. Examples of the internal factors are financial resources, strategy choice and managerial ability. In other words, the companies' life cycles are distinct stages which result from changes in the external and internal factors. Many of these changes will arise from strategic activities which are undertaken by the companies. Dickinson (2011) also mentions that structural changes, expansion into new markets and/or substantial product innovations can cause that companies develop non-sequentially across different corporate life cycle stages. Therefore, the company life cycle can be cyclical in nature. In other words, unlike the product life cycles, the company life cycle does not need to develop linearly through the corporate life cycle stages. The companies can, for example, enter

theoretically the Decline stage from any of the other stages. Furthermore, each life cycle stage exists in almost all industries and therefore alleviates the concern that company life cycle is driven by industry classification.

Loderer, Stulz and Waelchli (2016) argue that operational and organizational rigidities cause companies to progress to the latter corporate life cycle stages. They, for example, show that as companies become more mature, they become more rigid in exploiting benefits from the assets that they have. Furthermore, these companies do not consider renewing their growth oppportunities and, as a consequence, they experience a drop in company value. According to Hasan and Cheung (2018), a company's productive capacity, entrepreneurial dynamics and operating efficiency affect the development of the companies across the different stages of a company's life cycle. Hasan and Cheung (2018) have, for example, examined the relationship between firm life cycle and organizational capital (e.g. systems, processes, designs, business practices and unique corporate culture). They mention that organizational capital serves a source of sustainable competitive advantage and develops the resource base. Based on the results of their research, they argue that companies with low organization capital are more likely to be in the Growth and Maturity life cycle stages. In contrary, companies with high organization capital tend to be in the Introduction and Decline life cycle stages.

2.1.3 The impact of corporate life cycle

Several empirical studies in the field of Accounting and Finance have investigated the impact of the company life cycle on financial performance, financing, corporate investment and dividend decisions (Zhao & Xiao, 2018). Habib and Hasan (2019) support this and argue that corporate life cycle has received substantial interest in the finance, accounting and corporate governance literature. There are indeed evidences that suggest that corporate life cycle has considerable effect on financing, corporate investment, asset pricing and pay out decisions (key corporate decisions). Furthermore, they argue that the investors take into account the life cycle stages of the companies in order to value the companies. Besides that, the life cycle effect on corporate policies also exists in cross country setting (Habib and Hasan, 2019). In this line of reasoning, Owen and Yawson (2010) also mention that the corporate life cycle could be associated with investment and financing decisions. For example, the financial structure of the companies changes over the companies' life cycle. In the first stages of the corporate life cycle, the companies will have namely little retained earnings since they invest all their profits and also raise external funds. However, as the companies develop over time and become mature, they will probably have higher accumulated profits and so also higher retained earnings. Furthermore, Hasan, Hossain, Cheung and Habib (2015) argue also, based on the company life cycle

theory, that the operating performance and the investment and financing decisions of the companies are highly affected by the change in the companies' organizational capabilities (life cycle stages).

For example, Dickinson (2011) argues that various performance measures and company characteristics such as size, age and profitability are nonlinearly related to company life cycle and are maximized for the companies in the Maturity stage. In other words, an inverted U-shape is expected across the different corporate life cycle stages. Furthermore, the companies mostly strive and prefer for a position around the Growth and Maturity stage where the reward-risk structure is optimized. The capital investment and the sales growth should decrease monotonically across the corporate life cycle stages. Additionally, the research and development and the advertising intensity are predicted to be higher in the earlier life cycle stage since the companies build their initial technology.

As mentioned earlier, there are several studies that have investigated the impact of corporate life cycle on several aspects of finance, accounting and corporate governance. Below, I present the results of some of these empirical studies that have investigated the impact of corporate life cycle.

2.1.3.1 Corporate life cycle and aspects of finance

The corporate life cycle has an effect in the magnitude and nature of merger and acquisitions (M&A) activities and on corporate investment in intangible and tangible assets. Owen and Yawson (2010) have investigated the impact of corporate life cycle on takeover activity. Based on the results of their research, they argue that there is a positive association between the probability of becoming a bidder and the company life cycle. Furthermore, they found that corporate life cycle is negatively associated with tender offers and has a positive impact on the likelihood that a deal will be negotiated. Furthermore, Anthony and Ramesh (1992) have found that capital expenditure and stock market reactions to sales growth are functions of life cycle stage. The companies in the Growth life cycle stage have lower dividend payout ratios and invest relatively large amounts in plant and equipment. Furthermore, there is an opportunity set of positive net present value projects. However, the companies in the early life cycle stages have, on average, higher sales growth (Anthony & Ramesh, 1992). Chuang (2017) has, for example, examined whether companies in different stages of the corporate life cycle tend to hire more financial advisors in M&A's and whether financial advisors can create higher value to companies within various corporate life cycle stages.

It is also known that corporate life cycle has important influences on the risk-taking behavior of the companies. Habib and Hasan (2017) have investigated the performance and the corporate risk-taking consequences at various corporate life cycle stages. Based on the results of their research, they argue that company life cycle has explanatory power for corporate risk-taking behavior. More specifically, they have found that the risk-taking is lower in the Growth and Maturity stages of the corporate life cycle. In contrary, the risk-taking is higher in the Introduction and Decline stages.

Furthermore, risk-taking has a negative effect on future performance during the Introduction and Decline stage, while this effect is positive during the Growth and Maturity stage.

Hasan et al. (2015) have, for example, investigated the effect of corporate life cycle on the cost of equity capital. They found that the cost of equity capital varies across the different stages of the corporate life cycle. More specifically, they found that the cost of equity is lower in the Growth and Maturity stages and higher in the Introduction and Decline stages. So, there is a U-shaped pattern visible. Moreover, Hasan et al. (2015) argue that the cost of equity of the companies vary systematically across the different stages of the companies' life cycle, because of companies in different stages of the corporate life cycle have different levels of competitive advantages, resource base, riskiness and information asymmetry.

Another example is the research of Akbar, Akbar, Tang and Qureshi (2019). They have investigated the association between corporate life cycle and bankruptcy risk. They found that companies in the Introduction, Growth and Decline stages experience higher bankruptcy risk. In contrary, companies in the Maturity stage of the corporate life cycle experience lower bankruptcy risk.

Moreover, Hasan and Habib (2017b) have investigated the association between firm life cycle stages and idiosyncratic volatility. They argue that idiosyncratic volatility varies across different corporate life cycle stages, since availability of information and firm performance also vary across different corporate life cycle stages. They, for example, found that idiosyncratic volatility is significantly lower in the Growth and Mature stages in comparison with to that in the Shake-out stage. Additionally, they found that idiosyncratic volatility is significantly higher in the Introduction and Decline stages compared to that in the Shake-out stage.

There are more studies that have investigated the association between corporate life cycle and other aspects of finance. DeAngelo, DeAngelo and Stulz (2006) have, for example, investigated the life cycle theory of dividends. They have, for example, found that there is highly significant association between the earned/contributed capital mix (life cycle proxy) and the decision to pay dividends.

2.1.3.2 Corporate life cycle and aspects of accounting

It is also investigated how a company's tax payment behavior changes along the different stages of the corporate life cycle. Hasan, Al-Hadi, Taylor and Richardson (2017) have examined whether the life cycle of a company clarifies the tendency of a company to engage in corporate tax avoidance. They, for example, found that tax avoidance is significantly and negatively related with the Growth and Mature stages and significantly and positively related with the Introduction and Decline stages, when using the Shake-out stage as a benchmark. In other words, they observed a U-shaped pattern across the different stages of the corporate life cycle concerning the tax avoidance outcomes.

Dickinson, Kassa and Schaberl (2018) have, for example, found that analysts' earnings forecasts and accounting information are each informative for market values. However, they are in distinct ways conditional on a company's life cycle stage. For example, the investors find analysist' forecasts more relevant for the stock and stock price returns for companies in the Growth and Maturity stages. In contrary, investors put relatively more weight on accounting information for companies in the Introduction and Decline stages. Furthermore, Al-Hadi, Hasan and Habib (2016) have investigated whether the influence of a risk committee on market disclosures differs for the various stages of a company's life cycle.

It is also known that the financial reporting quality varies along the different stages of the corporate life cycle. Bakarich, Hossain, Hossain and Weintrop (2019) have, for example, found that the qualitative characteristics of annual reports vary across different corporate life cycle stages. More specifically, the 10-K disclosures of the companies become more optimistic, less ambiguous and less complex as the companies develop from the Introduction to the Maturity stage. The readability and clarity are highest at the Maturity stage. Lastly, the disclosures become the most ambiguous and negative as the companies enter the final Decline stage. Overall, it can be concluded that the textual characteristics of company disclosure are not static across the different corporate life cycle stages.

2.1.3.3 Corporate life cycle and aspects of corporate governance

The life cycle aspects concerning the corporate governance show that corporate life cycle has impacts on investment in Corporate Social Responsibility (CSR) activities, mix of executive compensation and board structure and function. O'Connor and Byrne (2015) have, for example, examined whether the corporate governance changes along the life cycle of the companies. They found that the corporate governance is better practiced by mature companies. This because of independence and discipline increase as companies mature. In contrary, young companies are more likely to be accountable and transparent. Al-Hadi, Chatterjee, Yaftian, Taylor and Hasan (2017) have examined the association between financial distress and the corporate responsibility (CSR) performance and additionally the moderating impact of firm life cycle stages on that association. They found that there is a negative association between financial distress and positive CSR. Moreover, they also found that this relationship is more pronounced for companies in the Maturity life cycle stages. Furthermore, Zhao and Xiao (2018) have examined the role of company's life cycle stage on the association between financial constraints and corporate social responsibility (CSR). They found that there is negative correlation between financial constraints and CSR engagement for companies in the Growth, Maturity and Decline life cycle stages. However, there is no correlation for companies in the Initial life cycle stage. Hasan and Habib (2017a) have, for example, also examined the relationship between corporate social responsibility (CSR) and the corporate life cycle. They found that companies in the Maturity

stage, due to competitive advantages and resource base, invest more in CSR-related activities compared to companies in other corporate life cycle stages. In addition, they found that the association between CSR and corporate life cycle is moderated by the variables: profitability, size and slack resources.

Koh, Durand, Dai and Chang (2015) have, for example, examined whether the corporate life cycle has influence on the restructuring strategies that companies choose when they face financial distress. They found indeed that the corporate life cycle stage, where the companies are in, has influence on the resources and the restructuring strategies of the distress companies. For example, companies in the early life cycle stages are more likely to reduce their employees when they are in financial distress. In contrary, the companies in the Maturity life cycle stage have a tendency to engage in asset restructuring. Moreover, the impact of corporate life cycle is most noticeable in the choice of financial restructuring strategies such as varying capital structures or reducing dividends.

Another example is the research of Eulaiwi, Al-Hadi, Hussain and Al-Yahyaee (2018). They have investigated the relationship between corporate cash holdings and voluntary formation of board investment committee (IC) across the different stages of the corporate life cycle. They, for example, found that the voluntary formation of board investment committee has a positive impact on the corporate cash holdings for companies in the Growth and Maturity stages, relative to Introduction, Shake-out and Decline stages.

2.2 Capital structure

A company's basic resource are the cash flows which are produced by its assets. In case the company is fully financed by common stock, all those cash flows belong to the shareholders. However, when the company is financed both by equity as well as debt, then the cash flows will be splitted into two streams. One, relatively safe, stream will go to the bondholders. Another, relatively riskier, stream will go the shareholders (Brealey, Myers & Allen, 2017).

A company can choose to finance an investment wholly or partly with debt. The company's mix of equity and debt financing is also called the capital structure of the company. There are many different types of debt and at least two types of equity (preferred and common). Furthermore, there are also hybrids such as convertible bonds. In general, the company can issue different types of securities in innumerable combinations. Overall, companies try to discover that particular combination (capital structure) where it maximizes its overall market value (Brealey et al., 2017). This particular capital structure represents the optimal debt-equity ratio if it results in the lowest possible overall cost of capital (WACC). This because of the overall cost of capital (WACC) is used as the discount rate for the company's overall cash flows to calculate the present value of the company. So, the value of the

company is maximized, when the overall cost of capital (WACC) is minimized. This optimal debt-equity ratio is sometimes also called the company's target capital structure (Ross, Westerfield & Jordan, 2014).

A company can change its capital structure whenever it wants. For example, a company can increase its debt-equity ratio by issuing some bonds and consequently use the proceeds to buy back some stock. Another example is that the company reduce its debt-equity ratio by issuing stock and consequently use the money to pay off some debt. These actions, which change the existing capital structure of the company, are also called capital restructurings (Ross et al., 2014).

During the last half century, capital structure theories have become a hot topic among many scholars in the field of financial management. One of the first study about capital structure was developed by Modigliani and Miller (1958). This is probably also the most widely known study. Nowadays, this study is also known as the Modigliani and Miller theorem or the irrelevance theory. Modigliani and Miller (1958) reported that, under some assumptions, the value of the firm is not influenced by the way how the company is financed. However, over the years, many studies have challenged these assumptions and concluded that the capital structure is, in fact, relevant for firm value. Agency costs, differences in information and taxes are the main reasons why financing matters. So, due to these imperfections in the real world, the capital structure is relevant for firm value.

So, the study of Modigliani and Miller (1958) was the starting point for the development of other capital structure theories which were followed by several empirical studies to prove or disprove the theories. According to Myers (2001) there is no universal theory which explains the optimal debt-equity choice and there is also no reason to expect one. Most of the time the statistical findings are in line with two or more competing capital structure theories. Huang and Ritter (2009) support this and argue that no single capital structure theory is capable to explain all of the cross-sectional and timeseries patterns that have been documented. Over the years, the pecking order theory and the trade-off theory emerged as the two key traditional theories in the literature of capital structure. In addition, these theories are considered as mutually exclusive. The market timing theory is a recent theory which is considered as complementary to any of the other two (Huang and Ritter, 2009; Castro et al., 2014). According to the market timing theory, the debt-equity choices could be explained by the market conditions (the development of stock and bond market) (Baker & Wurgler, 2002).

Since the trade-off theory and the pecking order theory are the main traditional capital structure theories and due to the time constraints of this research to fully investigate all capital structure theories, this research only includes the trade-off theory and the pecking order theory. Furthermore, Ahsan et al. (2016) mention that the market timing theory remains silent about the leverage preferences over a company's life cycle. This is also another reason to exclude the market

timing theory. Concluded, to demarcate this research, this research focusses only on the trade-off theory and the pecking order theory.

2.2.1 The Modigliani and Miller theorem

As earlier mentioned, Modigliani and Miller (1958) have showed that the financing decisions and pay-out policies do not matter in perfect capital markets. Any combination of securities is as good as another in a perfect capital market. As a result, they have formulated famously recognized propositions. The first proposition states that the total value of a company cannot be changed by splitting the cash flows into different streams. According to them, the total value of a company is determined on the left-hand side of the balance sheet by real assets and not by the way how the company is financed. In other words, as long as the company's investment decisions are taken as given, the capital structure is irrelevant. This line of reasoning also applies to the mix of debt securities which are issued by a company. For example, the choices of unsecured versus secured, short-term versus long-term, subordinated versus senior, and nonconvertible versus convertible debt do not affect the overall value of the firm (Brealey et al., 2017). Furthermore, the shareholders can undo the impact of any changes in the capital structure of a company by offsetting changes to their own portfolio. For example, adjustments in their portfolio in order to have a particular percentage control of the company's shares or to achieve a desired cash flow pattern (Brealey et al., 2017).

The second proposition is about that the expected return on equity of leveraged company increases in proportion to the debt-equity ratio. The level of increase depends on the spread between the expected return on assets (portfolio of all the company's securities) and the expected return on debt (Brealey et al., 2017). According to Modigliani and Miller (1958), the overall cost of capital (WACC) of the company cannot be reduced when equity will be substituted by debt. Even though it is noticeable that debt is cheaper than equity. This is because of that equity will become more risky (higher financial risk), when the company increases debt. Therefore, the shareholders will require a higher return. In other words, the cost of equity will increase. In this situation, the low cost of using debt will be offset by the increase in cost of equity. For these reasons, the capital structure is irrelevance for the overall cost of capital (WACC) and the value of the company (Miller, 1988). The Modigliani and Miller theorem and its propositions are visually illustrated in figure 2.

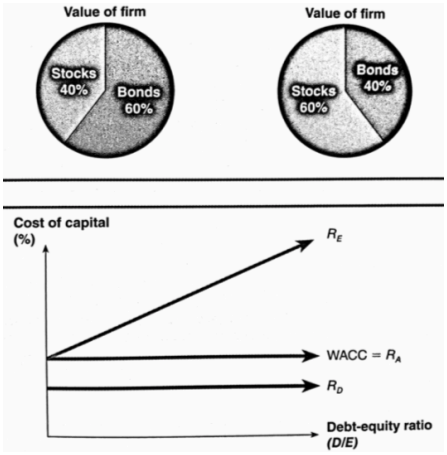


Figure 2: Illustration of Modigliani and Miller theorem. The "pie" model visually represents the proposition 1 of Modigliani and Miller, which states that the size of the pie does not depend on how it is sliced. So, when the value of the assets (and operations) of both companies is the same on the left-hand side of the balance sheet, it does not matter how it is financed on the right-hand side of the balance sheet. The second proposition of Modigliani and Miller is also visually represented on the graph below the pies. This shows that that the expected return on equity of leveraged company increases in proportion to the debt-equity ratio. Furthermore, the overall cost of capital (WACC) is constant. So, the capital structure is irrelevance for the overall cost of capital (WACC) and the value of the company (Ross et al., 2014).

2.2.2 Trade-off theory

As a debate on the Modigliani and Miller theorem, Kraus and Litzenberger (1973) have introduced the trade-off theory of the capital structure. According to this capital structure theory, which challenges the assumption of no taxes of Modigliani and Miller (1958), the optimal debt-equity choice depends on the balance between tax savings and the increasing agency and financial distress costs (reorganization or bankruptcy costs) which are associated with high levels of debt. The tax advantages are gained due to the fact that paid interest on outstanding debt is tax deductible. Consequently, this lowers the cost of using debt (Myers, 1977).

As mentioned earlier, one important advantage of debt financing is that, under the corporate income tax system in many countries, the interest expenses are tax deductible. In other words, the return to bondholders is free from taxation at the corporate level (Brealey et al., 2017). However, debt financing increases also the probability of financial distress. Financial distress takes place when the obligations to creditors are not fulfilled or honored with difficulty. In some situations, financial distress leads to bankruptcy. However, sometimes it could also mean skating on thin ice. In the situation of bankruptcy, the value of the debt of a company will equal the value of its assets. So, the value of equity will become zero and the ownership of the company's assets will be transferred to the bondholders (Ross et al., 2014).

Financial distress is costly. The costs of financial distress depend on the likelihood of distress and the extent (the great size; magnitude) of costs faced when distress takes place. Costs of financial distress include various items. These costs mainly arise from bankruptcy. However, not every company that has financial difficulties goes bankrupt. Companies can postpone bankruptcy for many years, as long as the companies can produce sufficient cash to meet the interest payments on their debt. Bankruptcy costs are the costs which are related to the use of the legal mechanism of allowing creditors to take over when a company default. These bankruptcy costs could be divided into direct and indirect bankruptcy costs. Direct bankruptcy costs are mainly related to the administrative and legal costs which occurs during reorganizing a bankrupt company. Indirect bankruptcy costs are hard to measure. These costs are not directly related to the reorganization of company. Mostly, these costs are related to the costs of avoiding a bankruptcy filing and can arise among companies that are close to bankruptcy but never go bankrupt or companies that are financially distressed. Furthermore, loosing employees, customers and suppliers due to high levels of debt, and so high financial risk, could also be expressed as costs of financial distress (Ross et al., 2014; Brealey et al., 2017).

When a company increases its borrowings, the present value of the tax shield will increase initially. The likelihood of financial distress is trivial at moderate levels of debt financing. In this situation, the tax advantages will dominate the costs of financial distress. However, at a certain point, the likelihood of financial distress will increase very quickly with extra borrowing. From this point, the tax advantage of extra borrowing is likely to taper off and ultimately disappear. This is also the case, when the company cannot be sure of gaining from the corporate tax shield. So, when the increases in the present value of costs of distress just offsets the present value of tax savings due to further borrowing, the theoretical optimum is achieved. This is also called the trade-off theory of capital structure and is visually illustrated in figure 3 (Ross et al., 2014; Brealey et al., 2017).

There is also a distinction between the static and dynamic form of trade-off theory. Based on the trade-off between the costs and the associated benefits with financing alternatives, in a perfect environment, the companies will target an optimal debt-equity choice. This concept is also known as the static form of trade-off theory. Besides that, the optimal debt-equity choice is depended on a number of endogenous and exogenous factors. These factors change over time, especially across the different stages of the companies' life cycle. As a result, companies adjust their optimal debt-equity choice according to dynamic environment. This concept is also known as the dynamic form of trade-off theory (Fischer, Heinkel & Zechner, 1989).

Furthermore, the target debt ratios can vary from company to company. For example, companies with plenty of taxable income to shield and safe, tangible assets are more likely to have high target ratios. Less profitable companies with risky, intangible assets are more likely to rely mainly on equity financing. So, based on the trade-off theory it can be interpreted that profitable companies

have more taxable income to shield and would have more debt-servicing capacity and so higher target debt ratio (Brealey et al., 2017).

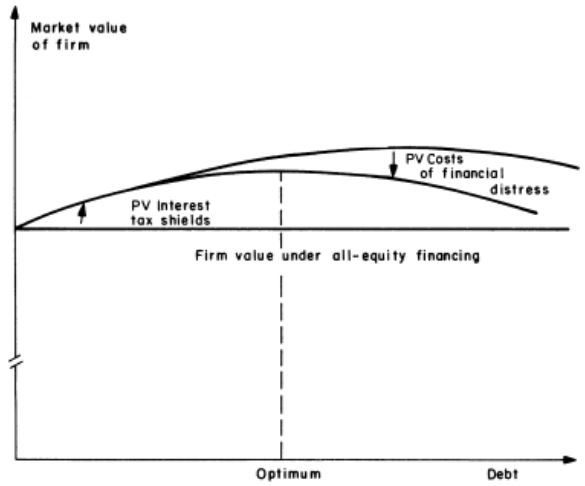


Figure 3: Illustration of static trade-off theory. According to the static trade-off theory, the optimal capital structure, in order to maximize the market value of the company, is determined by the balance between (present values of) the costs of financial distress and the (present values of) interest tax shields (Myers, 1984; Shyam-Sundar & Myers, 1999).

2.2.3 Pecking order theory

The pecking order theory, which challenges the assumption of no differences in information of Modigliani and Miller (1958), is developed by Myers (1984) and Myers and Majluf (1984). This theory is a result of differences in information, information asymmetries, existing between the outsiders (i.e. the capital market) and the insiders of the companies. For example, the managers know more about their companies' risks, prospects and values compared to the outside investors. Therefore, the investors will interpret rationally the companies' actions. This information asymmetry has influences on the choice between external and internal financing and between new issues of equity and debt securities. According to this theory, in contrast to the trade-off theory, there is no optimal capital structure. Furthermore, there are two kinds of equity, external and internal, one at the bottom of the pecking order and one at the top (Brealey et al., 2017).

The pecking order theory ranks the financing sources based on the level of information asymmetry and adverse selection costs. Managers change their financing policy in order to minimize the adverse selection costs of security issuance. According to the pecking order theory, the internal cashflow (retained earnings) is the favored way of financing. Retained earnings are namely much cheaper compared to debt and equity financing due to information asymmetry and the risk-reward demanded. The higher the information asymmetry, the higher the risk in the company. Therefore, the

investors and creditors will demand higher return against the risk they take. Using internal funds (retained earnings) avoids asymmetric information since there are no outsiders involved in this type of financing. Therefore, companies prefer internal financing to external financing (Harris and Raviv, 1991; Rajan and Zingales, 1995; Psillaki and Daskalakis, 2009).

Companies prefer to issue less information-sensitive securities. If external finance is needed, the companies will first issue the safest security. This will start first with debt. This will probably be followed by hybrid securities like convertible bonds. This because of issuing debt is a fixed claim and therefore less vulnerable to information asymmetry in comparison with equity. Lastly, possibly equity will be issued. New equity will be issued in situations when the company goes beyond the debt capacity. In other words, when the threat of financial distress costs brings regular sleeplessness to the financial managers and to existing creditors. However, issuing new equity is least attractive, since it can send adverse signals to the investors. For example, the stock price will decrease, when new stock issue is announced. This because of investors believe that managers are more likely to issue equity when shares are overpriced. The costs associated with the decline in the stock price are thus the result of asymmetric information between investors and the management and are also called the adverse selection costs. Concluded, companies with sufficient internal funds do not have to sell any kind of security, and avoids information problems and the costs of issuing completely. Furthermore, if the internally generated funds are higher than the capital investments, this cash surplus will be used to pay back the debtholders rather than repurchasing equity. Overall, the debt ratio of a company reflects the cumulative requirements of the company for external financing (Myers, 1984; Myers & Majluf, 1984; Brealey et al., 2017).

2.2.4 Firm-specific capital structure determinants and prediction

In the literature, there are several proxies used to test the presence of the trade-off theory and the pecking-order theory. In order to analyze the impacts of the firm-level determinants of the capital structure on the leverage ratios, a list of (traditional) capital structure determinants is examined which are common in the studies of Akhtar (2012), La Rocca et al. (2011), Tian et al. (2015), Castro et al. (2016), and Ahsan et al. (2016). These determinants are: profitability, size, tangibility and growth opportunities. The expected relationships between these determinants and financial leverage ratio, as predicted by the pecking order theory and trade-off theory, is discussed in the following paragraphs. However, how these firm-level determinants are measured in this research, is discussed in chapter 3. Furthermore, in chapters 2.2.5 and 2.2.6, respectively, the industry-specific and country-specific capital structure determinants are discussed.

2.2.4.1 Profitability

According to the trade-off theory, there is a positive relationship expected between profitability and the financial leverage of a company. Psillaki and Daskalakis (2009) mention that companies should prefer debt in order to gain tax advantages when they are profitable. Fama and French (2002) mention that profits are more heavily taxed than the losses are subsidized. Based on the progressive corporate tax rates, which progress the rate from low to high taxable base, more profitable companies have more potential benefits of interest tax shields since these companies also have higher effective taxes. Therefore, profitable companies issue more debt in order to offset the corporate tax. Kayhan and Titman (2007) support this and argue that, for multiple reasons, there is a positive relation expected between profitability and the financial leverage ratio of a company concerning the trade-off theory. Firstly, as mentioned earlier, profitable companies can gain advantage of interest tax shields (tax advantages). Secondly, profitable companies are mostly considered as less risky. When a company is profitable and healthy, creditors are namely more willing to lend money. The chance that the borrower will repay his debt is then higher and this gives the creditors a safer feeling. Concluded, profitable companies are mostly in better conditions to gain advantage of interest tax shields and are more likely to face lower expected bankruptcy costs.

On the contrary, based on the pecking order theory, there is an inverse relationship expected between profitability and the financial leverage of a company. This because of profitable companies have usually more internal financing available. Therefore, these companies do not need external financing and consequently borrow less. The other way around, less profitable companies generally issue more debt since they do not have sufficient internal financing for their investment programs and because of debt financing follows internal financing on the pecking order of financing (Psillaki and Daskalakis, 2009; La Rocca et al. 2011). Furthermore, Titman and Wessels (1988) argue that profitable companies will use their excess cash flows to repay their loans. This consequently also lowers the level of debt.

2.2.4.2 Size

According to the trade-off theory, there is a positive relationship between the size and the financial leverage of a company. This because of large companies are more likely to have collateralized assets and more stable cash flows. This lowers the probability of default and consequently allows these companies to issue more debt. So, there is an inverse relationship between probability of default and the size of a company (Fama & French, 2002; Lemon & Zender, 2010; La Rocca et al., 2011). Castro et al. (2014) argue that larger companies issue relatively more debt since the bankruptcy costs are lower due to higher diversification. In other words, from the financial distress point of view, as larger

companies are usually more diversified, these companies are expected to go less likely bankrupt compared to smaller and undiversified companies. Furthermore, Diamond (1991) argues that large established companies have better reputations in debt markets. Besides that, large companies can borrow at favorable interest rates and have better access to capital markets (Titman & Wessels, 1988). Huang & Song (2006) support this and add that large companies might also have bargaining power over the creditors, which ultimately result in cheaper debt and preference for debt over equity. Concluded, based on the trade-off theory, there is a positive relationship expected between the size and the financial leverage of a company.

On the contrary, based on the pecking order theory, there is a negative relationship expected between the size and the financial leverage of a company. According to this theory, large established companies have already found a stable source of return. Consequently, this stable source of return generates more retained earnings (internally generated funds) and discourage to rely on external financing. So, larger companies seem to rely more on internally generated funds and, therefore, have a lower financial leverage ratio. Besides that, the adverse selection costs/problems significantly decrease in large established companies (Frank & Goyal, 2003). Furthermore, Rajan and Zingales (1995) argue that the better quality (transparency and accuracy) of financial information provided by larger companies reduces the information asymmetry between the outside investors and the company.

2.2.4.3 Tangibility

The type of assets that a company has, can be seen as a puzzling factor for the determination of the financial leverage ratio. According to the trade-off theory, there is a positive relationship expected between tangibility and the financial leverage of a company. Rajan and Zingales (1995) argue that the lenders are more willing to supply loans, when the company has a large holding of tangible assets on the balance sheet. This because of the high level of tangible assets could be collateralized. This consequently decreases the risk of the lenders. So, fixed assets (securable assets) are considered to offer more security in comparison with current assets. Therefore, the financial leverage should be higher for companies with more tangible assets (Berger and Udell, 1998; Van der Wijst and Thurik, 1993; La Rocca et al., 2011). Furthermore, Psillaki and Daskalakis (2009) argue that the costs of financial distress are dependent on the types of assets that a company has. For example, the costs of financial distress are smaller for companies with high level of tangible assets compared to companies that rely on intangible assets. Overall, based on the trade-off theory, there is a positive relationship expected between tangibility and the financial leverage of a company.

However, according to the pecking order theory, there is a negative relationship expected between tangibility and the financial leverage of a company. According to this theory, a large portion of tangible assets on the balance sheet may namely indicate that a company has already found a stable source of return. Consequently, this stable source of return generates more retained earnings (internally generated funds) and discourage to rely on external financing. So, companies with large holdings of tangible assets seem to rely more on internally generated funds from those assets (Psillaki & Daskalakis, 2009). Overall, based on the pecking order theory, there is a negative relationship expected between tangibility and the financial leverage of a company.

2.2.4.4 Growth opportunities

Concerning the trade-off theory, there is a negative relationship expected between growth opportunities and the financial leverage of a company. According to Myers (1977), companies with growth opportunities are more likely to have lower financial leverage. He argues that growth opportunities can push companies to take more risk. For this reason, companies with growth opportunities will be perceived as risky companies. This consequently leads to difficulties to issue debt on favorable terms. Chen (2004) mention that companies with growth opportunities tend to have more equity relative to debt since growth opportunities could be seen as intangible assets which cannot be collateralized as opposed to tangible assets. Frank and Goyal (2009) support this and argue that the costs of financial distress increase with the presence of growth opportunities. In addition, they argue that companies prefer to choose equity over debt when they are in financial distress.

Based on the pecking order theory, there is a positive relationship expected between growth opportunities and the financial leverage of a company. This because of companies will rely on debt financing to fund their investment programs when these companies have good investment opportunities, but have less internal funds available to fund these good investment opportunities. In this situation, the companies require additional funds and will therefore issue more debt. The companies will issue more debt, because of the financing hierarchy of the pecking order theory. In general, the level of debt will increase with the good investment opportunities (Kayo & Kimura, 2011).

2.2.5 Industry-specific capital structure determinants

Sectors/industries differ from each other, because of some industry-level factors. For example, competition levels, technology used, risk levels, entry/exit barriers, product types and peer characteristics. These sector-/industry-level factors are also known as sector/industry fixed effects. In addition, these sector/industry fixed effects have implications for the financial preferences (corporate leverage policies) of the companies. For example, companies in the same sector/industry have more

similar financial behavior in comparison with other companies that belong to different sectors/industries (Ahsan et al., 2016). La Rocca et al. (2011) argue that the financial preferences across the different stages of a company's life cycle can vary according to the institutional environment and can be heterogenous according to industry affiliation. Furthermore, La Rocca et al. (2011) argue that the life cycle of the company may be influenced by the sort of industry a company operates in. For example, the life cycle could differ between low-growth and high-growth industries, or between traditional and emerging industries. For these reasons, La Rocca et al. (2011) mention that it is important to control for these factors as they did in their analysis. For example, based on two-digit Ateco codes (Italian Standard Industrial Classification), they created 12 industry groupings as industry controls. Harris and Raviv (1991) also suggested that there is strong relationship between average company leverage ratio and industry classification. They highlighted that there are differences across industries, but consistency within the industries. So, this also shows the importance to include industry dummies in the analyses, since the industry-specific features are relevant for capital structure decisions.

There are empirical evidences that support the hypothesis that industry has an effect on the capital structure of the companies. La Rocca et al. (2011) have, for example, verified whether the effect of the variable Age and its squared term on debt ratio of the companies is homogeneous across industries. They found that the financial preferences of the companies are not homogeneous across industries. Besides that, Rehman et al. (2016) argue, based on the results of their research, that companies follow industry in their leverage decisions across all the three stages (Growth, Maturity and Decline) of a company's life cycle. Furthermore, Van der Wijst and Thurik (1993), Michaelas, Chittenden and Poutziouris (1999) and Hall, Hutchinson and Michaelas (2000) also found that industry has impact on the capital structure of the companies and that the leverage ratios vary across industries.

Overall, it can be assumed that industry classifications have an impact on the debt ratio of the companies. Therefore, this research also controlled for the effect of industry classification on the debt ratios of the companies by including dummy variables for industries.

2.2.6 Country-specific capital structure determinants

There is an increasing number of studies that analyzes the firm-level determinants of capital structure and compares them between different countries. Each country has namely different institutional characteristics that have an effect on the capital structure of the companies. For example, different bankruptcy laws, corporate governance, tax code, capital markets, interest rates, GDP growth and inflation. Several studies have highlighted that there are systematic differences in the capital structure of companies that operate in different institutional contexts (Rajan and Zingales, 1995; Hall,

Hutchinson and Michaelas, 2004; Fan, Titman and Twite, 2012). According to La Rocca et al. (2011), the efficiency of the institutional context could diminish the problems of asymmetric information and opportunism. Therefore, the efficiency of the institutional context can have a significant effect on the relative magnitude of the benefits and costs that are related to issuing debt.

There are empirical evidences that support the hypothesis that different institutional characteristics have effect on the capital structure of the companies. For example, Booth, Aivazian, Demirgüc-Kunt and Maksimovic (2001) have analyzed the capital structure choices of several companies in developing and developed countries. They found that the capital structure decisions in the developing countries are influenced by the same variables and in the same way as in the developed countries. Some examples of these variables are: growth options, size, tangibility and tax-rate. However, they also found that there are systematic differences across countries which shows that the country specific factors are different. There are namely systematic differences in the way how the debt ratios of their sample firms are influenced by the institutional factors across the countries. Some examples of these country specific factors are: the development of capital markets, inflation rates and the GDP growth.

De Jong, Kabir and Nguyen (2008) have also analyzed the importance of firm-specific and country-specific factors in the capital structure decisions of companies from 42, equally divided into developing and developed, countries. Their main objective was to investigate the role of various country-specific determinants in deciding the corporate capital structure. In addition, they have distinguised between two types of effect. First, they discovered the direct effect of county-specific determinants on the corporate capital structure. Second, they found an indirect effect through the impact of county-specific determinants on firm-specific determinants. Based on the analysis of the direct effect of country-specific determinants on corporate capital structure, they suggest that bond market development, creditor right protection and GDP growth rate have a significant effect on leverage. Investigating the indirect effect of country-specific determinants on corporate capital structure, they found evidence for the importance of shareholder/creditor right protection, legal enforcement, GDP growth rate and capital formation. Overall, De jong et al. (2008) conclude that country-specific factors do matter in affecting and determining the capital structure choice around the world.

Fan et al. (2012) have examined the effect of institutional environment on capital structure and debt maturity choices by analyzing a cross-chapter of companies in 39 developing and developed countries. They found that a significant portion of the variation in debt maturity and leverage ratios are explained by the level of corruption, a country's tax and legal system and the preferences of capital suppliers. The results of their study show that companies in countries that are seen as more corrupt are more likely to use more debt, mainly short-term debt, and less equity. Vice versa, companies that

operate in countries with legal systems that give better protection for financial suppliers are more likely to have capital structures with more equity and relatively more long-term debt. Furthermore, they also found that in countries where there is a greater tax gain from leverage, the companies are more likely to use more debt.

In general, it can be assumed that the institutional context of the company has impact on the capital structure of the companies and that there are systematic differences in the capital structure of companies that operate in different institutional contexts. Therefore, the results of this research cannot be generalized to other institutional contexts.

2.3 Corporate life cycle and capital structure

Financial behaviors are life-cycle-specific. Like humans, organizations pass through some stages during their life cycle. These are also called corporate life cycle stages. A particular stage could be symbolized by its specific characteristics. As the companies develop over time, the levels of profitability, financial needs, growth opportunities, the availability of the financial resources and the opacity of information asymmetry also change. Accordingly, companies change their capital structures (Berger & Udell, 1998; La Rocca et al., 2011; Tian et al., 2015). So, companies make different financial decisions at all of the lifecycle stages and will therefore also have different capital structures. For example, Chen and Strange (2005) have conducted a study in China and concluded that companies which are listed for a longer number of years on the stock exchange have more access to the debt. This is because of the reduced information asymmetries. Berger and Udell (1998) also suggested that the mature companies use more debt compared to the younger companies. This is due to the fact that companies in the Mature stage have obtained a higher level of tangible assets which could be collateralized. In addition, the companies have also built a reputation. These lead to better access to the financial market. Furthermore, Hovakimian, Opler and Titman (2001) also mentioned that a firm should use progressively more debt from its initial stage to a more mature one. In general, the findings concerning the relationship between corporate life cycle and capital structure could help to better understand how a company financing changes in course of time.

Several studies have investigated the relationship between capital structure and corporate life cycle in different countries or multiple countries. For example, Italy (La Rocca et al., 2011), China (Tian et al., 2015), Pakistan (Ahsan et al., 2016), South Africa (Frielinghaus et al., 2005), Czech (Pinková & Kamínková, 2012), a wide sample of public companies from UK, Germany, France and Spain (Castro et al., 2014; Castro et al., 2015) and fourteen European countries (Castro et al., 2016). However, to the best knowledge of the author, there is no empirical evidence specifically from Germany. Furthermore, most of the above-mentioned studies used data which are at least more than seven years old. So, these

studies did not find empirical evidence about the relationship between capital structure and corporate life cycle specifically after the global financial crisis of 2008. Furthermore, the relationship between the capital structure and the stages of the corporate life cycle are less investigated. There is namely little research conducted with a focus on the direct impact of the corporate life cycle stages on the capital structure of the companies.

Below, I highlight the underlying theories regarding the relationship between corporate life cycle and capital structure. In addition, I also present the results of some important empirical studies concerning the relationship between corporate life cycle and capital structure.

2.3.1 Underlying theories: relationship between corporate life cycle and capital structure

There are several endogenous and exogenous factors which have an impact on the capital structure of companies and vary in the course of time and surely with the life cycle stages of companies (Fisher et al., 1989). The benefits and costs of debt financing are also predicted to change over the life cycle. This force or allow the companies to modify their financing strategies (Castro et al. (2016). According to trade-off theory, irrespective of the life cycle stage, companies should raise more debt in order to gain larger tax shield benefits. However, the financial distress and bankruptcy risk also increases with any increase in debt levels. Therefore, companies always look for achieving the breakeven point where their bankruptcy costs match with their tax shield benefits. The companies mostly strive and prefer for a position around the Maturity stage where the reward-risk structure is optimized (Dickinson, 2011). As companies develop and grow, they have more tangible assets which can be used as collateral and are usually more profitable (Titman & Wessels, 1988). Additionally, their size allows them to be more diversified (González & González, 2008). These three factors could lead to a reduction in bankruptcy costs. However, the factor growth opportunities contribute to an increase of bankruptcy costs which consequently could reduce the financial leverage ratio (Frank and Goyal, 2009). Compared to the Maturity stage, the chances for bankruptcy are expected to be higher in the Growth and Decline stages. Even though more debt financing will result in higher tax shield benefits, companies in the Growth and Decline stages may avoid debt financing in order to avoid bankruptcy. In addition, life cycle theory assumes that companies in Decline stage will experience a decline in earnings, which may lead to lower tax payments. Subsequently, companies might reduce their debt (Tian et al., 2015; Ahsan et al., 2016). So, based on the trade-off theory and the life cycle theory, it can be assumed that companies in Growth and Decline stages will raise less debt compared to companies in the Maturity stage, even knowing that higher debt could increase the tax benefits. Therefore, based on the trade-off theory and the life cycle theory, an inverted U-shape pattern (hump shape) is expected across the different corporate life cycle stages concerning the leverage ratios.

However, there is a competing capital structure theory (the pecking order theory). During the early stages of the companies' life cycle, the companies are often less profitable and the information asymmetry is higher. Although, these conditions could reverse during the later stages, companies in their Growth stages may have no or less retained earnings to finance their higher investment needs. In such times, companies raise the maximum available debt before they raise external equity (Bulan & Yan, 2009). La Rocca et al. (2011) support this and argue that young and middle-aged companies are more likely to have high leverage ratios due to asymmetric information problems and insufficient earnings to support the business with internal financing. In contrary, companies may have substantially higher retained earnings during their Mature stages in comparison with Growth stages. Therefore, companies in their Mature stages need less debt in comparison with what they needed during their Growth stages (Michaelas et al., 1999). So, higher profitability makes it possible for the companies to use less debt. The profits and also the retained earnings will decrease during the Decline stages. Accordingly, the companies have to take on debt again. Overall, based on the pecking order theory and the life cycle theory, it can be assumed that companies in the Maturity stage will raise less debt compared to companies in Growth and Decline stages. Therefore, based on the pecking order theory and the life cycle theory, a U-shape pattern is expected across the different corporate life cycle stages concerning the leverage ratios.

2.3.2 Empirical evidence: relationship between corporate life cycle and capital structure

Frielinghaus et al. (2005) investigated whether there is a relationship between a company's capital structure and its life stage. They have used the life stage model of Adizes (1979) to determine the life stage of their sample companies. Later, they have reclassified the ten life cycle stages of Adizes (1979) in to three broad stages (Early, Prime and Late). They found that there is a statistically significant relationship between the capital structure and the life cycle stage of the South African companies. Furthermore, the results of their research support the pecking order theory and shows that there is a high-low-high leverage pattern. In other words, companies use more debt in the Early and Late life cycle stages in comparison with the Prime stage. More specifically, the empirical evidence shows that companies in the Early stages have on average 35% debt. However, companies in the Prime and Late life cycle stages have on average respectively 22% and 40% debt.

Pinková and Kamínková (2012) tried to better understand how the corporate funding is changing in the course of time. More specifically, they have investigated the impact of corporate life cycle on the capital structure of the companies and so explored the relationship between capital structure and corporate life cycle. Furthermore, Pinková and Kamínková (2012) have classified the sample data into Birth, Growth, Maturity, Revival and Decline stages. Based on the results of their

research, they found that the development of leverage ratio appears to be dependent on corporate life cycle stages. They also conclude that the overall results of their research support the pecking order theory in many aspects. The companies in Birth, Growth and Decline life cycle stages have namely typically higher levels of debt. On the contrary, the leverage ratios are the lowest in the Maturity stage and rise again in the Revival stage.

La Rocca et al. (2011) conducted a research in the Italian small and medium-sized companies and examined the strategic financing choices of these companies through the lens of the business life cycle, to verify whether there exists a life-cycle pattern and to observe whether this pattern is similar among different institutional contexts and industries and homogeneous over time. They found that the hierarchy of leverage choices concerning the changing economic conditions, which characterize companies at different stages of their business life cycle, are affected by different sensitivities to information asymmetries. Consequently, as the companies progress through the stages of their life cycle, these companies tend to adopt different hierarchy of financial decision-making and specific financing strategies. Furthermore, they found that in the early stages of the company's life cycle debt is important for the business activities and represents the first choice. Younger companies are namely more dependent on creditors for financial sources in order to support their business, while higher profitability allows mature companies to be less dependent on external financial resources. So, companies need an increasing amount of debt in the earlier stages of their life cycle, while they gradually substitute debt for internal capital and so re-balance their capital structure in the later stages of their life cycle. In addition, this result (financial life-cycle pattern) appears to be consistent over time and homogenous for different industries.

Concluded, La Rocca et al. (2011) found that debt is a crucial constituent of the capital structure in the early phases of the corporate life cycle. As a company moves towards the Maturity stage, the growth and profitability opportunities will substitute the debt by their retained earnings. In addition, they also found that there are systematic differences across the company's life cycle in the capital structure determinants. Furthermore, they conclude that the pecking order theory has a high application for their sample firms.

Tian et al. (2015) investigated the determination of the leverage decisions and the impacts of the different stages of the corporate life cycle on the capital structure of their sample firms. They used both variables company age and a business life cycle proxy in their research to measure them impact on capital structure. They used a company-level life cycle proxy of Dickinson (2011) which is based on the expected behavior of operating, investing and financing cash flows over the different stages of the corporate life cycle (cash flow patterns). They found that this company-level life cycle proxy has a stronger impact on the capital structure compared to company age. In addition, they found that Chinese public manufacturing companies change their leverage ratio at different speeds according to

the life cycle stage in which they are in. Based on the results of their research, Tian et al. (2015) argue that the capital structure of the Chinese public manufacturing firms significantly differs across the stages of the corporate life cycle and that companies in their earlier and later life cycle stages rely more on external finance in the capital market (U-shaped pattern). According to them, these results imply that companies in their early stage have weaker ability to generate finance internally, for example, via retained earnings and will borrow more to raise capital. While, companies in their mature stage have stronger ability to generate finance internally (Tian et al., 2015).

Ahsan et al. (2016) have determined the factors that affect leverage decisions and adjustment rates during the different stages of the companies' life cycle. Furthermore, they have used a multivariate analysis to classify the 39 years of unbalanced panel data of the companies (1972-2010) into Growth, Maturity and Decline stages. They found, in line with the trade-off theory, a low-high-low leverage pattern during the Growth, Maturity and Decline stages of the companies. In addition, they found that growing companies have higher leverage adjustment rates.

Castro et al. (2014) and Castro et al. (2015) also provided evidence of the corporate life cycle as an explanatory factor of the company's leverage choice. Both studies analyzed the effect of the corporate life cycle stages on capital structure and studied a wide sample of public companies from UK, Germany, France and Spain. Later, Castro et al. (2016) have analyzed the differences in target leverage and speed of adjustment of European listed companies across three life cycle stages: Introduction, Growth and Maturity. They conclude that the target leverage and the speed of adjustment to the optimal capital structure differs across the different stages of the companies' life cycle. Furthermore, they have determined that the variables size and growth opportunities have changing effects across the life cycle stages. By contrast, tangibility and profitability are the most stable determinants. Furthermore, the results of their research indicate a high-low-high pattern across the life cycle stages concerning the speed of leverage adjustment.

According to Faff et al. (2016), behavioral preferences of managers and firm characteristics such as profitability, working capital and leverage are the two primarily determinants of corporate policies. To supplement this literature, they have examined whether corporate cash, financing and investment policies are independent and follow a predictable pattern which is in line with the life cycle of a company. To test their predictions and to investigate the impact of life cycle on corporate policies, they studied a large sample of US companies. Faff et al. (2016) classified their sample into four life cycle stages. These stages are: Introduction, Growth, Mature and Shake-out/Decline. Based on the results of their research and in line with their predictions, they argue that corporate policies are related to the development of a company's cash flows and investment opportunities, and therefore follow a predictable pattern which is in line with the life cycle of a company. In addition, they show how a company's investment activity, cash policies and external finance progress over the different stages of

the corporate life cycle. For example, they argue that the development of a company's debt issuance and cash holdings are non-monotonic and has a hump shape over a life cycle. More specifically, they found that cash holdings and debt issuance increase in the Introduction and Growth stages and decrease in the Mature and Decline stages of the company's life cycle. Debt issuance will gradually increase as a young company moves from its Introduction stage to the Mature stage, because of the improvement in debt servicing ability. In contrary, due to diminishing investment opportunities and debt servicing ability, companies will issue less debt as they move from their Mature stage to Decline stage. Overall, they conclude that life cycle is an important determinant of corporate policies and that corporate policies follow a company life cycle.

2.4 Hypotheses formulation

Now, it is clear that financial behaviors are life-cycle-specific. As companies develop over time, for example, the levels of profitability change, but also the financial needs, growth opportunities, the availability of the financial resources and the opacity of information asymmetry. Accordingly, companies change their capital structures. So, companies make different financial decisions at all of the lifecycle stages and will therefore also have different capital structures. Based on the previous discussed theories and empirical evidences, the following research question is formulated: "*What is the impact of the corporate life cycle stages on the capital structure of German listed companies in the period of 2009 until 2017*?".

Since the trade-off theory and pecking order theory are mutually exclusive and the most empirical studies concerning the relationship between corporate life cycle and capital structure have found support for the pecking order theory, I formulated the hypotheses of this research based on the pecking order theory and the life cycle theory. As mentioned earlier, in order to increase the comparability of the results of this research with other empirical studies, this research also classified the corporate life cycle of the sample firms into three stages. Therefore, the following corporate life cycle stages are taken into account in this research: Growth, Maturity and Decline. Below, I present the hypotheses which are formulated for each corporate life cycle stage based on the pecking order theory and the life cycle theory.

2.4.1 The impact of Growth life cycle stage on capital structure

In general, the Growth stage of the companies' life cycle is characterized as product diversification, rapid sales growth and distinctive competences. Companies in the Growth stage achieve rapid growth and are typically medium sized. The separation of ownership and control begins to arise and the

managers get more decision-making responsibility (Miller & Friesen, 1984). Furthermore, companies in the Growth life cycle stage are more likely to make early investments in order to avert the entries of their competitors into the market (Jovanovic, 1982). Furthermore, the research and development and the advertising intensity are predicted to be higher in the earlier life cycle stage since the companies build their initial technology (Dickinson, 2011). Moreover, Lemmon and Zender (2010) argue that companies in the Growth stage rely heavily on external financing in order to fund their investment and existing activities. This because of the rapid growth and since the demand for capital for these companies is greater than their ability to generate cash internally. Frielinghaus et al. (2005) support this and argue that companies in this life cycle stage need access to even more external financing in order to meet their appetite for growing their sales. So, based on the pecking order theory, it can be argued that these companies will increase their borrowings since companies prefer debt over equity (Barclay & Smith, 2005). Furthermore, Hasan et al. (2017) argue that leverage is maximized in the Growth stage when the geographical segments and the number of business grow.

Overall, during the early stages of the companies' life cycle, the companies are often less profitable and the information asymmetry is higher. Although, these conditions could reverse during the later stages, companies in their growth stages may have no or less retained earnings to finance their higher investment needs. In such times, companies raise the maximum available debt before they raise external equity (Bulan & Yan, 2009). La Rocca et al. (2011) support this and argue that young and middle-aged companies are more likely to have high leverage ratios due to asymmetric information problems and insufficient earnings to support the business with internal financing. They have namely found that in the early stages of the company's life cycle debt is important for the business activities and represents the first choice. Younger companies are namely more dependent on creditors for financial sources in order to support their business. Frielinghaus et al. (2005) also have found that companies use more debt in the early life cycle stage in comparison with the Prime stage. Pinková and Kamínková (2012) support this and argue that companies in the Growth life cycle stage have typically higher levels of debt. Additionally, Tian et al. (2015) also found that companies in their earlier life cycle stages rely more on external finance in the capital market. Based on this discussion, the following hypothesis is formulated:

H1: *Companies in the Growth life cycle stage have a higher financial leverage ratio than companies in the Maturity life cycle stage.*

2.4.2 The impact of Maturity life cycle stage on capital structure

The companies mostly strive and prefer for a position around the Maturity life cycle stage where the reward-risk structure is optimized. For example, Dickinson (2011) argues that various performance measures and company characteristics such as size and profitability are nonlinearly related to company life cycle and are maximized for the companies in the Maturity life cycle stage. In other words, an inverted U-shape is expected across the different corporate life cycle stages. Companies in the mature stage face stabilizing growth in sales. Moreover, these companies are less likely to take on risky or innovative strategies than in the earlier stages. This is mainly because of the higher level of competition and market saturation (Miller & Friesen, 1984). In this stage, the demand for capital gradually decreases and the companies are able to meet the requirements of their development with the internally generated cash flows from operations, even though companies in Mature stage are able to borrow more easily and at a lower cost (Bulan and Yan, 2009). According to Wernefelt (1985), the profit margins are maximized in the Maturity stage. Furthermore, the companies the Maturity stages invest relatively less (in capital) compared to the companies in the earlier stages. They namely mainly invest to maintain capital (Wernefelt, 1985). Besides that, as the companies mature, the competition intensifies and operational importance shifts to improved capacity utilization and cost reduction. Furthermore, mature companies have fewer investment opportunities. For these reasons, these companies have less need for additional borrowing. Even though, these companies are able to borrow more since these companies are mostly in the best financial position (Barclay & Smith, 2005). Hasan et al. (2017) support this and argue that companies in the maturity stage tend to reduce their level of debt financing. These companies are namely more likely to rely on retained earnings, because of reduced cash flow volatility and more persistent net income. Furthermore, according to Frielinghaus et al. (2005), the companies in this life cycle stage are solid and sound. However, there is not much expected from these companies with regard to future performance or growth.

In general, companies may have substantially higher retained earnings during their Mature stages in comparison with Growth stages. Therefore, companies in their Mature stages need less debt in comparison with what they needed during their Growth stages (Michaelas et al., 1999). So, higher profitability makes it possible for the companies to use less debt. For example, La Rocca et al. (2011) found that higher profitability allows mature companies to be less dependent on external financial resources. As a company moves towards the Maturity stage, the growth and profitability opportunities will substitute the debt by their retained earnings. Pinková and Kamínková (2012) support this and found that the leverage ratios are the lowest in the Maturity stage. Based on this discussion, the following hypothesis is formulated:

H2: *Companies in the Maturity life cycle stage have a lower financial leverage ratio than companies in other life cycle stages.*

2.4.3 The impact of Decline life cycle stage on capital structure

The capital investment and the sales growth decrease monotonically across the corporate life cycle stages (Dickinson, 2011). Companies will enter the final stage of their life cycle, the Decline stage, when companies fail to implement measures to improve growth. The companies in the Decline stage namely suffer from market stagnation, declining sales and low profitability. This is due to lack of innovation and external challenges (Miller and Friesen, 1984). Wernefelt (1985) supports this and argue that as the company enter the Decline stage, the growth rates as well as the prices will decline. Companies that move into the Decline stage hold back from innovation since they usually try to save resources. Furthermore, companies in this life cycle stage rapidly lose market share. When these companies have insufficient resources, they may also need to adapt their financing structure (Frielinghaus et al., 2005). Furthermore, typically managerial incentives, capital structure changes and new business strategies are employed in this life cycle stage in order to revive the companies. Especially, the companies need to secure external sources of supporting funds in order to prevent bankruptcy. Furthermore, the companies in the Declining stages may also liquidate assets in order to support operations and to service existing debt (Dickinson, 2011). These companies are mostly not capable to generate sufficient resources in order to sustain themselves (Adizes, 1979). Hasan et al. (2017), for example, argue that companies in the Decline life cycle stage may heavily rely on external debt financing in order to fund business restructuring and revitalization and to continue as a going concern.

Overall, the profits and also the retained earnings will decrease during the Decline stages. Furthermore, the overall levels of liquidity are low and the volatility in cash flows is increased in the Decline stage (Hasan et al., 2017). Accordingly, the companies have to take on debt again. So, companies in Decline stage will raise more debt compared to companies in the Maturity stage. Frielinghaus et al. (2005) have, for example, found that companies use more debt in the Late life cycle stage (similar to Decline stage) in comparison with the Prime stage (similar to Maturity stage). Pinková and Kamínková (2012) support this and found that companies in the Decline life cycle stage have typically higher levels of debt. In addition, Tian et al. (2015) also found that companies in their later life cycle stages rely more on external finance in the capital market. Based on this discussion, the following hypothesis is formulated:

H3: *Companies in the Decline life cycle stage have a higher financial leverage ratio than companies in the Maturity life cycle stage.*

3 Research method and variables

In this chapter the methodology of this research is discussed. First, the research methods are presented that are used to investigate the relationship between capital structure and corporate life cycle. This will be followed by the description of the research method and the empirical model that are applied in this research in order to test the hypotheses and to answer the research question. Lastly, the measurement of the dependent, independent and control variables is presented.

3.1 Methods applied in studied articles

As mentioned earlier, the purpose of this research is to determine whether the corporate life cycle stages have a direct impact on the capital structure of the German listed companies in the period of 2009 until 2017. In the empirical literature, the methods OLS and fixed effects regressions are mainly applied to investigate the relationship between capital structure and corporate life cycle. Since the relationship between capital structure and corporate life cycle is less investigated, this research also take into account the research methods that are applied in the life cycle literature, for example, to investigate the direct relationship between corporate life cycle and several financial, accounting or corporate governance outcome variables. These methods are, for example, OLS, fixed effects and logistic regressions.

3.1.1 Ordinary least squares regressions (OLS)

There are various types of regression analyses that can be applied in order to predict a dependent variable. Regression analysis is a statistical technique that is used to analyze the relationship between several independent (predictor) variables and a single dependent (criterion) variable. The ordinary least squares regression (OLS) is the most common and simplest type of linear regression. Based on the concept of minimizing the sum of squared errors of prediction, the “best” independent variable will be selected based on the correlation coefficient. This is because of the relationship will be stronger and the predictive accuracy will be greater, when the correlation coefficient is higher. In the regression model, the intercept is noted as $b0$. The intercept stands for the amount of change in the dependent variable when the independent variables have the value of zero. The term $b1$, the regression coefficient, stands for the amount of change in the dependent variable due to the independent variable. The term residual (*e)* implies the difference between the predicted and actual values of the dependent variable. This is also known as the prediction error. Furthermore, the OLS regressions are based on several underlying assumptions which have to be met before the regression analyses can be performed. These assumptions include: normality, homoscedasticity, linearity and the absence of

multicollinearity. Besides these assumptions, the sample size should be large enough and the variables in the regression models should be metric (Hair et al., 2014). In general, the ordinary least squares regression (OLS) method includes some advantages and disadvantages. For example, compared to other regression techniques, the ordinary least squares regression (OLS) is a relatively easy way to implement and analyze the regression. However, the key disadvantage is the endogeneity problem. The endogeneity problem emerges from simultaneous causality, omitted variables, reverse causality, auto regression and measurement error (Woolridge, 2012).

Faff et al. (2016) have used OLS estimation with clustered standard errors in order to investigate the impact of life cycle on the corporate policies. In this empirical model the corporate policies (capital expenditure, long-term debt issuance, equity issuance and cash holdings) are regressed on a group of independent variables. More specifically, based on a life-cycle indicator variable, which takes the value of one if a company is in a particular life cycle stage and zero otherwise, and several control variables. They analyzed the regression coefficients of the life cycle dummies in order to capture the impact of the life cycle stages on corporate policies.

Akhtar (2012) has investigated the relationship between capital structure and the business cycle in contrast to the corporate life cycle. She has applied both ordinary least squares regressions (OLS) and fixed effects models in order to examine whether the different phases of the business cycle have impact on the relative importance of the unobserved permanent component (or time invariant factor) of the leverage ratios. Although business cycle differs from corporate life cycle, the same approach can be applied to measure the impact of the different life cycle stages on the capital structure of the companies. They have employed five models. In all these models the long-term leverage is regressed on a group of independent variables. More specifically, based on business cycle dummies, which takes the value of one if a particular phase occurs in a year and zero otherwise, and several control variables. They analyzed the regression coefficients of the business cycle dummies and the adjusted R square of the models in order to examine whether the different phases of the business cycle have impact on the relative importance of the unobserved permanent component (or time invariant factor) of the leverage ratios.

Several other empirical studies in the life cycle literature also have applied ordinary least squares regression (OLS) models in order to investigate, for example, the direct relationship between corporate life cycle and several financial, accounting or corporate governance outcome variables. Al-Hadi, Hasan and Habib (2016) have, for example, investigated whether the influence of a risk committee on market disclosures differs for the various stages of a company's life cycle. To examine this relationship, they have applied an OLS model which contains year, industry and country fixed effects. Habib and Hasan (2017) have, for example, investigated the performance and the corporate risk-taking consequences at various corporate life cycle stages. They included year and industry

dummies in their OLS regressions in order to control, respectively, for year and industry effects. Eulaiwi et al. (2018) have investigated the relationship between corporate cash holdings and voluntary formation of board investment committee (IC) across the different stages of the corporate life cycle. In order to test this relationship empirically, they have applied an OLS model which includes year, industry and country dummies. Furthermore, Bakarich et al. (2019) have investigated how the qualitative characteristics of annual reports change along the various corporate life cycle stages. They have examined this relationship empirically by performing OLS regressions. Moreover, these regressions also contained year fixed effects.

3.1.2 Fixed-effects regressions

In general, fixed-effects models are preferred in case of balanced and long-term panel data. A fixed effects model controls for the attendance of omitted/unobserved time-specific and firm-specific heterogeneity which may lead to bias in the estimates of the OLS regressions. In a fixed effect regression, the parameters are non-random quantities or fixed. This implies that the variables are constant across individuals. In other words, fixed effects model considers the individuality of each company by permitting the intercept to vary across companies, whereas the coefficients of the slope are hold constant across companies. Besides that, fixed effects model controls for any possible correlation among the omitted and independent variables by applying a fixed effect.

Therefore, a great advantage of fixed effects models in comparison with the ordinary least squares regressions (OLS) is that it accounts for the individual heterogeneity. It allows namely to control for variables that one cannot measure or observe like differences across companies (sector/industry) or variables that change over time (Hair et al., 2014). In other words, fixed effects models introduce time-specific and firm type effects into the regression equations. This, in turn, avoid or reduce bias with respect to omitted variables (La Rocca et al., 2011; Hasan et al, 2017). As a consequence, the time-specific and firm type effects of both the included and the omitted variables will be captured. Akbar et al. (2019) support this and argue that the benefit of panel data fixed effects models is that they account for the unobserved heterogeneity. Therefore, the probability of having biased empirical results, arising from the issue of heterogeneity, will be minimized. However, a key disadvantage of a fixed effects model is that it does not allow the involvement of time-invariant independent variables in the regression model. This is due to the fact that, when a fixed effects regression is performed, the impact of these independent variables will be removed from the analyses.

La Rocca et al. (2011) have applied a fixed effects model, which is estimated in the LSDV form, in order to verify whether the life cycle is a relevant factor in a company's financing behavior. Akhtar (2012) has applied both ordinary least squares regressions (OLS) and fixed effects models in order to

examine whether the different phases of the business cycle have impact on the relative importance of the unobserved permanent component (or time invariant factor) of the leverage ratios. To determine the factors that have impact on the capital structure and adjustment rates during the stages of companies' life cycle, Ahsan et al. (2016) have applied a fixed effects panel data model. Tian et al. (2015) have also used a fixed effects panel data approach to investigate the impacts of life cycle stages on capital structure.

Several other empirical studies in the life cycle literature also have applied fixed effects models in order to investigate, for example, the direct relationship between corporate life cycle and several financial, accounting or corporate governance outcome variables. Hasan, Al-Hadi, Taylor and Richardson (2017) have, for example, examined whether the life cycle of a company clarifies the tendency of a company to engage in corporate tax avoidance. In order to test this relationship empirically, they have applied a fixed effects regression analysis. They have chosen for this particular analysis, because of the unobserved time invariant characteristics of company life cycle. They have, for example, included firm specific unobserved fixed effects and year dummies in their regression models. Hasan and Habib (2017a) have examined the relationship between corporate social responsibility (CSR) and the corporate life cycle. They have also included industry fixed effects and year fixed effects in their regressions. Furthermore, Hasan et al. (2015) have tested the relationship between the firm life cycle and the cost of equity by applying a fixed effects model. This also in order to control for individual firm heterogeneity.

Furthermore, Habib and Hasan (2019) mention the importance to use fixed effects regressions. They argue that a large part of the life cycle studies uses ordinary least squares regressions (OLS) in order to estimate the relationship between several outcome variables and the company life cycle stages. However, Habib and Hasan (2019) argue that firm fixed effects regressions are crucial for studies that attempt to estimate how the financial or accounting or governance outcomes vary with changes in the stages of the corporate life cycle (i.e., within-company variation). Firm fixed effects regressions can namely mitigate the concern with unobserved time-invariant firm heterogeneity which could drive the association between corporate life cycle and other outcome variables. Additionally, they also argue the importance of the use of a set of observable control variables in order to account properly for the relationship between several outcome variables and the different stages of the corporate life cycle.

3.1.3 Logistic regressions

Logistic regression model, also known as logit analysis, is a special form of regression. Logit analysis is quite similar to multiple regression analysis. In both analyses, the single dependent variable will be

predicted by one or more independent variables. Furthermore, the general manner of interpretation of both analyses is also quite similar. However, the only difference is that the logistic regression model has a nonmetric dependent variable, while multiple regression has a metric dependent variable (Hair et al., 2014).

Several empirical studies in the life cycle literature have applied logistic regressions in order to investigate, for example, the direct relationship between corporate life cycle and several financial, accounting or corporate governance outcome variables. Owen and Yawson (2010) have, for example, investigated the impact of corporate life cycle on takeover activity. They have applied a binomial logit model in order to evaluate the probability that a company will become a bidder. Zhao and Xiao (2018) have, for example, examined the role of company's life cycle stage on the association between financial constraints and corporate social responsibility (CSR). In order to test this relationship empirically, they have applied logistic regressions. Koh, Durand, Dai and Chang (2015) have also used logistic regressions in order to examine whether the corporate life cycle has influence on the restructuring strategies that companies choose when they face financial distress. Hasan and Cheung (2018) have, for example, tested the relationship between firm life cycle and organizational capital by applying a multinomial logistic regression model. Furthermore, Chuang (2017) has applied both probit and OLS regression analyses in order to examine whether companies in different stages of the corporate life cycle tend to hire more financial advisors in M&A's and whether financial advisors can create higher value to companies within various corporate life cycle stages.

Overall, logistic regressions are only suitable when the dependent variable is a nonmetric variable. More specifically, when the dependent variable is a categorical variable which consists of a set of unordered and mutually exclusive categories. Since the dependent variable of this research, financial leverage ratio (capital structure), is a metric variable, the logistic regression analysis is not appropriate for this research to examine the relationship between corporate life cycle and capital structure.

3.2 Method applied in this research

For comparison purposes and since the purpose of this research is almost similar to the research of La Rocca et al. (2011), Akhtar (2012), Tian et al. (2015) and Faff et al. (2016), this study applied both ordinary least squares regressions (OLS) and fixed effects models. Hasan and Habib (2017b) and Akhtar (2012) have, for example, applied both ordinary least squares regressions (OLS) and fixed effects models. Hasan and Habib (2017b) have found that the OLS results are qualitatively very similar to the results of the firm fixed effects regressions. Therefore, they confirm that their results were not driven by firm-level unobserved heterogeneity. However, Akhtar (2012) found that fixed effects regressions

captured substantially more of the variation in the financial leverage compared to the OLS counterpart. More specifically, the fixed effects regressions produced an adjusted R square which was more than the double of the OLS counterpart.

Firstly, a univariate analysis is applied to analyze the descriptive statistics. Second, a bivariate analysis is performed to show the correlations between the variables (dependent and independent variables). At last, a multivariate analysis is used, by applying ordinary least squares regressions (OLS) and fixed effects regressions, to test the hypotheses and to answer the research question. All these analyses are performed in SPSS.

3.3 Empirical model

As mentioned earlier, for comparison purposes and in order to test all the hypotheses and to answer the research question, this study applied both ordinary least squares regressions (OLS) and fixed effects regressions. The baseline equation of these regressions can be written as followed (La Rocca et al., 2011; Akhtar, 2012; Tian et al., 2015; Faff et al., 2016):

$$Leverage_{it} = \beta_0 + \beta_{1-3} LifeCycle_{i,t-1} + \beta_4 Profitabilty_{i,t-1} + \beta_5 Size_{i,t-1} + \beta_6 Tangibility_{i,t-1} + \beta_7 Growth_{i,t-1} + \beta_8 Industry_{i,t} + \beta_9 Year_i + \epsilon_{it}$$

Where:

Leverage:	financial leverage ratio of firm i in year t
LifeCycle:	life cycle stage of firm i in year t-1
Profitability:	profitability of firm i in year t-1
Size:	size of firm i in year t-1
Tangibility:	tangibility of firm i in year t-1
Growth:	growth opportunities of firm i in year t-1
Industry:	industry of firm i in year t
Year:	year t

In this equation the capital structure, measured by total debt ratio, is regressed on a group of firm-level capital structure determinants and life cycle stages. The life cycle variable is converted into life cycle dummies: Growth, Maturity and Decline life cycle stages. These dummies take the value of one if a company is in a particular life cycle stage and zero otherwise. Furthermore, industry and year (time) dummies are included in the equation in order to control for, respectively, industry fixed effects and time-specific fixed effects (La Rocca et al., 2011; Akhtar, 2012). Moreover, the firm-specific

independent variables of this research are lagged by one year in order to correct for the potential pitfalls of OLS and so to prevent potential reverse causality and autocorrelation. As a robustness test, I performed the regression analyses also without lagged firm-specific independent variables. When the results of both regressions are comparable, it can be assumed that endogeneity does not play a role in this research.

One model includes, besides the control variables, only the life cycle dummies Growth and Decline life cycle stages. This model is used for testing hypotheses 1 and 3. This model only includes the life cycle dummies Growth and Decline life cycle stages since the purpose of hypotheses 1 and 3 is to measure the (incremental) impact of these life cycle stages on the total debt ratio, relative to the Maturity life cycle stage (reference/excluded/base group). This in order to investigate whether companies in the Growth and Decline life cycle stages have higher total debt ratio compared to companies in the Maturity life cycle stage and, so, whether there is a U-shaped leverage pattern/movement visible across the different life cycle stages. Therefore, in order to test hypotheses 1 and 3, the regression coefficient (direction, magnitude and statistical significance) of the life cycle dummies Growth and Decline life cycle stages are analyzed. The excluded category, Maturity life cycle stage, becomes the reference/base category. The (incremental) impact of the Growth and Decline life cycle stages, relative to the Maturity life cycle stage (reference/base category), on the total debt ratio of the sample companies is captured, respectively, by the β_1 and β_2 terms. These regression coefficients and the adjusted R square of the regression are the main interests of this research. Based on the pecking order theory and the life cycle theory, I predict β_1 and β_2 to be positive and significant for hypotheses 1 and 3.

Another model includes, besides the control variables, only the life cycle dummy Maturity life cycle stage and is applied in order to test hypothesis 2. This because of the purpose of hypothesis 2 is to measure the (incremental) impact of Maturity life cycle stage on total debt ratio, relative to other life cycle stages (reference/excluded/base groups). In other words, investigating whether companies in the Maturity life cycle stage have lower total debt ratio compared to companies in other life cycle stages. This is also done in order to investigate/confirm whether there is a U-shaped leverage pattern/movement visible across the different life cycle stages. Therefore, in order to test hypothesis 2, the regression coefficient (direction, magnitude and statistical significance) of the life cycle dummy Maturity life cycle stage is analyzed. The excluded categories, Growth and Decline life cycle stages, become the reference/base categories. The (incremental) impact of the Maturity life cycle stage, relative to other life cycle stages (reference/base categories), on the total debt ratio of the sample companies is captured by the β_1 term. This regression coefficient and the adjusted R square of the regression are the main interests of this research. Based on the pecking order theory and the life cycle theory, I predict β_1 to be negative and significant for hypothesis 2.

3.4 Variables definitions and measurement

The empirical model of this research consists of three sets of variables: dependent, independent and control variables. The definitions of these variables are visually represented in table 1 on page 50.

3.4.1 Dependent variable

In the empirical literature, several measures are used to measure the capital structure of a sample firm. For example, long-term book leverage, short-term book leverage, total debt ratio (total leverage) and long-term market leverage. However, the total debt ratio is mostly used in the empirical literature of corporate life cycle and capital structure to measure the capital structure of the sample companies. Therefore, this research also used total debt ratio to measure the capital structure of a sample company. The total debt ratio is also known as the debt to assets ratio. This ratio is defined as the ratio of total liabilities divided by the total assets of the company. In addition, this research also applied long-term book leverage (ratio of long-term liabilities to total assets) and short-term book leverage (ratio of short-term liabilities to total assets) to measure the capital structure of the sample companies. These are used as robustness checks (Rajan & Zingales, 1995; La Rocca et al., 2011; Akhtar, 2012; Tian et al., 2015; Ahsan et al., 2016).

3.4.2 Independent variable

Finding a good proxy for company life cycle is a challenging part of this research. In the empirical literature, several life cycle proxies are applied to identify the different stages of a company's life cycle, ranging from profitability ratio to the company age. Some examples of these life cycle proxies are: based on numerical and descriptive criteria, univariate procedure (one life cycle descriptor, for example retained earnings or number of years listed), multivariate procedure (for example, based on four life cycle descriptors: dividends, sales growth, capital expenditure and firm age), cash flow patterns, a multiclass linear discriminant analysis (MLDA) or by applying two-step cluster analysis.

In this research, I follow La Rocca et al. (2011), Keasey et al. (2015) and Faff et al. (2016) to classify the observations into three corporate life cycle stages, namely Growth, Maturity and Decline. They have applied the two-step cluster analysis or the multiclass linear discriminant analysis (MLDA) to classify their observations into different corporate life cycle stages. In this research, I use the two-step cluster analysis as the main life cycle proxy and the multiclass linear discriminant analysis (MLDA) as a robustness check. More specifically, firstly the observations of this research are classified into three groups (Growth, Mature and Decline) by applying the two-step cluster analysis. Afterwards, this classification is refined by performing the multiclass linear discriminant analysis (MLDA).

In general, the cluster analysis and the multiclass linear discriminant analysis (MLDA) are preferred for classifying companies' life cycle compared to other (indicative) life cycle proxies. This because of these proxies have more benefits compared to traditional life cycle proxies. For example, these proxies reflect more life cycle information, since it is possible to choose as many life cycle descriptors (classification variables) as I want instead of being a single indicator of company-specific characteristics (e.g. sales growth, size, age, dividend payout and capital expenditure). In other words, choosing multivariate methodology instead of univariate. Another benefit of cluster analysis and multiclass linear discriminant analysis (MLDA) is that the classifications are verified by statistical procedures. In addition, cluster analysis and multiclass linear discriminant analysis (MLDA) allow that a company moves non-monotonically (non-sequential) through its life cycle. However, this is not the case for the common life cycle proxies: age and size. The life cycle proxy age, for example, relies on the assumption that a company moves monotonically (sequential) through its life cycle. Furthermore, the variable age as a life cycle proxy on its own could be misleading. For example, some young companies, especially companies in high technology sector, disappear after the first years of their existence. Based on the life cycle variable age only, these companies will be classified into the Growth stage, while they are actually in a Decline stage (Keasey et al., 2015). Besides that, the classification criteria of Miller and Friesen (1984), as visually represented in figure 4, are mostly descriptive. Therefore, there is a lot of information required about the companies before the different corporate life cycle stages of the companies can be identified. For this reason, the access to data is easier for the cluster analysis and multiclass linear discriminant analysis (MLDA) compared to identifying different life cycle stages based on the classification criteria of Miller and Friesen (1984). This is even another benefit of cluster analysis and multiclass linear discriminant analysis (MLDA). Lastly, the cluster analysis and a multiclass linear discriminant analysis (MLDA) can be applied to classify all companies in the sample, however for some proxies, like cash flow patterns (Dickinson, 2011), data are not always fully available.

Phase		Criteria
Birth	—	Firm is less than 10 years old, has informal structure, and is dominated by owner-manager.†
Growth	—	Sales growth greater than 15%, functionally organized structure, early formalization of policies.
Maturity	—	Sales growth less than 15%, more bureaucratic organization.
Revival	—	Sales growth greater than 15%, diversification of product-lines,† divisionalization, use of sophisticated controls and planning systems.†
Decline	—	Demand for products levels off, low rate of product innovation,† profitability starts to drop off.†

Figure 4: classification criteria to identify the five life cycle stages (Miller & Friesen, 1984, p.1166)

3.4.2.1 Cluster analysis: classifying observations into different life cycle stages

Cluster analysis is an analytical technique that is used to develop meaningful subgroups of objects or individuals based on the characteristics they possess. More specifically, on a set of characteristics selected by the user. The cluster analysis has also been referred to as typology construction, Q analysis, numerical taxonomy and classification analysis. This array of names is because of the application of clustering methods in such various disciplines as biology, psychology, sociology, engineering, economics and business. Even though the names differ across disciplines, all the methods have the same common objective. The objective of cluster analysis is namely to classify a sample of entities (objects or individuals) into a small number of mutually exclusive groups. This will be done based on the relationships (similarities) among the objects being clustered. The attempt of cluster analysis is to maximize the heterogeneity between the clusters, while also maximizing the homogeneity of observations within the clusters (Hair et al., 2014).

La Rocca et al. (2011) have applied two-step cluster analysis and classified their observation into three clusters, namely Young firms, Middle-aged firms and Old firms. Furthermore, Keasey et al. (2015) also have applied two-step cluster analysis and classified their observation into three clusters, namely Growth stage, Maturity stage and Revival stage. As applied by La Rocca et al. (2011) and Keasey et al. (2015), in this research I also applied a two-step cluster analysis to classify the observations into the three stages: Growth, Maturity and Decline. The goal is to maximize the variability between the clusters and to minimize the variability within the clusters. According to La Rocca et al. (2011), two-step cluster analysis is an exploratory tool designed to make known the clusters (natural groupings) within the dataset which otherwise would not be clearly visible.

There are two possibilities to determine the number of clusters. Firstly, you can choose fixed number of clusters. Secondly, you can choose for an automatically procedure to determine the optimal number of clusters. An automatically procedure is preferred, since the silhouette measure of cohesion and separation is usually higher for an automatically procedure. This measure refers to the cluster quality for the interpretation and validation of consistency within clusters of data (i.e. assessing the number of clusters). More specifically, the silhouette measure will be checked in order to get insight into the separation distance between the resulting clusters. This measure shows namely how close each point in one cluster is to points in the neighboring clusters. The silhouette measure has a range of -1 to 1. Silhouette coefficients near to +1 imply that the sample is far away from the neighboring clusters. In contrary, a negative coefficient means that the samples may have been classified into the wrong cluster. Furthermore, a value of 0 shows that the sample is very close or on the decision boundary between two neighboring clusters. Since I investigate the impact of the Growth, Maturity and Decline stages on the capital structure of German listed companies, I prefer for three clusters. If

the automatically procedure do not come up with three clusters, I will choose for three fixed clusters. So, these three clusters will then represent the Growth, Maturity and Decline stages.

Both categorical and continuous variables could be taken into account to perform the two-step cluster analysis. In this research, the variables age (logarithm of the number of years since the date of incorporation), sales growth (% change in annual sales) and RETA (retained earnings scaled by total assets) are used to perform the cluster analysis and to classify the firms into Growth, Maturity or Decline stage. I have chosen for the variables age, sales growth and RETA as the classification variables (life cycle descriptors), since Miller and Friesen (1984), Anthony and Ramesh (1992), DeAngelo, DeAngelo and Stulz (2006), DeAngelo, DeAngelo and Stulz (2010), La Rocca et al. (2011), Keasey et al. (2015), Faff et al. (2016) and Ahsan et al. (2016) also used successfully most of these variables as the key classification variables to classify their sample firms into different stages. Furthermore, I performed also a cluster analysis where I added the classification variable profitability/cashflow (EBITDA scaled by total assets). Besides that, I performed also another cluster analysis where I replaced the RETA (retained earnings scaled by total assets) classification variable by RETA growth (% change in RETA). In addition, I performed also a cluster analysis based on a sub-sample (random 50% of the sample). This all is done in order to investigate whether this addition, replacement or using different sample will lead to significant different cluster classification results (robustness tests).

Furthermore, as also predicted by the life cycle theory, the earlier mentioned classification variables (life cycle descriptors) show a particular pattern across the different stages of the corporate life cycle. Therefore, the classification results of this research can be assessed by comparing the patterns of the outcome of the classification variables (life cycle descriptors) with the predicted patterns along the life cycle of the companies. For example, the variable age is used, since the sample companies in the Growth, Maturity and Decline life cycle stages could be classified as, respectively, young, adult and old companies. Younger companies are namely more likely to have new products. Besides that, it is expected that companies in the earlier life cycle stages, on average, have higher sales growth. In addition, this sales growth will monotonically decrease along the corporate life cycle of a company and, therefore, the percentage sales growth could be classified into high, medium and low level for, respectively, the Growth, Maturity and Decline life cycle stages (Anthony and Ramesh, 1992). further, I use the retained earnings scaled by total assets (RETA) as a classification variable (life cycle descriptor). This variable measures the extent to which a company is self-financing or reliant on external capital. Companies with a low RETA are usually more likely to be young and growing, while companies with high RETA are more likely to be more mature or older with declining investment. More specifically, young and growing companies rely heavily on external financial sources in order to finance their investment needs since their earnings capacity is low. In contrary, companies in the Maturity

stage will have few investment opportunities and high cash flows. Therefore, these companies tend to be self-financing (DeAngelo et al., 2006).

After performing the two-step cluster analysis, a cluster membership variable will be created. In this research, this variable is named as "Corporate Life Cycle". Each observation gets a cluster number (i.e. a value which represent a life cycle stage). In other words, the numbers (values) one, two and three, respectively, represent the Growth, Maturity and Decline life cycle stages. Additionally, a one-way analysis of variance (ANOVA) test is applied to verify whether there are statistically significant differences between the three life cycle stages for capital structure and the firm-level capital structure determinants (dependent and control variables).

3.4.2.2 Multiclass linear discriminant analysis: classifying observations into different life cycle stages

Multiclass linear discriminant analysis (MLDA) is the suitable multivariate technique when the single dependent variable is nonmetric. For example, when the dependent variable is dichotomous (e.g., female-male) or multichotomous (e.g., low-medium-high). In contrary, the independent variables are assumed to be metric. Multiclass linear discriminant analysis (MLDA) is appropriate in cases in which the total sample could be divided into groups according to a nonmetric dependent variable that characterize certain known classes. The key objectives of a multiclass linear discriminant analysis (MLDA) are to predict the probability that an object or individual will belong to a specific group or class based on various metric independent variables and to understand the group differences. Multiclass linear discriminant analysis (MLDA) include deriving a variate from an equation as like in multiple regression. The variate for discriminant analysis is also called as the discriminant function. A linear combination of the two (or more) independent variables, the discriminant variate, will discriminate best between the observations (companies, persons and etc.) in the groups that are determined a priori. The weight of the variate for every independent variable will be calculated in order to achieve discrimination to maximize the differences between the groups (the between group variance in relation to the within group variance) (Hair et al., 2014).

According to Faff et al. (2016), there are several reasons why a multiclass linear discriminant analysis (MLDA) is preferred for classifying companies' life cycle compared to other (indicative) life cycle proxies. Firstly, a multiclass linear discriminant analysis (MLDA) allows to disentangle and to make use of the life cycle information that are provided by a range of life cycle variables which are commonly accepted. Secondly, the classification is verified by statistical procedures. Thirdly, a multiclass linear discriminant analysis (MLDA) reduces the problem of that many variables are not good life cycle proxies since they do not progress monotonically over the life cycle stages. Lastly, a multiclass linear

discriminant analysis (MLDA) can be applied to classify all companies in the sample, however for some proxies, like cash flow patterns, data are not always fully available.

Faff et al. (2016) argue that the variables such as age, size, asset growth, earned to contributed capital ratio and cash flows provide some indication of company's maturity, however they have limitations and therefore are unlikely to be reliable proxies for a company life cycle on their own. To deal with this issue and to make use of the life cycle information that are provided by those variables, Faff et al. (2016) have applied a multiclass linear discriminant analysis (MLDA) and classified their sample into four life cycle stages. These stages are: Introduction, Growth, Mature and Shake-out/Decline. They generated their main life cycle proxy as a function of: earned to contributed capital ratio, age, assets growth and profitability/cash flow. A multiclass linear discriminant analysis (MLDA) is used to provide maximal separation between the groups (life cycle stages).

As applied by Faff et al. (2016), in this research I also applied the multiclass linear discriminant analysis (MLDA) to classify the observations into three life cycle stages, as a robustness test. These stages are Growth, Maturity and Decline. This life cycle proxy was a function of: age (logarithm of the number of years since the date of incorporation), sales growth (% change in annual sales) and RETA (retained earnings scaled by total assets). So, I have chosen for the same classification variables (life cycle descriptors) as in the cluster analysis.

3.4.3 Control variables

In order to analyze the impacts of the firm-level determinants of the capital structure on the leverage ratios, a list of capital structure determinants is examined which are common in the studies of Akhtar (2012), La Rocca et al. (2011), Keasey et al. (2015), Tian et al. (2015), Castro et al. (2016) and Ahsan et al. (2016). These determinants are: profitability, size, tangibility and growth opportunities. Furthermore, industry and year (time) dummies are included in the equation in order to control for, respectively, industry fixed effects and time-specific fixed effects (La Rocca et al., 2011; Akhtar, 2012). The definition of the variables is included in table 1.

Table 1: Definition dependent, independent and control variables

Variables:	**Definition in this research:**	**Reference:**
Dependent variable		
Total debt ratio	Ratio of total liabilities to total assets	Michaelas et al. (1999), La Rocca et al. (2011), Akhtar (2012), Tian et al. (2015), Ahsan et al. (2016) and Castro et al. (2016)
Long-term debt leverage	Ratio of long-term liabilities to total assets	Michaelas et al. (1999), Akhtar (2012) and Ahsan et al. (2016)
Short-term debt leverage	Ratio of short-term liabilities to total assets	Michaelas et al. (1999) and Ahsan et al. (2016)
Independent variable		
Life cycle dummies	Dummy variables: takes the value of 1 for a particular life cycle stage, otherwise 0.	Faff et al. (2016) and Tian et al. (2015)
Control variables		
Profitability	(EBITDA / total assets) (Net income / total assets)	La Rocca et al. (2011), Keasey et al. (2015), Tian et al. (2015) and Castro et al. (2016)
Size	Logarithm of total assets Logarithm of total sales	La Rocca et al. (2011), Akhtar (2012), Keasey et al. (2015), Tian et al. (2015), Ahsan et al. (2016), Faff et al. (2016) and Castro et al. (2016)
Tangibility	(Net property, plant and equipment / total assets) (Total fixed assets / total assets)	La Rocca et al. (2011), Akhtar (2012), Keasey et al. (2015), Tian et al. (2015) and Castro et al. (2016)
Growth opportunities	(% change in total assets) (% change in annual sales)	La Rocca et al. (2011), Ahsan et al. (2016) and Tian et al. (2015)
Industry dummies	Dummy variables: takes the value of 1 for a particular industry, otherwise 0.	La Rocca et al. (2011), Castro et al. (2016) and Faff et al. (2016)
Year dummies	Dummy variables: takes the value of 1 for a particular year, otherwise 0.	La Rocca et al. (2011) and Akhtar, 2012

4 Sample and data

In this chapter the data source and the sampling criteria of this research is discussed.

To determine whether the corporate life cycle stages have a direct impact on the capital structure of the companies, the firm-level data of German listed companies is collected from Orbis. Orbis database is bought together by Bureau Van Dijk and is approachable via the library of the University of Twente. Orbis database contains both financial and non-financial data for a large number of companies globally. Firstly, the sample companies have been selected in the Orbis database. Afterwards, the firm-level data of these companies are collected which is needed to calculate and/or to measure the variables of interest of this research (dependent, independent and control variables). These variables of interest are described in table 1.

The data is collected for the previous nine financial years (2009-2017). This because of the financial data is only available from 2009 in Orbis. Furthermore, besides there is no empirical evidence specifically from Germany, to the best knowledge of the author, most of the current researches in the field of capital structure and corporate life cycle have used data which are at least more than seven years old. So, these studies did not find empirical evidence about the relationship between capital structure and corporate life cycle specifically after the global financial crisis of 2008. Moreover, since the comparable empirical studies analyzed the data of listed companies and, therefore, in order to increase the comparability of the results of this research with other empirical studies, the focus of this research is also on the data of listed companies.

However, not all the German listed companies are included in the empirical analyses. Only publicly listed German non-financial companies are selected in the sample. This because of financial companies tend to have different capital structure compared to non-financial companies. As common in the finance literature and following previous studies that investigated the relationship between capital structure and corporate life cycle, like Tian et al. (2015), Castro et al. (2016) and Faff et al. (2016), the utility (regulated) and financial companies are excluded from the sample. Their financial statements are namely being influenced by factors, such as regulatory laws and industry rules (Rajan & Zingales, 1995). So, financial institutions, like banks, insurance companies, asset managers and pension funds are excluded from the sample. In addition, (regulated) companies in the utility sector and companies that operate in real estate industry are also excluded.

Furthermore, the data which is needed to calculate and/or to measure the variables of interest of this research (dependent, independent and control variables) need to be available in Orbis for the sample companies during the entire sample period. In other words, companies with missing financial data/values are excluded from the sample. This makes the sample data a longitudinal or balanced

panel data. Panel data combines cross-sectional and time-series observations. As a consequence, panel data not only disclose the variations between the individual companies, but also the variations within each company over time. These available data make it possible to mitigate the problem of time-invariant omitted variables. So, it accounts for individual heterogeneity and controls for the impact of omitted variables.

Based on the sampling criteria, the final sample size of this research is 361 publicly listed German non-financial companies with in total 3249 firm-years observations. The distribution of the sample companies/observations across the different industries is visually represented in figure 5. The final sample consist of companies that only operate in ten different industries. These industries are classified based on NACE Rev. 2. NACE is the European standard classification of productive economic activities.

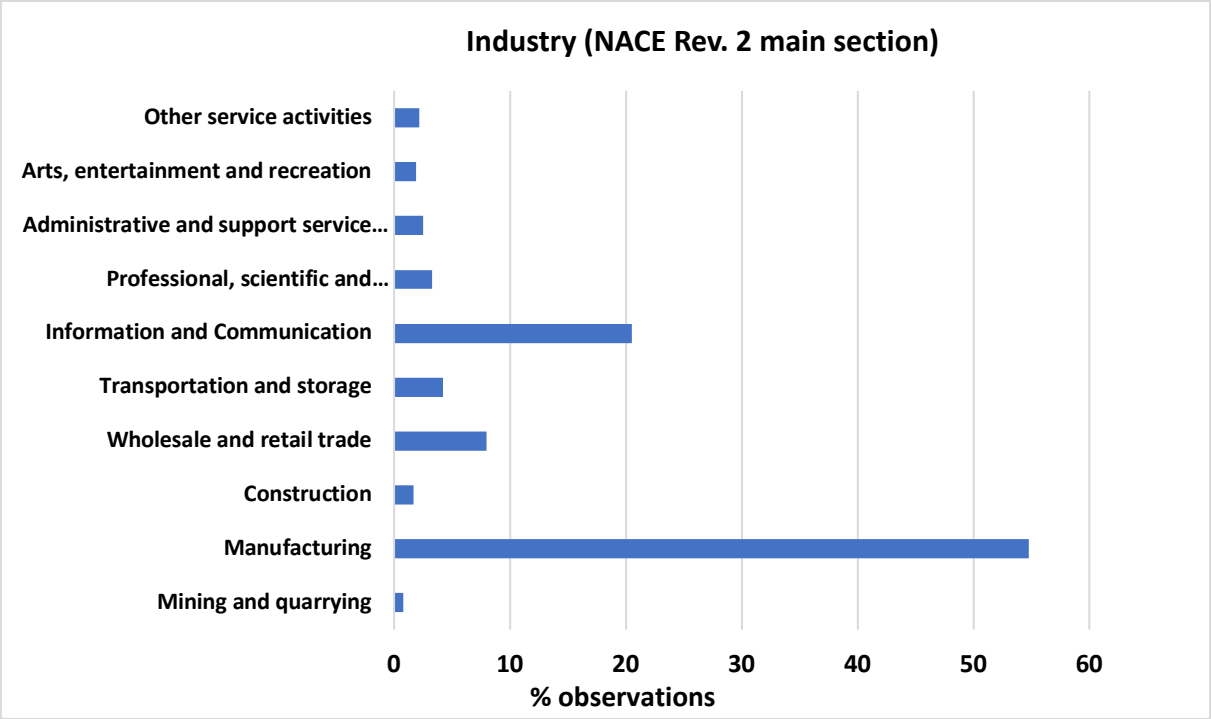


Figure 5: Industry classification sample companies (NACE Rev. 2 main section)

As mentioned earlier, industry dummies are included in the empirical models in order to control for industry fixed effects. In order to control for industry fixed effects, it is important to have sufficient observations per industry group. Since the number of observations for some industries are very small, I reclassified the ten industries into four main groups (dummies). From the sample data it is clearly visible that over 50% of the sample companies (the firm-years observations) belong to the industry classification Manufacturing. For this reason, it is acceptable to assume that the manufacturing industry will account significantly for the variance of the results. Therefore, in order to control for the

effects of industry classification on the debt ratio of the companies, the industry classification of this research include the dummy variable called “Manufacturing”. This variable will take the value of 1 if the sample company operates in the manufacturing industry and zero otherwise. Besides that, the dummy variable “Information and Communication” is also included. This variable will take the value of 1 if the sample company operates in the Information and Communication industry and zero otherwise. Furthermore, I reclassified the companies/observations from the “Other service activities”, “Arts, entertainment and recreation”, “Administrative and support service activities” and “Professional, scientific and technical activities” industries into a group (dummy variable) called “Other service companies”. This dummy variable “Other Services Companies” will take the value of 1 if the sample company operates in one of the earlier mentioned service industries and zero otherwise. Lastly, the companies/observations from the “Construction”, “Transportation and Storage”, “Wholesale and retail trade” and “Mining and quarrying” industries are reclassified into a group (dummy variable) called “Other industries”. This dummy variable “Other industries” will take the value of 1 if the sample company operates in one of these industries and zero otherwise. This reclassification of industries is visually represented in table 2. In the regression models, the industry dummy “Other Service Companies” is dropped in order to avoid the problem of dummy variable trap multicollinearity.

Table 2: Reclassification industries

Industry classification based on NACE Rev. 2.	**# observations prior to reclassification**	**Reclassification**	**% of observations after reclassification**
Manufacturing	1782	Manufacturing	54.8%
Mining and quarrying	27	Mining, Construction, Retail and Transport	14.7%
Construction	54		
Wholesale and retail trade	261		
Transportation and storage	135		
Information and Communication	666	Information and Communication	20.5%
Professional, scientific and technical activities	108	Other Service Companies	10.0%
Administrative and support service activities	81		
Arts, entertainment and recreation	63		
Other service activities	72		
Total	**3249**		**100%**

5 Results

In this chapter the results of this study are described. First, the results of the univariate analyses are shown. Second, the bivariate analyses with the correlation matrix is presented. Third, the multivariate analyses with the regression results are shown. Last, the results of the robustness tests are discussed.

5.1 Univariate analyses

Table 3 shows the descriptive statistics for the variables (dependent, independent and control variables) that are included in the multiple regression analyses. These include the number of observations, the mean, the median, the standard deviation, minimum and maximum. In addition, following La Rocca et al. (2011), Akhtar (2012), Faff et al. (2016) and Hasan and Cheung (2018), all continuous variables (the dependent and control variables) are winsorized at 1% level (the 1st and 99th percentile) in order to control for the undesirable influences of the outliers.

5.1.1 Dependent variable

To start with the dependent variable, capital structure, is measured by total debt ratio, long-term debt ratio and short-term debt ratio. The dependent variables have 3249 observations. A higher leverage ratio means that a company issue relatively more debt than equity in its capital structure. The total debt ratio shows a mean and median value of 0.53 and 0.54. This finding shows the importance of the creditors and lenders in the financial structure of the companies analyzed, since the sample companies are for more than fifty percent financed by debt. The long-term debt ratio shows a mean and median value of 0.24 and 0.22. The short-term debt ratio shows a slightly higher mean (0.30) compared to the median (0.27).

This research shows a long-term debt ratio which is comparable with other studies. Akhtar (2012) have, for example, found a long-term debt ratio with a mean and median value of 0.26 and 0.24. In contrary, in my research the total debt ratio is higher compared to other studies. For example, La Rocca et al. (2011) found a total debt ratio with a mean and median value of 0.45 and 0.50. Tian et al. (2015) found also a lower total debt ratio with a mean value of 0.46. Furthermore, Hasan and Cheung (2018) found a total debt ratio with the mean and median value of 0.25 and 0.19. Additionally, Faff et al. (2016) also found a lower total debt ratio with a mean and median value of 0.22 and 0.20. Moreover, Castro et al. (2016) found a total debt ratio with a mean and median value of 0.21 and 0.18. These differences between the level of total debt ratio could be explained by the differences between the sample companies (institutional contexts) and the sample periods (time frame). Hasan and Cheung (2018) have, for example, included all non-financial companies traded on AMEX, NYSE and NASDAQ for the period from 1987 until 2016. Furthermore, Castro et al. (2016) cover the sample period from 1990 to 2012 and include all quoted firms from Austria, Belgium, Denmark, Finland, France, Germany,

Greece, Italy, Netherlands, Norway, Portugal, Spain, Sweden and UK. Besides that, Faff et al. (2016) analyzed a large sample of US companies over the period 1973 to 2014. Therefore, the sample periods of these mentioned studies include periods such as dotcom bubble and several financial crises which could affect the total debt ratio, while this research analyzed the firm-level data after the global financial crisis of 2008. Furthermore, it can be assumed that the institutional context of the company has impact on the capital structure of the companies and that there are systematic differences in the capital structure of companies that operate in different institutional contexts. In addition, it is also assumable that that those companies traded on AMEX, NYSE and NASDAQ could differ in terms of size and level of debt and equity issuances relative to the sample companies of this research (German listed non-financial companies).

Table 3: Descriptive statistics

Variables	N	Mean	Median	Std. Deviation	Minimum	Maximum
Dependent variables						
Total debt ratio	3249	0.53	0.54	0.21	0.05	0.92
Long-term debt ratio	3249	0.24	0.22	0.18	0.00	0.74
Short-term debt ratio	3249	0.30	0.27	0.16	0.01	0.69
Independent variables						
Growth life cycle stage (dummy)	3249	0.06	0.00	0.24	0.00	1.00
Maturity life cycle stage (dummy)	3249	0.48	0.00	0.50	0.00	1.00
Decline life cycle stage (dummy)	3249	0.31	0.00	0.46	0.00	1.00
Control variables						
Profitability 1	3249	0.08	0.10	0.15	-0.70	0.40
Profitability 2	3249	0.00	0.03	0.20	-1.19	0.33
Size 1 (x €1 mln)	3249	4157	154	16227	0.64	126746
Size 2 (x €1 mln)	3249	3268	136	11272	0.00	74150
Tangibility 1	3249	0.20	0.15	0.19	0.00	0.97
Tangibility 2	3249	0.48	0.46	0.22	0.02	0.97
Growth opportunities 1	2888	0.07	0.04	0.23	-0.47	1.33
Growth opportunities 2	2828	0.08	0.05	0.31	-0.75	1.97

Notes: This table shows the descriptive statistics for each variable after winsorizing the continuous variables (dependent and control variables) at 1% level (the 1st and 99th percentile) and before the logarithm transformation of the control variables Size 1 and Size 2. The definitions of these variables are described in table 1.

5.1.2 Independent variable

The independent variables of this research are the three dummy variables which represent the three different corporate life cycle stages. After performing the two-step cluster analyses, three groups are formed automatically. These groups are named, respectively, Growth life cycle stage, Maturity life cycle stage and Decline life cycle stage. The cluster classification results (including the distribution of

the observations across the three corporate life cycle stages), the transition of life cycle stages and the robustness of the cluster classification results will be discussed in this sub-chapter.

5.1.2.1 Cluster classification results

As discussed earlier, there are two possibilities to determine the number of clusters. Firstly, you can choose fixed number of clusters. Secondly, you can choose for an automatically procedure to determine the optimal number of clusters. Since the automatically procedure already came up with three optimal numbers of clusters for the sample data of this research, which was preferred, it was not necessary to do a cluster analysis with fixed number of clusters. Besides that, the silhouette measure of the cluster analysis shows a coefficient of 0.6. Therefore, based on this result and as also shown by the statistical program (SPSS), it can be argued that the cluster quality is "good". This means that that the sample is quite far away from the neighboring clusters.

Regarding the descriptive statistics of the classification variables (LN_Age, RETA and Sales growth) for each life cycle stage as shown in table 4, it can be concluded that the classification results of this research are in line with the predictions which are already discussed in the method section. Firstly, looking at the logarithm of age, it is visible that the predicted pattern of young, adult and old is clearly visible across the three corporate life cycle stages. Furthermore, table 4 shows that the sales growth decreases monotonically along the life cycle of the sample companies. More specifically, there is a huge decline visible in the sales growth of the companies, when companies move from the Growth life cycle stage to the Maturity life cycle stage. However, this decline in the sales growth become clearly relatively smaller when companies move from the Maturity life cycle stage to the Decline life cycle stage. These decreases were also expected, as described in the method section. Moreover, these classification results are in line with the classification results of Ahsan et al. (2016) and Rehman et al. (2016). Lastly, as predicted, the RETA is low (even negative in this research) in the Growth life cycle stage showing that the companies in this stage are young and growing. These young and growing companies rely heavily on external financial sources in order to finance their investment needs since their earnings capacity is low. While, the RETA become, as predicted, significantly higher in the later life cycle stages which implies that companies in these stages are more mature and older and have declining investment opportunities. Since these companies will have few investment opportunities and high cash flows, these companies tend to be self-financing. Besides, there are statistically significant mean differences between the three life cycle stages for the three classification variables (life cycle descriptors).

As it is visible from table 4, 7%, 57% and 36% of the total observations are, respectively, classified into the Growth life cycle stage, Maturity life cycle stage and Decline life cycle stage. This distribution of the observations across the different stages of the corporate life cycle is comparable

with some other studies. In most of the studies, the largest part of the observations is classified into the Maturity life cycle stage. This will be followed by the Decline or Growth life cycle stage. Castro et

Table 4: Descriptive statistics classification variables (life cycle descriptors)

	Growth life cycle stage		Maturity life cycle stage		Decline life cycle stage		ANOVA test on mean differences (F test and p value)
Classification variables (life cycle descriptors)	**Mean**	**Std.Deviation**	**Mean**	**Std.Deviation**	**Mean**	**Std.Deviation**	
Logarithm of age	2.94	0.64	3.09	0.51	4.76	0.35	4139.653***
RETA	-4.39	4.56	0.01	0.47	0.20	0.24	322.239***
Sales growth	0.56	0.82	0.05	0.20	0.04	0.14	1135.345***
# Observations	205		1565		996		
% Observations	7%		57%		36%		

*Notes: This table shows the descriptive statistics for the classification variables (life cycle descriptors) and the results of the ANOVA test on mean differences for these variables between the different life cycle stages. The definitions of these variables are described in section 3.4.2. ***. - Mean differences significant at the 0.01 level. **. – Mean differences significant at the 0.05 level. *. – Mean differences significant at the 0.1 level.*

al. (2016) have, for example, classified 19%, 48% and 33% of the observations into, respectively, Introduction stage, Growth stage and Mature stage. Ahsan et al. (2016) have classified 20%, 74% and 6% of the observations, respectively, into Growth stage, Mature stage and Decline stage. Furthermore, Rehman et al. (2016) have classified 16%, 74% and 10% of the observations, respectively, into Growth stage, Maturity stage and Decline stage. Moreover, Keasey et al. (2015) have classified 12%, 77% and 11% of the total observations, respectively, into Growth stage, Maturity stage and Revival stage. However, in contrast to other studies, La Rocca et al. (2011) have classified the largest part of their observation into the first stage. More specifically, they have classified 45%, 40% and 15% of the total observations, respectively, into young, middle-aged and old firms. This difference between the classification of the observations into different stages could be explained by the fact that La Rocca et al. (2011) have analyzed non-financial Italian small and medium-sized firms that are not involved in a bankruptcy process, while other studies (including this research) have analyze listed non-financial companies. It is namely assumable that listed companies, in contrast to small and medium-sized firms, are big and well settled and have usually progressed through the Growth life cycle stage and are further in their life cycle. This could be also the reason why only 7% of the observations are classified into the Growth life cycle stage in this research.

Overall, the cluster quality is “good” and the classification results are in line with the predicted patterns and are comparable with the classification results of other studies. Furthermore, there are statistically significant mean differences between the three life cycle stages for the three classification

variables (life cycle descriptors). Additionally, the distribution of the observations across the different stages of the corporate life cycle is more and less comparable with other studies. Therefore, it can be assumed that the formed three clusters which represent, respectively, the Growth, Maturity and Decline life cycle stages are valid. The robustness of these findings will be discussed in section 5.1.2.3.

5.1.2.2 Transition of life cycle stages (movement of life cycle stages)

Table 5 shows the percentage of companies that change from one life cycle stage to another life cycle stage from year T to year T+1. Table 5, for example, shows that 58.19% of the companies in the Growth life cycle stage in year T remain in the Growth life cycle stage in year T+1. While, 35.59% and 6.21 % of the companies in the Growth life cycle stage in year T, respectively, move to the Maturity and Decline life cycle stages in year T+1. Regarding the companies in the Maturity life cycle stage in year T, 95.82% of these companies remain in the Maturity life cycle stage in year T+1. While, 3.82% of the companies move back to the Growth life cycle stage in year T+1 and 0.37% of the companies move to the Decline life cycle stage in year T+1. Besides that, it is also visible from table 5 that 99.07% of the companies in the Decline life cycle stage in year T, remain in the maturity life cycle stage in year T+1. While, 0.12% and 0.81% of the companies in the Decline life cycle stage in year T, respectively, move back to the Maturity and Growth life cycle stages in year T+1.

These results are in line with the prediction, as predicted by Dickinson (2011), that a company moves non-monotonically (non-sequential) through its life cycle. From the literature review, it was clear that many life cycle proxies do not evolve monotonically across the different stages of the corporate life cycle. According to Dickinson (2011), companies evolve with the path of evolution which is determined by external and internal factors. Dickinson (2011) also mentions that structural changes, expansion into new markets and/or substantial product innovations can cause that companies develop non-sequentially across different corporate life cycle stages. Therefore, the company life cycle can be cyclical in nature. In other words, unlike the product life cycles, the company life cycle does not need to develop linearly through the corporate life cycle stages. The companies can, for example, enter theoretically the Decline life cycle stage from any of the other stages. Besides that, by making some structural changes, expansion into new markets and/or substantial product innovations, companies can also move backward in life cycle stages. For example, from Decline life cycle stage to Maturity or Growth life cycle stage. Furthermore, Faff et al. (2016) and Tian et al. (2015) also found that their sample companies move non-monotonically (non-sequential) through their life cycle.

Table 5: Transition of life cycle stages (movement of life cycle stages)

		YEAR T+1		
		Growth life cycle stage	Maturity life cycle stage	Decline life cycle stage
YEAR T	Growth stage	**58.19%**	35.59%	6.21%
	Maturity stage	3.82%	**95.82%**	0.37%
	Decline stage	0.81%	0.12%	**99.07%**

Notes: This table shows the movement of the life cycle stages from year T to year T+1. The bold values represent the percentage of the observations that remain at the same stage in year T+1, while the other percentages show the movement from one stage to another life cycle stage in year T+1.

5.1.2.3 Robustness tests for the cluster classification results

I have performed several cluster analyses in order to test the robustness of the cluster classification results. I have, for example, performed a cluster analysis where I added the classification variable profitability/cashflow (EBITDA scaled by total assets). Besides that, I performed also another cluster analysis where I have replaced the RETA (retained earnings scaled by total assets) classification variable by RETA growth (% change in RETA). In addition, I performed also a cluster analysis based on a sub-sample (random 50% of the sample). This all is done in order to investigate whether this addition, replacement or using different sample will lead to significant different cluster classification results. The classification results of these cluster analyses are included in appendices A, B and C.

Since the automatically procedure of all the three cluster analyses already came up with three optimal numbers of clusters for the sample data of this research, which was preferred, it was not necessary to do a cluster analysis with fixed number of clusters. Besides that, the silhouette measure of the cluster analyses shows a coefficient of 0.6, 0.7 and 0.7 for, respectively, the cluster analysis where I added the classification variable profitability/cashflow (EBITDA scaled by total assets), the cluster analysis where I replaced the RETA (retained earnings scaled by total assets) classification variable by RETA growth (% change in RETA) and the cluster analysis based on a sub-sample (random 50% of the sample). Therefore, based on these results and as also shown by the statistical program (SPSS), it can be argued that the cluster quality of all the three cluster analyses is "good". This means that that the sample is quite far away from the neighboring clusters.

Further, it is noticeable that the classification results are comparable with the classification results from the first cluster analysis. As it is visible from table 9 in appendix A, 8%, 55% and 37% of the total observations are, respectively, classified into the Growth life cycle stage, Maturity life cycle stage and Decline life cycle stage for the cluster analysis where I added the classification variable profitability/cashflow (EBITDA scaled by total assets). Further, table 10 in appendix B shows that 3%, 62% and 35% of the total observations are, respectively, classified into the Growth life cycle stage, Maturity life cycle stage and Decline life cycle stage for the cluster analysis where I replaced the RETA (retained earnings scaled by total assets) classification variable by RETA growth (% change in RETA).

Besides that, table 11 in appendix C shows that 8%, 55% and 37% of the total observations are, respectively, classified into the Growth life cycle stage, Maturity life cycle stage and Decline life cycle stage for the cluster analysis based on a sub-sample (random 50% of the sample). These distributions of the observations across the different stages of the corporate life cycle is comparable with the distribution of the first cluster analysis and, therefore, also with some other studies. Regarding the classification variables logarithm of age, RETA and sales growth, these variables follow the same predicted pattern which was also visible from the results of the first cluster analysis. However, the classification variables profitability/cashflow and % change in RETA follow a low-high-low pattern. This finding could be explained by the predictable pattern of the level of profitability and the amount of retained earnings across the different stages of the corporate life cycle. During the early stages of the companies' life cycle, the companies are often less profitable and the information asymmetry is higher. Although, these conditions could reverse during the later stages, companies in their growth stages may have no or less retained earnings to finance their higher investment needs. In contrary, companies may have substantially higher retained earnings during their mature stages in comparison with growth stages. While, the profits and also the retained earnings will decrease during the decline stages. Furthermore, the overall levels of liquidity are low and the volatility in cash flows will be increased in the Decline stage.

Overall, since the classification results of all the cluster analyses are comparable (including the classification results based on the sub-sample analysis) and since there is clearly lower number of observations classified into the Growth life cycle stage for the third cluster analysis, I will take into account the life cycle dummies which are made from the first cluster analysis for the further analyses.

5.1.3 Control variables

The control variables are profitability, firm size, tangibility, growth opportunities, industry dummies and year dummies. The industry and year dummies have been already discussed in chapter 4. Table 3, on page 58, shows that the variable profitability 1 has a mean and median value of 0.08 and 0.10. This result is comparable with the results of other studies. Castro et al. (2016) have, for example, found, a mean and median value of 0.07 and 0.10 for the same measure (EBITDA scaled by total assets). Furthermore, Akhtar (2012) has also found comparable results. More specifically, she found a mean and median value of 0.09 and 0.12. Besides that, La Rocca et al. (2011) also found comparable results. They found namely a mean and median value of 0.10 and 0.09. Moreover, Keasey et al. (2015) found also comparable results with a mean and median value of 0.06 and 0.08. Since the result of this research is comparable with other studies, it can be assumed that the measure of profitability 1 is reliable and not biased.

In contrary, the variable profitability 2 is less comparable with the results of other studies. The mean value of this measure (net income scaled by total assets) is 0.00, while the median value is 0.03. This means that the variable profitability 2 is left skewed and that the sample companies are on average not profitable at all during the sample period. Tian et al. (2015) have, for example, found a mean value of 0.05 for the same measure.

Further, table 3 shows that the average firm size measured by total assets is €4157 million and the median value is €154 million. Besides that, the mean value of annual sales is €3268 million and the median value is €136 million. Since for the both measures the mean value is clearly larger than the median, it can be concluded that both measures for firm size are highly right skewed. For this reason, as done by the prior studies, both measures are transformed using a natural logarithm in order to correct for their skewness and non-normality.

Further, it is noticeable from table 3 that the mean and median value of the measure tangibility as net property, plant and equipment scaled by total assets are, respectively, 0.20 and 0.15. Since the mean value is larger than the median value, it can be argued that the variable tangibility 1 is skewed to the right. This also the case for the other measure of tangibility. The measure of total fixed assets scaled by total assets shows namely a mean and median value of 0.48 and 0.47. Overall, the findings are comparable with the results of other studies. La Rocca et al. (2011) have, for example, found a mean and median value of 0.22 and 0.19 for the variable tangibility (net property, plant and equipment scaled by total assets). For the same measure, Akhtar (2012) has found a higher mean and median value. These values are, respectively, 0.34 and 0.29. Furthermore, Castro et al. (2016) have found a mean and median value of 0.27 and 0.22.

Lastly, the variable growth opportunities, measured as % change in total assets, shows a mean and median value of 0.07 and 0.04. Since the mean value is higher than the median value, it can be argued that the measure of growth opportunities (% change in total assets) is skewed to the right. This is also the case for the other measure of growth opportunities (% change in annual sales). This measure shows namely a mean and median value of 0.08 and 0.05.

5.1.4 ANOVA test on mean differences

Table 6 presents the descriptive statistics for the variables (dependent and control variables) across the different corporate life cycle stages and the one-way analysis of variance (ANOVA) test on mean differences. A one-way analysis of variance (ANOVA) test is applied to verify whether there are statistically significant mean differences between the three life cycle stages for capital structure and the firm-level capital structure determinants (control variables).

It is clearly visible from table 6 and figure 6 that the leverage ratios (total debt ratio and long-term debt ratio), as predicted by the life cycle theory and the pecking order theory, follow a U-shaped pattern across the three different corporate life cycle stages. However, this is not the case for the short-term debt ratio looking at the univariate analysis. The total debt ratio shows a mean value of 0.55, 0.51 and 0.57 in, respectively, Growth, Maturity and Decline life cycle stages. These values are, respectively, 0.25, 0.22 and 0.28 for long-term debt ratio and 0.34, 0.30 and 0.29 for short-term debt ratio. Furthermore, all these mean differences are statistically significant at 0.01 level or better (t=27.232***, t=38.448*** and t=8.532***). These findings, U-shaped patterns, are consistent with the results of the studies of Frielinghaus et al. (2005), Pinková and Kamínková (2012), Tian et al. (2015) and Hasan et al. (2015). Frielinghaus et al. (2005) have, for example, also found that there is a high-low-high leverage pattern. In other words, companies use more debt in the early and late life cycle stages in comparison with the prime stage. Additionally, La Rocca et al. (2011) also found that debt is a crucial constituent of the capital structure in the early phases of the corporate life cycle. As a company moves towards the maturity stage, the growth and profitability opportunities will substitute the debt by their retained earnings. Furthermore, Tian et al. (2015) argue that the capital structure of the Chinese public manufacturing firms significantly differs across the stages of the corporate life cycle and that companies in their earlier and later life cycle stages rely more on external finance (U-shaped pattern).

Table 6 also shows that there are significant mean differences for the control variables between the three corporate life cycle stages. Besides that, there are also particular patterns visible in the mean values of the control variables across the different life cycle stages. As a company progress through its life cycle, the level of profitability will increase. Moreover, this increase (mean differences) in the level of profitability along the corporate life cycle is statistically significant for both profitability measures at 0.01 level or better (t=276.415*** and t=208.701***). This similar pattern is also visible for the measures of firm size and tangibility. More specifically, the firm size and the level of tangibility increase substantially when progressing from the Growth life cycle stage to the Decline life cycle stage. Furthermore, the mean differences in firm size (total assets and annual sales) and in the level of tangibility between the three corporate life cycle stages are statistically significant at 0.01 level or better (t=27.785***, t=38.753***, t=173.040*** and t=21.366***). Lastly, the measures of growth opportunities (% change in total assets and % change in annual sales) show a substantial decrease along the corporate life cycle of the sample companies. Moreover, this decrease (mean differences) is statistically significant at 0.01 level or better (t=17.357***, t=322.239***). These (ANOVA test) results are in line with the findings of La Rocca et al. (2011), Tian et al. (2015), Castro et al. (2016), Ahsan et al. (2016) and Rehman et al. (2016).

Overall, it can be concluded that there are statistically significant mean differences between the three life cycle stages for capital structure and the firm-level capital structure determinants (control variables). The fluctuations in the leverage ratios show that the leverage ratios (except short-term debt ratio) are higher in the Growth and Decline life cycles stages, but lower in the Maturity life cycle stage. In other words, as predicted, there is a U-shaped pattern visible. However, since these descriptive statistics (univariate analyses) do not control for the impacts of other variables, regression analyses will be performed in order to examine the more interesting findings further. These results are shown in table 8.

Table 6: ANOVA test on mean differences

	Growth life cycle stage		Maturity life cycle stage		Decline life cycle stage		ANOVA test on mean differences (F test and *p* value)
Variables	**Mean**	**Std. Deviation**	**Mean**	**Std. Deviation**	**Mean**	**Std. Deviation**	
Dependent variable							
Total debt ratio	0.55	0.29	0.51	0.20	0.57	0.19	27.232***
Long-term debt ratio	0.25	0.25	0.22	0.17	0.28	0.15	38.448***
Short-term debt ratio	0.34	0,23	0.30	0.15	0.29	0.15	8.532***
Control variables							
Profitability 1	-0.13	0.32	0.10	0.12	0.11	0.07	276.415***
Profitability 2	-0.21	0.40	0.02	0.15	0.04	0.06	208.701***
Size 1 (x €1 mln)	342	2358	2857	13800	7196	20990	27.748***
Size 2 (x €1 mln)	219	1577	2260	9786	5853	14523	38.753***
Tangibility 1	0.08	0.12	0.17	0.18	0.28	0.19	173.040***
Tangibility 2	0.41	0.26	0.46	0.23	0.50	0.19	21.366***
Growth opportunities 1	0.14	0.47	0.07	0.21	0.05	0.13	17.357***
Growth opportunities 2	0.56	0.82	0.05	0.19	0.04	0.14	322.239***
# Observations	205		1565		996		
% Observations	7%		57%		36%		

*Notes: This table shows the descriptive statistics for each variable in each corporate life cycle stage (subsamples) after winsorizing the continuous variables (control variables) at 1% level (the 1st and 99th percentile) and before the logarithm transformation of the control variables Size 1 and Size 2. The definitions of these variables are described in table 1. Furthermore, this table shows also the results of the ANOVA test on mean differences for these variables between the different life cycle stages. ***. - Mean differences significant at the 0.01 level. **. – Mean differences significant at the 0.05 level. *. – Mean differences significant at the 0.1 level.*

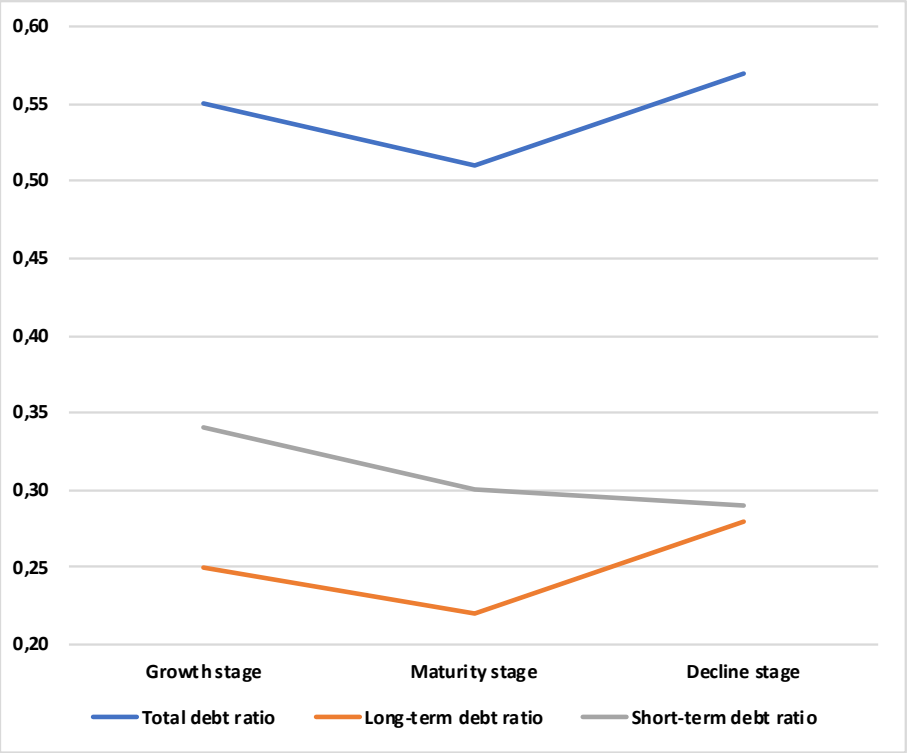


Figure 6: The patterns of the leverage ratios along the corporate life cycle of the sample companies.

5.2 Bivariate analyses

The bivariate analysis is performed using the Pearson's correlation matrix as presented in table 7. As it visible from table 7, the total debt ratio correlates significantly with other dependent variables (long-term debt ratio, r=0.666**; short-term debt ratio, r=0.639**) at 0.01 level or better. These findings support the prediction that all the three dependent variables measure the same concept, namely the capital structure of the sample companies. Furthermore, it is also visible from table 7 that long-term debt ratio is negatively and significantly correlated with the short-term debt ratio at 0.01 level or better (r=-.093**). This result is in line with the findings of Ahsan et al. (2016). This implies that when the long-term debt ratio increases, the long-term debt ratio will decrease (and vice versa).

Regarding the correlations between the dependent variables (total debt ratio, long-term debt ratio and short-term debt ratio) and the independent variables (Growth life cycle, Maturity life cycle stage and Decline life cycle stage), the correlation matrix shows that the Growth life cycle stage is only positively and significantly correlated with the short-term debt ratio at 0.01 level or better (r=.071**). Although the correlation coefficients are also positive for the total debt ratio and the long-term debt ratio, these coefficients are not statistically significant. In general, these results are in line with the prediction that companies in the growth stages (earlier life cycle stages) rely more on external

financing. Companies in their growth stages may have namely no or less retained earnings to finance their higher investment needs.

Further, table 7 shows that the Maturity life cycle stage is negatively and significantly related to total debt ratio and long-term debt ratio at 0.01 level or better (r=-.105** and r=-.126**). However, there is no significant relationship found between short-term debt ratio and the Maturity life cycle stage. Overall, these results are in line with the prediction that companies in the Maturity stage rely less on external financing. This because of these companies are namely more likely to rely on retained earnings, because of reduced cash flow volatility and more persistent net income. In general, companies may have substantially higher retained earnings during their mature stages in comparison with growth stages. Therefore, companies in their mature stages need less debt in comparison with what they needed during their growth stages. In other words, as a company moves towards the maturity stage, the growth and profitability opportunities will substitute the debt by their retained earnings.

Lastly, the correlation matrix shows that the decline life cycle stage is positively and significantly related to the total debt ratio and long-term debt ratio at 0.01 level or better (r=.118** and .143**). However, there is no significant relationship found between the variables Decline life cycle stage and short-term debt ratio. Overall, these results show, as predicted, that companies in the Decline life cycle stage will raise more debt compared to the companies in the maturity stage, because of the companies in the Decline life cycle stage suffer from market stagnation, declining sales and low profitability and/or in order to fund business restructurings and revitalizations. The overall levels of liquidity are low and the volatility in cash flows is increased in the Decline life cycle stage.

Looking at the interesting relationships between the independent and control variables, table 7 shows that there are negative and significant relationships between the Growth life cycle stage and the measures of profitability and size at 0.01 level or better. More specifically, relationships with correlation coefficients which lie between r=-0.253** and r=0.348**. These results imply that when companies are in the Growth life cycle stages, these companies are smaller and less profitable. In contrary, table 7 shows that companies in the Maturity life cycle stage are more profitable (r=0.130** and r=0.103**), but still smaller (r=-0.131** and r=-0.115**). While, companies in the Decline life cycle stage are more profitable (r=0.124** and r=0.137**) and bigger (r=328** and r=298**). Besides that, it is also clearly visible from table 7 that there are positive and significant relationships between the variables Growth life cycle stage and the measures of growth opportunities (r=0.090** and r=0.434**). While, this is relationship is negative and significant between other life cycle stages and the measures of growth opportunities (except between the variables Maturity life cycle stage and Growth opportunities 1). Lastly, it noticeable from table 7 that companies in the Decline life cycle stage

experience more tangibility (r=0.290** and r=0.086**). In contrast, companies in other life cycle stages are less tangible.

Looking at the interesting relationships among the control variables, table 7 shows that there are positive and significant relationships between the measures of profitability and the measures of size at 0.01 level or better. More specifically, relationships with correlation coefficients which lie between r=0.293** and r=0.349**. These results imply that when companies become bigger, these companies will become also more profitable (and vice versa). Besides that, it is also noticeable from table 7 that there are positive and significant relationships between the measures of profitability and the measures of growth opportunities. These results show that when companies become more profitable, these companies will have higher investment needs/growth opportunities (and vice versa). Lastly, table 7 shows that when companies become bigger, these companies will become more tangible (and vice versa).

Regarding the relationships between the control variables and the dependent variables, table 7 shows that the both profitability measures are significantly and negatively related to the total debt ratio (r=-.085** and r=-.179**), long-term debt ratio (r=-.063** and r=-.096**) and short-term debt ratio (r=-.089** and r=-.185**). Furthermore, it is clearly visible that the relationship with the leverage ratios is stronger for the variable profitability 2 (net income/ scaled by total assets). Furthermore, as predicted, both profitability measures are strongly correlated with each other. Overall, these findings show that when the companies become more profitable, these companies will lower their leverage ratios (and vice versa).

Regarding the measures of firm size, it can be concluded that both measures of firm size (total assets and total sales) are positively and significantly related to the total debt ratio (r=.213** and r=.317**), long-term debt ratio (r=.221** and r=.184**) and short-term debt ratio (r=-.006 and r=.168**). However, there is no significant relationship found between the variables LN_Size 1 (total assets) and short-term debt ratio (r=-.006). In general, these results show that when companies become bigger, these companies will increase their leverage ratios (and vice versa).

Furthermore, both measures of tangibility have a positive and significant relationship with total debt ratio (r=.185** and r=.317**) and long-term debt ratio (r=.344** and r=.332**) at 0.01 level or better. In contrary, there is a negative and significant relationship found between the measures of tangibility and short-term debt ratio (r=-.149** and r=-.295**). Overall, these results concerning relationships with the total debt ratio and long-term debt ratio show that when companies have more tangible assets, these companies will increase their leverage ratios. These tangible assets can namely be seen as collateral which increase the certainty that a lender receives the money back in an occasion of default. Tangible assets could namely be liquidated in order to repay the outstanding debts.

Lastly, table 7 shows that both measures of growth opportunities (% change in total assets and % change in annual sales) are negatively and significantly related to the total debt ratio at 0.01 level or better (r=-.080** and r=-.057**). Furthermore, both measures are negatively and significantly related to the long-term debt ratio at the level of 0.05 (r=-.044* and r=-.040*), while there is only a significant and negative relationship between the variables short-term debt ratio and growth opportunities 1 (% change in total assets) at 0.01 level or better (r=-.067**). Overall, these results show that when companies have higher investment needs/growth opportunities, these companies will lower their leverage ratios (and vice versa).

Furthermore, additionally tests have been conducted in order to test whether there is the presence of multicollinearity. Multicollinearity exists when the independent and control variables are strongly correlated with each other. Therefore, the variation inflation factors have been calculated for all the variables that are included in the different multiple regression analyses. Since all the variation inflation factors are lower than 5.0 (more specifically, below 1.1916) (results not reported), it can be concluded that there is no presence of multicollinearity (Hair et al., 2014). However, if all the three corporate life cycle stages are included in one model, which is not the case in this research, then the highest VIF score will be 6.623 for the Maturity life cycle stage and 6.590 for the Decline life cycle stage. This relatively high VIF score could be explained by the fact that there is a strong negative relationship between the Maturity and Decline life cycle stages (r=-.641**).

Table 7: Correlation matrix

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	**Total debt ratio**	1													
2	**Long-term debt ratio**	.666**	1												
3	**Short-term debt ratio**	.639**	-.093**	1											
4	**Profitability 1**	-.085**	-.063**	-.089**	1										
5	**Profitability 2**	-.179**	-.096**	-.185**	.753**	1									
6	**LN_Size 1**	.213**	.221**	.006	.293**	.305**	1								
7	**LN_Size 2**	.317**	.184**	.168**	.349**	.299**	.902**	1							
8	**Tangibility 1**	.185**	.344**	-.149**	.148**	.088**	.024	.040*	1						
9	**Tangibility 2**	.064**	.332**	-.295**	.071**	.055**	.167**	.130**	.397**	1					
10	**Growth opportunities 1**	-.080**	-.044*	-.067**	.119**	.209**	-.003	-.017	-.093**	.002	1				
11	**Growth opportunities 2**	-.057**	-.040*	-.036	.105**	.117**	-.013	-.017	-.070**	-.018	.352**	1			
12	**Growth life cycle stage**	.021	.011	.071**	-.348**	-.275**	-.253**	-.273**	-.160**	-.079**	.090**	.434**	1		
13	**Maturity life cycle stage**	-.105**	-.126**	.009	.130**	.103**	-.131**	-.115**	-.162**	-.058**	.015	-.120**	-.250**	1	
14	**Decline life cycle stage**	.118**	.143**	-.021	.124**	.137**	.328**	.298**	.290**	.086**	-.072**	-.101**	-.173**	-.641**	1

Notes: This table shows the Pearson correlation coefficients with their statistical significance. The definitions of these variables are described in table 1 and the sample is described in section 4.
***. – Correlation significant at the 0.01 level. *. – Correlation significant at the 0.05 level.*

5.3 Multivariate regression analyses

In this section, the results of the OLS regression analyses are discussed. In the upcoming subsections 5.3.1 to 5.3.3, the results of the hypotheses 1 to 3 are described, respectively. These hypotheses are formulated in section 2.4. Table 8 shows the results of the OLS regression analyses. In the regression analyses, the capital structure, measured by total debt ratio/long-term debt ratio/short-term debt ratio, is regressed on a group of firm-level capital structure determinants and life cycle stages. Furthermore, industry and year (time) dummies are included in the equation in order to control for, respectively, industry fixed effects and time-specific fixed effects.

Models 1, 4 and 7 of table 8 are the baseline models which include only the control variables. Models 2, 5 and 8 of table 8 include also the life cycle dummies Growth and Decline life cycle stages. These models are used for testing hypotheses 1 and 3. These models only include the life cycle dummies Growth and Decline life cycle stages since the purpose of hypotheses 1 and 3 is to measure the (incremental) impact of these life cycle stages on the debt ratios, relative to the Maturity life cycle stage (reference/excluded/base group). This in order to investigate whether companies in the Growth and Decline life cycle stages have higher debt ratios compared to companies in the Maturity life cycle stage.

The models 3, 6 and 9 of table 8 only include the life cycle dummy Maturity life cycle stage and are applied in order to test hypothesis 2. This because of the purpose of hypothesis 2 is to measure the (incremental) impact of Maturity life cycle stage on debt ratios, relative to other life cycle stages (reference/excluded/base groups). In other words, investigating whether companies in the Maturity life cycle stage have lower debt ratios compared to companies in other life cycle stages.

Besides that, I also have applied the OLS regression analyses of the above-mentioned models with different combinations of control variables (results not reported). By excluding and including some control variables and using different combinations (instead of full model), it is possible to check whether the main results change when controlling for the impact of different combinations of firm-level control variables.

Table 8: OLS regression results for the impact of corporate life cycle stages on the leverage ratios (capital structure)

Variables	Expected sign	Total debt ratio			Long-term debt ratio			Short-term debt ratio		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept		0.413***	0.315***	0.366***	0.104***	0.070***	0.123***	0.270***	0.345***	0.377***
		(13.366)	(12.691)	(14.716)	(5.377)	(3.494)	(4.910)	(14.309)	(14.378)	(15.388)
Growth life cycle stage (t-1)	**+**		**0.092*** **			**0.080*** **			**0.047*** **	
			(5.628)			**(6.092)**			**(3.627)**	
Maturity life cycle stage (t-1)	**–**			**-0.033*** **			**-0.018*** **			**-0.021*** **
				(-3.869)			**(-2.683)**			**(-3.160)**
Decline life cycle stage (t-1)	**+**		**0.028*** **			**0.007**			**0.020*** **	
			(2.852)			**(0.964)**			**(2.627)**	
LN_Size 1 (t-1)		0.015***	0.016***	0.015***	0.009***	0.011***	0.009***	0.004***	0.004***	0.004***
		(9.107)	(9.195)	(8.808)	(6.570)	(7.446)	(6.353)	(3.039)	(3.030)	(2.793)
Profitability 1 (t-1)		-0.005**	-0.005**	-0.004**	-0.006***	-0.006***	-0.006***	-0.003***	-0.003**	-0.003*
		(-2.516)	(-2.475)	(-2.337)	(-4.216)	(-4.189)	(-4.089)	(-2.050)	(-2.016)	(-1.902)
Tangibility 1 (t-1)		0.178***	0.184***	0.173***	0.254***	0.266***	0.251***	-0.088***	-0.087***	-0.091***
		(7.548)	(7.710)	(7.346)	(13.434)	(13.893)	(13.284)	(-4.756)	(-4.637)	(-4.931)
Growth opportunities 1 (t-1)		-0.080***	-0.083***	-0.079***	-0.013	-0.019	-0.013	-0.077***	-0.078***	-0.076***
		(-4.155)	(-4.373)	(-4.113)	(-0.879)	(-1.224)	(-0.843)	(-5.135)	(-5.221)	(-5.101)
Year dummies		Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry dummies		Included	Included	Included	Included	Included	Included	Included	Included	Included
N		2527	2527	2527	2527	2527	2527	2527	2527	2527
Adjusted R Square		0.074	0.086	0.079	0.143	0.155	0.145	0.053	0.059	0.056

*Notes: This table shows the unstandardized coefficients with their statistical significance. The t-statistics are represented in the parentheses. Furthermore, the definitions of these variables are described in table 1 and the sample is described in section 4. ***. - Correlation significant at the 0.01 level. **. – Correlation significant at the 0.05 level. *. – Correlation significant at the 0.10 level. The following empirical model is estimated:* $Leverage_{it} = \beta_0 + \beta_{1-3}LifeCycle_{i,t-1} + \beta_4 Profitabilty_{i,t-1} + \beta_5 Size_{i,t-1} + \beta_6 Tangibility_{i,t-1} + \beta_7 Growth_{i,t-1} + \beta_8 Industry_{i,t} + \beta_9 Year_i + \epsilon_{it}$*. Models 1, 4 and 7 of this table are the baseline models which include only the control variables. Models 2, 5 and 8 of this table include also the life cycle dummies Growth and Decline life cycle stages. These models are used for testing hypotheses 1 and 3. These models only include the life cycle dummies Growth and Decline life cycle stages since the purpose of hypotheses 1 and 3 is to measure the (incremental) impact of these life cycle stages on the debt ratios, relative to the Maturity life cycle stage (reference/excluded/base group). This in order to investigate whether companies in the Growth and Decline life cycle stages have higher debt ratios compared to companies in the Maturity life cycle stage. The (incremental) impact of the Growth and Decline life cycle stages, relative to the Maturity life cycle stage (reference/excluded/base category), on the debt ratios of the sample companies is captured respectively by the* β_1 *and* β_2 *terms of the models 2, 5 and 8. While, the models 3, 6 and 9 of this table only include the life cycle dummy Maturity life cycle stage and are applied in order to test hypothesis 2. This because of the purpose of hypothesis 2 is to measure the (incremental) impact of Maturity life cycle stage on debt ratios, relative to other life cycle stages (reference/excluded/base groups). In other words, investigating whether companies in the Maturity life cycle stage have lower debt ratios compared to companies in other life cycle stages. The (incremental) impact of the Maturity life cycle stage, relative to the other life cycle stages (reference/excluded/base groups), on the debt ratios of the sample companies is captured by the* β_1 *term of the models 3, 6 and 9.*

5.3.1 Hypothesis 1: The impact of Growth life cycle stage on capital structure

The first hypothesis predicts that companies in the Growth life cycle stage have a higher financial leverage ratio (i.e. total debt ratio, long-term debt ratio and short-term debt ratio) than companies in the Maturity life cycle stage. The results in table 8 present that the companies in the Growth life cycle stage have indeed a higher financial leverage ratio than companies in the Maturity life cycle stage. This because of the regression coefficient of the variable Growth life cycle stage is positive and significant at the 0.01 level or better for all the measures of capital structure. Since the Maturity life cycle stage is the reference/base category in the models 2, 5 and 8, the regression coefficient of the Growth life cycle stage shows the (incremental) impact of the variable Growth life cycle stage on the leverage ratios of the sample companies, relative to the Maturity life cycle stage (excluded/reference/base category). The (incremental) impact of the Growth life cycle stage on the total debt ratio (b=.092***, t=5.628), long-term debt ratio (b=.080***, t=6.092) and short-term debt ratio (b=.047***, t=3.627), relative to the Maturity life cycle stage, is positive and significant at the 0.01 level or better. Moreover, it could be argued that these results are significant even after controlling for the impact of several firm-level control variables. Besides that, quite similar findings are also found after performing OLS regression analyses with different combinations of firm-level control variables (instead of full model) (results not reported). The main results of this research will be related with the findings of prior studies in the upcoming paragraphs.

The predicted U-shaped pattern of leverage ratios along the corporate life cycle of the sample companies and which were found in the univariate analysis is confirmed after controlling for a wide range of firm-level control variables. For example, moving from the Growth life cycle stage to the Maturity life cycle stage is associated with a decrease of 9.2%, 8.0% and 4.7%, respectively, in total debt ratio, long-term debt ratio and short-term debt ratio. These results are in line with the prediction, as predicted by the life cycle theory and pecking order theory, that during the early stages of the companies' life cycle, the companies are often less profitable and the information asymmetry is higher. Companies in their growth stages may have no or less retained earnings to finance their higher investment needs. In such times, companies raise the maximum available debt before they raise external equity.

Furthermore, the results of this research are in line with the U-shaped (high-low-high) leverage patterns which were found by Tian et al. (2015). Tian et al. (2015) have classified their observations into five different life cycle stages. These stages are Birth, Growth, Mature, Revival and Decline. They used in their regression analyses, the Decline stage as a base group (reference/excluded category). They found that the impact of Birth stage on the total debt ratio, relative to the Decline stage, is positive and significant at the level of 0.05. While, the Revival stage has, relative to the Decline stage, a negative and significant impact on the total debt ratio. Therefore, the results of their research show

that companies in the Birth stage have higher total debt ratio than the companies in the Decline stage (base group). While, companies in the Revival stage have lower total debt ratio than companies in the Decline stage. So, they found a U-shaped pattern of total debt ratio movement along the life cycle stages. According to them, these results imply that companies in their early stage have weaker ability to generate finance internally, for example, via retained earnings and will borrow more to raise capital. While, companies in their Mature stage have stronger ability to generate finance internally (Tian et al., 2015).

However, the results of this research are in contrast to the results which were found by Faff et al. (2016). Faff et al. (2016) found, for example, also a non-linear relation between debt issuance and corporate life cycle. However, they found that the debt issuances follow a "hump" shape pattern (low-high-low) along the corporate life cycle of their sample companies. More specifically, Faff et al. (2016) classified their observations into four different life cycle stages. These stages are: Introduction, Growth, Mature and Shake-out/Decline. In their analyses, they used Mature stage as the reference/base category. They found that the impact of Growth stage on debt issuance, relative to the Mature stage (reference/base category), is positive and significant at the level of 0.01 or better (b=0.046***). Besides that, the Shake-out/Decline stage has a negative and significant impact on debt issuance at the level of 0.01 or better (b=-0.011***), relative to the Mature stage. Therefore, based on the results of their research, they argue that companies in the Growth stage issue more debt in comparison with companies in the Introduction or Shake-out/Decline stage. More specifically, they found that moving from the Introduction stage to the Growth stage is associated with an increase in debt issuance of 0.7% of total assets. While, they also found that moving from the Mature stage to the Shake-out/Decline stage is associated with a decrease in debt issuance of 1.1% of total assets. According to them, these results are in line with the reasoning that debt issuance will gradually increase as a young company moves from its Introduction stage to the Mature stage, because of the improvement in debt servicing ability. In contrary, due to diminishing investment opportunities and debt servicing ability, companies will issue less debt as they move from their Mature stage to Decline stage. Besides that, Ahsan et al. (2016) and Rehman et al. (2016) found, in contrast to the results of my research, a low-high-low leverage pattern across the Growth, Maturity and Decline life cycle stages. These contrasting results could arise, because of the different institutional contexts of the sample companies and the different sample periods (time frame). Faff et al. (2016) have, for example, studied a large sample of US companies from 1973 until 2014. Ahsan et al. (2016) studied listed non-financial Pakistani companies from 1972 until 2010, while Rehman et al. (2016) studied listed non-financial Chinese companies over a period of 19 years (1996-2014).

Overall, the OLS regression results suggest that, relative to the Maturity life cycle stage, the Growth life cycle stage is positively and significantly associated with the leverage ratios. In other words,

the companies in the Growth life cycle stage have a higher leverage ratio (total debt ratio, long-term debt ratio and short-term debt ratio) compared to the companies in the Maturity life cycle stage. For example, moving from the Growth life cycle stage to the maturity life cycle stage is associated with a decrease of 9.2%, 8.0% and 4.7%, respectively, in total debt ratio, long-term debt ratio and short-term debt ratio. Therefore, based on these findings, it can be argued that the hypothesis 1 of this research is supported. The robustness of this finding will be discussed in section 5.4.

5.3.2 Hypothesis 2: The impact of Maturity life cycle stage on capital structure

The second hypothesis predicts that companies in the Maturity life cycle stage have a lower financial leverage ratio (i.e. total debt ratio, long-term debt ratio and short-term debt ratio) than companies in the Growth and Decline life cycle stages. The results in table 8 present that the companies in the Maturity life cycle stage have indeed a lower financial leverage ratio than companies in the Growth and Decline life cycle stages. This because of the regression coefficient of the variable Growth life cycle stage is negative and significant for all the measures of capital structure. Since the Growth and Decline life cycle stages are the reference/base categories in the models 3, 6 and 9, the regression coefficient of the Maturity life cycle stage shows the (incremental) impact of the variable Maturity life cycle stage on the financial leverage ratios of the sample companies, relative to the Growth and Decline life cycle stages (excluded/reference/base categories). The (incremental) impact of the Maturity life cycle stage on the total debt ratio (b=-.033***, t=-3.869), long-term debt ratio (b=-.018***, t=-2.683) and short-term debt ratio (b=-.021***, t=-3.160), relative to the Growth and Decline life cycle stages, is negative and significant at the 0.01 level or better. However, the impact of the Maturity life cycle stage on the short-term debt ratio is only significant when the industry dummies are included in the model. This shows the importance to control for industry fixed effects. In other words, industry classifications have impact on the capital structure of the sample companies.

Moreover, it could be argued that the results are significant even after controlling for the impact of several firm-level control variables. Besides that, quite similar findings are also found after performing OLS regression analyses with different combinations of firm-level control variables (instead of full model) (results not reported). The findings are in line with the prediction, as predicted by the life cycle theory and pecking order theory, that companies may have substantially higher retained earnings during their Mature stages in comparison with Growth stages. In the Maturity life cycle stage, the demand for capital gradually decreases and the companies are able to meet the requirements of their development with the internally generated cash flows from operations, even though companies in Mature stage are able to borrow more easily and at a lower cost. Furthermore, mature companies have fewer investment opportunities. Therefore, companies in their Mature stages need less debt in

comparison with what they needed during their Growth stages. So, higher profitability makes it possible for the companies to use less debt. Additionally, these findings are in line with the U-shaped (high-low-high) leverage patterns which were found by Tian et al. (2015) and which were visible from the results of the univariate analysis. However, these findings are in contrast to the results which were found by Faff et al. (2016).

Overall, the OLS regression results suggest that, relative to the Growth and Decline life cycle stages, the Maturity life cycle stage is negatively and significantly associated with the leverage ratios. In other words, the companies in the Maturity life cycle stage have a lower leverage ratio (total debt ratio, long-term debt ratio and short-term debt ratio) compared to the companies in the Growth and Decline life cycle stages. Therefore, based on these findings, it can be argued that the hypothesis 2 of this research is supported. The robustness of this finding will be discussed in section 5.4.

5.3.3 Hypothesis 3: The impact of Decline life cycle stage on capital structure

The third hypothesis predicts that companies in the Decline life cycle stage have a higher financial leverage ratio (i.e. total debt ratio, long-term debt ratio and short-term debt ratio) than companies in the Maturity life cycle stage. The results in table 8 present that the companies in the Decline life cycle stage have indeed a higher financial leverage ratio than companies in the Maturity life cycle stage. This because of the regression coefficient of the variable Decline life cycle stage is positive and significant at the 0.01 level or better for all the measures of capital structure, with the exception of long-term debt ratio. Based on the results in table 8, it can be concluded that the Decline life cycle stage has no significant impact on the long-term debt ratio of the sample companies, although the sign of the regression coefficient is positive as predicted. However, this effect becomes positive and significant when the control variables tangibility 1 (net property, plant and equipment scaled by total assets) and size 1 (logarithm of total assets) are not included in the same regression model (results not reported). Besides that, when the control variables tangibility 1 (net property, plant and equipment scaled by total assets) and size 2 (logarithm of total sales) are included in the same regression model, the positive (incremental) impact of Decline life cycle stage on both total debt ratio and short-term debt ratio, relative to the Maturity life cycle stage, becomes not significant anymore (results not reported).

Since the Maturity life cycle stage is the reference/base category in the models 2, 5 and 8, the regression coefficient of the Decline life cycle stage shows the (incremental) impact of the variable Decline life cycle stage on the leverage ratios of the sample companies, relative to the Maturity life cycle stage (excluded/reference/base category). The (incremental) impact of the Decline life cycle stage on the total debt ratio (b=.028***, t=2.852) and short-term debt ratio (b=.020***, t=2.627), relative to the Maturity life cycle stage, is positive and significant at the 0.01 level or better. Further,

the impact of Decline life cycle stage on total debt ratio and short-term debt ratio is only significant when the industry dummies are included in the models. This shows the importance to control for industry fixed effects. In other words, industry classifications have impact on the total debt ratio and the short-term debt ratio of the sample companies.

Moreover, it could be argued that the results are significant even after controlling for the impact of several firm-level control variables. For example, moving from the maturity life cycle stage to the decline life cycle stage is associated with an increase of 2.8% and 2.0% in, respectively, total debt ratio and short-term debt ratio. These results are in line with the prediction, as predicted by the life cycle theory and pecking order theory, that the profits and also the retained earnings of the companies will decrease during the Decline stages. Accordingly, the companies have to take on debt again. The overall levels of liquidity are low and the volatility in cash flows is increased in the Decline life cycle stage. Furthermore, companies in the Decline life cycle stage may heavily rely on external debt financing in order to fund business restructuring and revitalization and to continue as a going concern. Additionally, these findings are in line with the U-shaped (high-low-high) leverage patterns which were found by Tian et al. (2015) and which were visible from the results of the univariate analysis. However, these findings are in contrast to the results which were found by Faff et al. (2016).

Overall, the regression results suggest that, compared to the Maturity life cycle stage, the Decline life cycle stage is positively and significantly associated with the leverage ratios (except with the long-term debt ratio). In other words, the companies in the Growth life cycle stage have a higher leverage ratio (total debt ratio and short-term debt ratio) compared to the companies in the Maturity life cycle stage. For example, moving from the Maturity life cycle stage to the Decline life cycle stage is associated with an increase of 2.8% and 2.0% in, respectively, total debt ratio and short-term debt ratio. Therefore, based on these findings, it can be argued that the hypothesis 3 of this research is partially supported, since there is not a significant effect found for Decline life cycle stage on long-term debt ratio. The robustness of this finding will be discussed in section 5.4.

5.3.4 Other findings

Looking at the adjusted R squares of the models 2, 5 and 8, these increase slightly compared to the adjusted R square of the baseline models (models 1, 4 and 7). This finding also accounts when including the dummy variable Maturity life cycle stage, since the adjusted R squares of the models 3, 6 and 8 are slightly higher compared to the adjusted R square of the baseline models (models 1, 4 and 7). Furthermore, it is noticeable that the adjusted R squares are the highest for the long-term debt ratio models with values between 14.3% and 15.5%. This will be followed by the total debt ratio models

with values between 7.4% and 8.6% and short-term debt ratio models with values between 5.3% and 5.9%.

Further, looking at the control variables, it is visible that all these variables are significant at the level of 0.1 or better for all the models (except the variable growth opportunities 1 in the models 4, 5 and 6). More specifically, the first control variable, LN_Size 1, shows a positive and significant effect on the total debt ratio, long-term debt ratio and short-term debt ratio at the level of 0.01 or better. This is effect is robust, since the coefficient of this control variable for the total debt ratio, long-term debt ratio and short-term debt ratio does not change in its sign and significance. Furthermore, the magnitude of these effects is more and less the same across all the models (including the baseline models). This result implies that when the companies become bigger, these companies will increase their leverage ratios.

Regarding the control variable profitability 1, it can be concluded that this variable has a robust significant and negative impact on the leverage ratios at the level of 0.01 or better. This finding shows that when the companies become more profitable, these companies will decrease their leverage ratios.

Besides that, table 8 shows that the control variable tangibility 1 has a significant and positive impact on the total debt ratio and short-term debt ratio at the level of 0.01 or better (models 1-6). This finding shows that when companies have more tangible assets, these companies will issue relatively more debt. These tangible assets can namely be seen as collateral which increase the certainty that a lender receives the money back in an occasion of default. In contrast to this finding, the variable tangibility 1 has a negative and significant effect on the short-term debt ratio (models 7-9).

Regarding the control variable growth opportunities 1, table 8 shows that this variable has a negative and significant effect on the total debt ratio and short-term debt ratio (models 1, 2, 3, 7, 8 and 9). This result shows that when companies have higher investment needs/growth opportunities, these companies will have a lower total debt ratio and short-term debt ratio. In contrast to this result, the negative coefficient is not significant for growth opportunities 1 on long-term debt ratio. Overall, these results show mixed evidences for the trade-off theory and the pecking order theory regarding the prediction of the control variables.

5.4 Robustness tests

Besides the regular regression analyses, also several robustness tests have been applied in order to increase the reliability and validity of the OLS regression results. For the regression results of these robustness tests, see Appendices D until H. These robustness tests include applying fixed effects regression analyses (individual heterogeneity), regression analyses without one-year lagged

independent variables (endogeneity problem), using alternative measure for the control variables, applying an alternative life cycle proxy (MLDA-analysis) and applying the regression analyses for subsamples (four different industries). The robustness of using alternative measures for the dependent variable (total debt ratio, long-term debt ratio and short-term debt ratio) is already taken into account in the discussion of table 8.

5.4.1 Robustness test using fixed effects regressions

Fixed effects regression analyses are performed in order to check whether the regression results are driven by firm-level unobserved heterogeneity. Regarding the fixed effects regression results, table 12 in appendix D shows that the fixed effects regression results are highly consistent with the main results in table 8. More specifically, the sign, magnitude and significance of the impacts of both independent variables (life cycle dummies) and the control variables on all the three measures of capital structure are highly similar. However, it is noticeable that the positive impact of Decline life cycle stage on the leverage ratios is not significant for fixed effects regressions. While, the positive impact of Decline life cycle stage on total debt ratio and short-term debt ratio is positive and significant at the level of 0.01 or better for the OLS regressions. Furthermore, in contrast to the main results, the negative impact of Maturity life cycle stage on the short-term debt ratio is not significant for the fixed effects regression.

Regarding the fixed effects regression results, the (incremental) impact of the Growth life cycle stage on the total debt ratio (b=0.084***, t=5.118), long-term debt ratio (b=0.082***, t=6.302) and short-term debt ratio (b=0.036***, t=2.755), relative to the Maturity life cycle stage, is positive and significant at the 0.01 level or better. Besides that, the (incremental) impact of the Maturity life cycle stage on the total debt ratio (b=-0.020**, t=-2.436) and long-term debt ratio (b=-0.019**, t=-2.853), relative to the Growth and Decline life cycle stages, is negative and significant at the 0.05 level. However, this negative impact is not significant on the short-term debt ratio (b=-0.008, t=-1.154). Furthermore, similar to the OLS regression result, there is also no significant effect found for the Decline life cycle stage on the long-term debt ratio for the fixed effects regression. However, in contrast to the main results, the predicted positive (incremental) impact of the Decline life cycle stage on the other leverage ratios, relative to the Maturity life cycle stage, is not significant for the fixed effects regressions.

Overall, although there are some noticeable differences, it can be argued that the OLS regression results are somewhat qualitatively similar to the results of the firm fixed effects regressions. Therefore, it can be argued that the results of this research are likely not much driven by firm-level unobserved heterogeneity.

5.4.2 Robustness test without lagged independent variables

In the regular regression analyses, the firm-specific independent variables of this research are lagged by one year in order to correct for the potential pitfalls of OLS and so to prevent potential reverse causality and autocorrelation. As a robustness check, I also performed the regression analyses without lagged firm-specific independent variables. When the results of both regressions are comparable, it can be assumed that endogeneity does not play a role in this research.

Regarding the OLS regression results without one-year lagged independent variables, table 13 in appendix E shows that the OLS regressions results without one-year lagged independent variables are consistent with the main results in table 8. More specifically, the sign, magnitude and significance of the impacts of both independent variables (life cycle dummies) and the control variables on all the three measures of capital structure are highly similar. However, it is noticeable that the impact of Maturity life cycle stage on long-term debt ratio is significant at the level of 0.1 for the OLS regression without lagged independent variables, while this impact is significant at the level of 0.01 or better for the OLS regression with one-year lagged independent variables. In contrary, it is visible that the impact of the variable profitability on the total debt ratio (model 2) is less significant when it is one-year lagged, relative to the significance level of the impact of the not lagged profitability variable (models 1, 2, 3, 8 and 9). Further, it is also visible that the magnitude of the impact of the one-year lagged profitability variable on the leverage ratios is clearly lower compared to the magnitude of the impact of not lagged profitability variable. Besides that, the models of table 13 show higher adjusted R squares compared to the models of table 8.

Regarding the OLS regression results without one-year lagged independent variables, the (incremental) impact of the Growth life cycle stage on the total debt ratio (b=.060***, t=3.743), long-term debt ratio (b=.050***, t=3.895) and short-term debt ratio (b=.038***, t=2.968), relative to the Maturity life cycle stage, is positive and significant at the 0.01 level or better. Besides that, the (incremental) impact of the Maturity life cycle stage on the total debt ratio (b=-.026***, t=-3.275) long-term debt ratio (b=-.011*, t=-1.741) and short-term debt ratio (b=-.021***, t=-3.285), relative to the Growth and Decline life cycle stages, is negative and significant at the 0.01, 0.1 and 0.01 level, respectively. Lastly, the (incremental) impact of the Decline life cycle stage on the total debt ratio (b=.031***, t=3.479) and short-term debt ratio (b=.023***, t=3.299), relative to the Maturity life cycle stage, is positive and significant at the 0.01 level or better. Similar to the OLS regression result with one-year lagged independent variables, there is also no significant effect found for the Decline life cycle stage on the long-term debt ratio for the OLS regression without lagged independent variables.

Overall, since the results of both regressions (with and without lagged independent variables) are comparable (same directions of the relationships), it can be assumed that endogeneity does not play a role in this research. This implies that the causality goes from the independent variables to the

measures of capital structure. Therefore, using one-year lagged independent variables does not have much impact on the results.

5.4.3 Robustness test using alternative measure for the control variables

As the robustness of using alternative measures for dependent variable (total debt ratio, long-term debt ratio and short-term debt ratio) is already taken into account in the discussion of table 8, in this section the results of the alternative measure for the control variables are discussed. More specifically, the alternative measure for the variables firm size, profitability, tangibility and growth opportunities. The definitions of these alternative measures for the control variables are described in table 1.

Regarding the OLS regression results with the alternative measure for the control variables, table 14 in appendix F shows that OLS regression results with alternative measure for the control variables are consistent with the main results in table 8. More specifically, the sign, magnitude and significance of the impacts of both independent variables (life cycle dummies) and the control variables on all the three measures of capital structure are highly similar. However, there are also some noticeable differences. Firstly, it is clearly visible that the negative and significant impact of profitability on the leverage ratios from table 8 is only visible for the models 5 and 6 of table 14. Furthermore, table 14 shows that the magnitude of the impact of the alternative measure for tangibility on short-term debt ratio is clearly higher compared to the main results in table 8 (models 7, 8 and 9). While, in contrast to the main results in table 8, there is no significant impact found on the total debt ratio for the alternative measure of tangibility. Lastly, it is noticeable that the adjusted R squares of the models with the alternative measure for the control variables are clearly higher compared to the models in table 8. This shows that the alternative measure for the control variables are able to explain relatively more variations in the capital structure of the listed non-financial German companies.

Looking at the impact of the life cycle dummies on the leverage ratios, when controlling for the impact of the alternative measure of the control variables, it can be argued that there are some changing results. Firstly, the expected positive (incremental) impact of the Decline life cycle stage on long-term debt ratio (b=0.015**, t=2.013), relative to the Maturity life cycle stage, become significant at the 0.05 level when controlling for the impact of the alternative measure of the control variables (model 5). While, this positive impact is not significant in the regular OLS regression analyses (model 5 in table 8). Besides that, the negative (incremental) impact of the Maturity life cycle stage on long-term debt ratio, relative to the Growth and Decline life cycle stages, become more significant when controlling for the impact of the alternative measure of the control variables (model 6). More specifically, a significant level of 0.01 or better instead of 0.1. However, in contrast to the main findings in table 8, the positive significant impact of the Decline life cycle stage on the short-term debt ratio at

the level of 0.01 or better, relative to the Maturity life cycle stage, disappears when controlling for the impact of the alternative measure of the control variables (model 8).

Overall, it can be argued that only the significance level of the impacts of some life cycle dummies changes when controlling for the impact of the alternative measure of the control variables. There are namely no changes in the sign of the impact of the life cycle dummies. Furthermore, the magnitude of the impact of the life cycle dummies is also highly similar in both OLS regression results (table 8 and 14).

5.4.4 Robustness test using MLDA-analysis as life cycle proxy

This section shows the fourth robustness test of this research. As discussed in the method section, I used the two-step cluster analysis as the main life cycle proxy and the multiclass linear discriminant analysis (MLDA) as a robustness check. More specifically, firstly the observations of this research are classified into three groups (Growth, Maturity and Decline life cycle stages) by applying the two-step cluster analysis. Afterwards, this classification is refined by performing the multiclass linear discriminant analysis (MLDA).

Regarding the OLS regression results with MLDA-analysis as life cycle proxy, table 15 in appendix G shows that OLS regression results with MLDA-analysis as life cycle proxy are consistent with the main results in table 8. More specifically, the sign, magnitude and significance of the impacts of both independent variables (life cycle dummies) and the control variables on all the three measures of capital structure are highly similar. These results could be highly similar, because of the fact that 96.5% of the original grouped cases are correctly classified into the same groups. In other words, 96.5% of the observations are correctly reclassified in the same life cycle stage after performing the MLDA-analysis (results not reported). Looking further in detail, the results of MLDA-analysis show that 76.6%, 96.9% and 100% of the observations are correctly reclassified into, respectively, Growth, Maturity and Decline life cycle stages (results not reported). However, there are also some noticeable differences. In contrast to the main results, the positive impact of Decline life cycle stage on total debt ratio is not significant. Further, the positive impact of Decline life cycle stage on the short-term debt ratio (model 8 of table 15) is less significant in comparison with the main results (model 8 of table 8).

5.4.5 Robustness test using subsamples (four different industry groupings)

This section shows the last robustness test of this research. This robustness test is applied in order to check whether the main results could be generalized to several industry groupings. There are namely empirical evidences found by prior studies that support the hypothesis that industry has an effect on

the capital structure of the companies. La Rocca et al. (2011) have, for example, found that the financial preferences of the companies are not homogeneous across industries.

Regarding the OLS regression results for the sample companies in the Manufacturing industry, table 16 in appendix H shows that the impact of the Growth life cycle stage on the leverage ratios is, in contrast to the main results in table 8, not significant (except model 5). Furthermore, the (incremental) impact of the Maturity life cycle stage on the long-term debt ratio, relative to the Growth and Decline life cycle stages, is not significant. While, this impact is negative and significant at the level of 0.1 for the full sample. Moreover, in contrast to the main results in table 8, the impact of the Decline life cycle stage on the long-term debt ratio is positive and significant at the level of 0.5. While, this impact is not significant for the full sample. Overall, concerning the OLS regression results for the sample companies in the Manufacturing industry, the impacts of the life cycle dummies only differ in terms of significance level compared to the main results in table 8, while the sign of the impacts are similar.

Looking at the impact of the life cycle dummies on the leverage ratios for the companies in the Information and Communication industry, table 17 in appendix H shows that these results are consistent with the main results in table 8. The only difference is that the positive (incremental) impact of the Decline life cycle stage on the measures of the capital structure, relative to the Maturity life cycle stage, is not significant for the sample companies in the Information and Communication industry. Furthermore, it is noticeable that the magnitude of the life cycle effects (Growth and Maturity life cycle stages) on the leverage ratios is clearly higher for the sample companies in the Information and Communication industry compared to the OLS regression results for full sample. Lastly, it is noticeable that the adjusted R square of the OLS regression models for the companies in the Information and Communication industry is clearly lower compared to the OLS regression models for the full sample. More specifically, total debt ratio models with adjusted R square values between 1.0% and 6.0%, long-term debt ratio models with values between 9.3% and 11.1% and shot-term debt ratio models with values between 2.7% and 7.8%.

The OLS regression results for the subsample “Mining, Construction, Retail and Transport” shows contradictory results. These results show namely contradictory signs for the impact of the life cycle stages on the leverage ratios. More specifically, in contrast to the expected positive impact, table 18 in appendix H shows that the Growth life cycle stage has a negative and significant effect on the total debt ratio (b=-0.126**, t=-2.150) and the short-term debt ratio (b=-0.093**, t=2.005), relative to the Maturity life cycle stage. Further, in contrast to the expected negative impact, the Maturity life cycle stage has a positive and significant impact on the short-term debt ratio (b=0.054***, t=2.649). These results support partially that the total debt ratio and the short-term debt ratio of the companies in the subsample “Mining, Construction, Retail and Transport” follow an inverted U-shaped pattern

(low-high-low pattern) in contrast to the expected the U-shaped pattern. Lastly, it is noticeable that the adjusted R square of the OLS regression models for the subsample “Mining, Construction, Retail and Transport” is clearly higher compared to the OLS regression models for the full sample. More specifically, total debt ratio models with adjusted R square values between 31.3% and 32.5%, long-term debt ratio models with values between 48.8% and 49.2% and short-term debt ratio models with values between 23.7% and 26.5%.

Regarding the OLS regression results for the subsample “Other service companies”, table 19 in appendix H shows that the impact of the Growth life cycle stage is, as predicted, positive and significant on the total debt ratio (b=0.102***, t=2.669) and long-term debt ratio (b=0.102***, t=3.238) at the 0.01 level or better. However, in contrast to the main results, there is no positive and significant impact found on the short-term debt ratio for the companies in the subsample “Other service companies”. Furthermore, in contrast to the main results in table 8, the (incremental) impact of the Decline life cycle stage, relative to the Maturity life cycle stage, is negative and significant on the short-term debt ratio (model 8). Besides that, the negative (incremental) impact of the Maturity life cycle stage, relative to the other life cycle stages, is only significant on the long-term debt ratio (model 6).

Overall, regarding the OLS regression results for the different subsamples (industry groupings), tables 16-19 in appendix H show that the OLS regression results for the different subsamples (industry groupings) are not always consistent with the main results in table 8. More specifically, the sign, magnitude and significance of the impacts of both independent variables (life cycle dummies) and the control variables on all the three measures of capital structure differ for some subsamples (industry groupings) compared to the main results in table 8. Furthermore, the explained variances in the dependent variables by the independent variables are also clearly higher or lower for some subsamples. Therefore, it can be assumed that the financial preferences and the leverage patterns along the life cycle of the sample companies vary across industries.

6 Conclusion

In this chapter the conclusion of this research is described. First, the main findings based on the results of this research are summarized. Second, the limitations of this research and the recommendations for future research are discussed.

6.1 Main findings

The purpose of this research is to examine the direct impact of the corporate life cycle stages on the capital structure of the German listed companies in the period of 2009 until 2017. Therefore, this research extends the life cycle literature by directly examining the role of corporate life cycle in influencing the capital structure. There is namely little research conducted with a focus on the direct impact of the corporate life cycle stages on the capital structure of the companies. In this section, the research question as discussed in chapter one is answered. The following research question was formulated: "*What is the impact of the corporate life cycle stages on the capital structure of German listed companies in the period of 2009 until 2017*?". In order to answer this research question, three hypotheses have been formulated that have been answered in chapter five. This research applied both ordinary least squares (OLS) and fixed effects regressions in order to test the hypotheses and to answer the research question.

The first hypothesis predicts that companies in the Growth life cycle stage have a higher financial leverage ratio (i.e. total debt ratio, long-term debt ratio and short-term debt ratio) than companies in the Maturity life cycle stage. This hypothesis is supported since the (incremental) impact of the Growth life cycle stage on the leverage ratios, relative to the Maturity life cycle stage, is positive and significant even after performing some robustness tests. This implies that moving from the Growth life cycle stage to the Maturity life cycle stage is associated with a decrease in the leverage ratios. However, this decrease is not significant for all companies across different industries. The positive and significant impact of the Growth life cycle stage on the leverage ratios, relative to the Maturity life cycle stage, for example, disappears for the companies in the Manufacturing industry. Besides that, the OLS regression results for the subsample "Mining, Construction, Retail and Transport" show that moving from the Growth life cycle stage to the Maturity life cycle stage is associated with an increase in the total debt ratio and short-term debt ratio, while there was a decrease expected.

The second hypothesis predicts that companies in the Maturity life cycle stage have a lower financial leverage ratio (i.e. total debt ratio, long-term debt ratio and short-term debt ratio) than companies in the Growth and Decline life cycle stages. This hypothesis is supported since the (incremental) impact of the Maturity life cycle stage on the leverage ratios, relative to the other life cycle stages, is negative and significant even after performing some robustness tests. However, this

negative (incremental) impact of the Maturity life cycle stage on the leverage ratios, relative to the other life cycle stages, is not significant for all companies across different industries. Furthermore, there is no significant impact found for the Maturity life cycle stage on the short-term debt ratio for the fixed effects regression.

The third hypothesis predicts that companies in the Decline life cycle stage have a higher financial leverage ratio (i.e. total debt ratio, long-term debt ratio and short-term debt ratio) than companies in the Maturity life cycle stage. This hypothesis is partially supported since the (incremental) impact of the Decline life cycle stage, relative to the Maturity life cycle stage, is not significant on the long-term debt ratio. In contrary, the impact on total debt ratio and short-term debt ratio is indeed, as predicted, positive and significant. This result implies that moving from the Maturity life cycle stage to the Decline life cycle stage is associated with an increase in total debt ratio and short-term debt ratio. However, this increase is not significant when performing some robustness tests. Furthermore, this increase is also not significant for all companies across different industries. The positive and significant impact of the Decline life cycle stage on the leverage ratios, relative to the Maturity life cycle stage, for example, disappears for the companies in the Information and Communication industry and for companies in the subsample "Mining, Construction, Retail and Transport". Besides that, the OLS regression results for the subsample "Other service companies" show that moving from the Maturity life cycle stage to the Decline life cycle stage is associated with a decrease in the short-term debt ratio, while there was an increase expected.

Overall, the main findings of this research support partially the predictions, as predicted by the life cycle theory and pecking order theory, that the leverage ratios will follow a U-shaped (high-low-high) pattern along the corporate life cycle of the sample companies. This is in line with the reasoning that during the early stages of the companies' life cycle, the companies are often less profitable and the information asymmetry is higher. Although, these conditions could reverse during the later stages, companies in their growth stages may have no or less retained earnings to finance their higher investment needs. In such times, companies raise the maximum available debt before they raise external equity. In contrary, companies may have substantially higher retained earnings during their mature stages in comparison with growth stages. Therefore, companies in their mature stages need less debt in comparison with what they needed during their growth stages. So, higher profitability makes it possible for the companies to use less debt. The profits and also the retained earnings will decrease during the decline stages. Accordingly, the companies have to take on debt again.

Furthermore, these results are in line with the U-shaped (high-low-high) leverage patterns/movements which was found by Tian et al. (2015). However, the results of this research are in contrast to the results which were found by Faff et al. (2016). Faff et al. (2016) found, for example, also a non-linear relation between debt issuance and corporate life cycle. However, they found that

the debt issuances follow a “hump” shaped pattern (low-high-low) along the corporate life cycle of their sample companies. Besides that, Ahsan et al. (2016) and Rehman et al. (2016) found, in contrast to the results of this research, a low-high-low leverage pattern across the Growth, Maturity and Decline life cycle stages, respectively. These contrasting results could arise, because of the different institutional contexts of the sample companies and the different time frames (sample periods).

6.2 Limitations and recommendations

This section discusses the limitations of this study and the recommendations for future research. Even though this research showed some relevant results in the context of the impact of corporate life cycle on the capital structure in the German context, it is crucial to comment that there are several limitations concerning this research. One of the limitations is that this research only examined publicly listed companies (public companies). The publicly listed companies are exposed to certain legislations and regulations in contrast to the privately held companies. As a consequence, the results of this research are not/very limited generalizable to the privately held companies (unlisted/private companies). It could namely be that the impact of the corporate life cycle stages is different for privately held companies. Furthermore, it can be assumed that the institutional context of the companies has impact on the capital structure of those companies. In other words, there are systematic differences in the capital structure of companies that operate in different institutional contexts. Therefore, the results of this research cannot be generalized to other institutional contexts. This research focusses namely only on German listed companies. Further, the regression results show that the impact of the corporate life cycle stages on the leverage ratios (i.e. total debt ratio, long-term debt ratio and short-term debt ratio) depends on the industry grouping in which a company operates. Therefore, as predicted, the results of this research are not generalizable for all companies in different industries. Lastly, there is a harsh sampling criterion which required that the data which is needed to calculate and/or to measure the variables of interest of this research (dependent, independent and control variables) need to be available in Orbis for the sample companies during the entire sample period. In other words, companies with missing financial data/values are excluded from the sample. Therefore, this study could suffer from the survivorship bias, since only successful companies will remain in the sample.

Based on the results and the limitations of this research, some recommendations for future research concerning corporate life cycle on capital structure could be given. The first recommendation is that it would be interesting to do a similar research in different countries and perhaps with more years. In order to assess the generalizability of the results, future research could examine whether the impact of corporate life cycle stages on capital structure differs per country. Furthermore, the second

recommendation is that future research should also focus on the private/unlisted companies and perhaps in the German context. Most of the empirical studies concerning the relationship between corporate life cycle and capital structure focus primarily on public companies (publicly listed companies), while private/unlisted companies are generally neglected. However, private/unlisted companies are a very important group of companies which have certain characteristics. Therefore, future research should also focus more on the impact of corporate life cycle on capital structure for private/unlisted companies. The last recommendation is concerning the measurement of the corporate life cycle. There are namely more life cycle proxies which could be applied in order to classify the observations into different life cycle stages. Further, the number of the life cycle stages can be also different. Therefore, future research should focus also on applying other life cycle proxies to classify the observations into different life cycle stages. This should be done in order to assess whether the impact of the corporate life cycle stages on the capital structure is similar when applying different life cycle proxies and stages.

References

Adizes, I. (1979). Organizational passages-diagnosing and treating lifecycle problems of organizations. *Organizational Dynamics*, *8*(1), 3-25. https://doi.org/10.1016/0090-2616(79)90001-9

Ahsan, T., Wang, M., & Qureshi, M. A. (2016). How do they adjust their capital structure along their life cycle? An empirical study about capital structure over life cycle of Pakistani firms. *Journal of Asia Business Studies*, *10*(3), 276-302. https://doi.org/10.1108/JABS-06-2015-0080

Akbar, A., Akbar, M., Tang, W., & Qureshi, M. (2019). Is bankruptcy risk tied to corporate life-cycle? evidence from Pakistan. *Sustainability, 11*(3), 678-678. doi:10.3390/su11030678

Akhtar, S. M. (2012). Capital structure and business cycles. *Accounting and Finance*, *52*, 25-48. https://doi.org/10.1111/j.1467-629X.2011.00425.x

Al-Hadi, A., Hasan, M., & Habib, A. (2016). Risk committee, firm life cycle, and market risk disclosures. *Corporate Governance: An International Review, 24*(2), 145-170. doi:10.1111/corg.12115

Al-Hadi, A., Chatterjee, B., Yaftian, A., Taylor, G., & Hasan, M. (2017). Corporate social responsibility performance, financial distress and firm life cycle: Evidence from Australia. *Accounting & Finance*, *59*(2), 961-989. https://doi.org/10.1111/acfi.12277

Anthony, J. H., & Ramesh, K. (1992). Association between accounting performance measures and stock prices. A test of the life cycle hypothesis. *Journal of Accounting and Economics*, *15*(2-3), 203-227. https://doi.org/10.1016/0165-4101(92)90018-W

Bakarich, K., Hossain, M., & Weintrop, J. (2019). Different time, different tone: Company life cycle. *Journal of Contemporary Accounting & Economics, 15*(1), 69-86. doi:10.1016/j.jcae.2018.12.002

Baker, M., & Wurgler, J. (2002). Market timing and capital structure. *The Journal of Finance*, *57*(1), 1-32. https://doi.org/10.1111/1540-6261.00414

Barclay, M., & Smith, C. (2005). The capital structure puzzle: The evidence revisited. *Journal of Applied Corporate Finance*, *17*(1), 8-17.

Berger, A. N., & Udell, G. F. (1998). The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle. *Journal of Banking & Finance*, *22*(6-8), 613-673.

Booth, L., Aivazian, V., Demirgüç-Kunt, A., & Maksimovic, V. (2001). Capital structures in developing countries. *Journal of Finance*, *56*(1), 87-130.

Brealey, R., Myers, S., & Allen, F. (2017). *Principles of Corporate Finance (12th edition).* New York: McGraw-Hill.

Bulan, L., & Yan, Z. (2009). The pecking order of financing in the firm's life cycle. *Banking and Finance Letter*, *1*(3), 129-140.

Castro, P. C., Tascón, M. T., & Amor-Tapia, B. (2014). The role of life cycle on the firm's capital structure. *Pecvnia: Revista de La Facultad de Ciencias Económicas y Empresariales, Universidad de León*, (19), 131-155. https://doi.org/10.18002/pec.v0i19.3585

Castro, P., Tascón Fernández, M. T., Amor-Tapia, B., & de Miguel, A. (2016). Target leverage and speed of adjustment along the life cycle of European listed firms. *BRQ Business Research Quarterly*, *19*(3), 188-205. https://doi.org/10.1016/j.brq.2016.01.003

Castro, P., Tascón, M.T., Amor-Tapia, B., (2015). Dynamic analysis of the capital structure in technological firms based on their life cycle stages. *Span. J. Finance Account*. *44*(4), 458-486.

Chen, J. J. (2004). Determinants of capital structure of Chinese-listed companies. *Journal of Business Research*, *57*(12), 1341-1351. https://doi.org/10.1016/S0148-2963(03)00070-5

Chen, J., & Strange, R. (2005). The determinants of capital structure: Evidence from Chinese listed companies. *Economic Change and Restructuring*, *38*(1), 11-35. https://doi.org/10.1007/s10644-005-4521-7

Chuang, K. (2017). Corporate life cycle, investment banks and shareholder wealth in m&as. *Quarterly Review of Economics and Finance, 63*, 122-134.

DeAngelo, H., L. DeAngelo, and R. M. Stulz. (2006). Dividend policy and the earned/contributed capital mix: a test of the life-cycle theory. *Journal of Financial Economics*, *81*(2), 227-254.

DeAngelo, H., DeAngelo, L., & Stulz, R. M. (2010). Seasoned equity offerings, market timing, and the corporate lifecycle. *Journal of Financial Economics*, *95*(3), 275-295.

De Jong, A., Kabir, R., & Nguyen, T.T. (2008), Capital structure around the world: The roles of firmand country-specific determinants*, Journal of Banking & Finance*, *32*(9), 1954-1969.

Diamond, D. (1991). Monitoring and reputation: The choice between bank loans and directly placed debt. *Journal of Political Economy*, *99*(4), 689-721.

Dickinson, V. (2011). Cash flow patterns as a proxy for firm life cycle. *The Accounting Review*, *86*(6), 1969-1994. https://doi.org/10.2308/accr-10130

Dickinson, V., Kassa, H., & Schaberl, P. (2018). What information matters to investors at different stages of a firm's life cycle? *Advances in Accounting, Incorporating Advances in International Accounting, 42*, 22-33. doi:10.1016/j.adiac.2018.07.002

Eulaiwi, B., Al-Hadi, A., Hussain, S., & Al Yahyaee, K. (Accepted/In press). Investment Committee, Corporate Cash Holdings and Corporate Life Cycle. *International Review of Finance*. https://doi.org/10.1111/irfi.12240

Faff, R., Kwok, W. C., Podolski, E. J., & Wong, G. (2016). Do corporate policies follow a life-cycle? *Journal of Banking & Finance*, *69*, 95-107. https://doi.org/10.1016/j.jbankfin.2016.04.009

Fama, E., & French, K. (2002). Testing tradeoff and pecking order predictions about dividends and debt. *Review of Financial Studies*, *15*(1), 1-33.

Fan, J. P., Titman, S., & Twite, G. (2012). An international comparison of capital structure and debt maturity choices. *Journal of Financial and Quantitative Analysis*, *47*(1), 23-56.

Fischer, E. O., Heinkel, R., & Zechner, J. (1989). Dynamic capital structure choice: theory and tests. *The Journal of Finance*, *44*(1), 19-40.

Frank, M. Z., & Goyal, V. K. (2003). Testing the pecking order theory of capital structure. *Journal of Financial Economics*, *67*(2), 217-248. https://doi.org/10.1016/S0304-405X(02)00252-0

Frank, M. Z., & Goyal, V. K. (2009). Capital structure decisions: Which factors are reliably important? *Financial Management*, *38*(1), 1-37. https://doi.org/10.2139/ssrn.567650

Frielinghaus, A., Mostert, B., & Firer, C. (2005). Capital structure and the firm's life stage. *South African Journal of Business Management*, *36*(4), 9-18.

González, V., & González, F. (2008). Influence of bank concentration and institutions on capital structure: New international evidence. *Journal of Corporate Finance, 14*(4), 363-375. doi:10.1016/j.jcorpfin.2008.03.010

Habib, A., & Hasan, M. (2019). Corporate life cycle research in accounting, finance and corporate governance: A survey, and directions for future research. *International Review of Financial Analysis, 61*, 188-201. doi:10.1016/j.irfa.2018.12.004

Habib, A., & Hasan, M. (2017). Firm life cycle, corporate risk-taking and investor sentiment. *Accounting and Finance, 57*(2), 465-497. doi:10.1111/acfi.12141

Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R.E. (2014). *Multivariate Data Analysis: Pearson New International Edition (seventh edition)*. Harlow, Essex: Pearson Education Limited.

Hall, G., Hutchinson, P., & Michaelas, N. (2000). Industry effect on the determinants of unquoted SME's capital structure. *International Journal of the Economics of Business, 7*(3), 297-312.

Hall, G., Hutchinson, P., & Michaelas, N. (2004). Determinants of the capital structure of European SMEs. *Journal of Business Finance and Accounting*, *31*(5), 711-728.

Harris, M., & Raviv, A. (1991). The theory of capital structure. *The Journal of Finance*, *46*(1), 297-355.

Hasan, M., Al-Hadi, A., Taylor, G., & Richardson, G. (2017). Does a firm's life cycle explain its propensity to engage in corporate tax avoidance? *European Accounting Review, 26*(3), 469-501. doi:10.1080/09638180.2016.1194220

Hasan, M., & Habib, A. (2017a). Corporate life cycle, organizational financial resources and corporate social responsibility. *Journal of Contemporary Accounting & Economics, 13*(1), 20-36. doi:10.1016/j.jcae.2017.01.002

Hasan, M., & Habib, A. (2017b). Firm life cycle and idiosyncratic volatility. *International Review of Financial Analysis, 50*, 164-175. doi:10.1016/j.irfa.2017.01.003

Hasan, M., Hossain, M., Cheung, A., & Habib, A. (2015). Corporate life cycle and cost of equity capital. *Journal of Contemporary Accounting & Economics, 11*(1), 46-60. doi:10.1016/j.jcae.2014.12.002

Hasan, M., & Cheung, A. (2018). Organization capital and firm life cycle. *Journal of Corporate Finance, 48*, 556-578. doi:10.1016/j.jcorpfin.2017.12.003

Hirsch, J., & Walz, U. (2011). Financing decisions along a firm's life-cycle: Debt as a commitment device. *European Financial Management, 17*(5), 898-927. doi:10.1111/j.1468 036X.2011.00618.x

Hovakimian, A., Opler, T., & Titman, S. (2001). The debt-equity choice. *Journal of Financial and Quantitative analysis*, 36(1), 1-24.

Huang, R., & Ritter, J. (2009). Testing theories of capital structure and estimating the speed of adjustment. *Journal of Financial and Quantitative Analysis, 44*(2), 237-237. doi:10.1017/S0022109009090152

Huang, G., & Song, F. M. (2006). The determinants of capital structure: Evidence from China. *China Economic Review*, *17*(1), 14-36. https://doi.org/10.1016/j.chieco.2005.02.007

Jovanovic, B. (1982). Selection and the evolution of industry. *Econometrica, 50*(3), 649-649. doi:10.2307/1912606

Kayhan, A., & Titman, S. (2007). Firms' histories and their capital structures. *Journal of Financial Economics*, *83*(1), 1-32.

Kayo, E. K., & Kimura, H. (2011). Hierarchical determinants of capital structure. *Journal of Banking & Finance*, *35*(2), 358-371. https://doi.org/10.1016/j.jbankfin.2010.08.015

Keasey, K., Martinez, B., & Pindado, J. (2015). Young family firms: Financing decisions and the willingness to dilute control. *Journal of Corporate Finance, 34*, 47-63. doi:10.1016/j.jcorpfin.2015.07.014

Koh, S., Durand, R., Dai, L., & Chang, M. (2015). Financial distress: Lifecycle and corporate restructuring. *Journal of Corporate Finance, 33*, 19-33. doi:10.1016/j.jcorpfin.2015.04.004

Kraus, A., & Litzenberger, R. H. (1973). A state-preference model of optimal financial leverage. *The Journal of Finance*, *28*(4), 911-922.

La Rocca, M., La Rocca, T., & Cariola, A. (2011). Capital structure decisions during a firm's life cycle. *Small Business Economics*, *37*(1), 107-130. https://doi.org/10.1007/s11187-009-9229-z

Lemmon, M.L. & Zender, J.F. (2010). Debt capacity and tests of capital structure theories. *Journal of Financial and Quantitative Analysis*, *45*(5), 1161-1187.

Liu, H., & Gao, Y. (2019). The impact of corporate lifecycle on fama-french three-factor model. *Physica A: Statistical Mechanics and Its Applications, 513*, 390-398. doi:10.1016/j.physa.2018.09.037

Loderer, C., Stulz, R., & Waelchli, U. (2016). Firm rigidities and the decline in growth opportunities. *Management Science*, *63*(9), 3000-3020.

Michaelas, N., Chittenden, F., & Poutziouris, P. (1999). Financial policy and capital structure choice in U.K. SMEs: Empirical evidence from company panel data. *Small Business Economics*, *12*(2), 113-130. https://doi.org/10.1023/A:1008010724051

Miller, D., & Friesen, P. H. (1984). A Longitudinal Study of the Corporate Life Cycle. *Management Science*, *30*(10), 1161-1183.

Miller, M.H. (1988). The Modigliani-Miller propositions after thirty years. *Journal of Economic Perspectives*, *2*(4), 99-120.

Mintzberg, H. (1984). Power and Organization Life Cycles. *Academy of Management Review*, *9*(2), 207-224. https://doi.org/10.1007/sl0869-007-9037-x

Modigliani, F., & Miller, M. H. (1958). The Cost of Capital. *The American Economic Review*, *48*(3), 261-297.

Myers, S.C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, *5*(2), 147-175.

Myers, S. C. (1984). The Capital Structure Puzzle. *The Journal of Finance*, *39*(3), 575-592. https://doi.org/10.1093/rfs/8.4.1185

Myers, S. C. (2001). Capital Structure. *The Journal of Economic Perspectives*, *15*(2), 81-102.

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, *13*(2), 187-221. https://doi.org/10.1016/0304-405X(84)90023-0

O'Connor, T., & Byrne, J. (2015). Governance and the corporate life-cycle. *International Journal of Managerial Finance*, *11*(1), 23-43.

Owen, S., & Yawson, A. (2010). Corporate life cycle and m&a activity. *Journal of Banking & Finance, 34*(2), 427-440. doi:10.1016/j.jbankfin.2009.08.003

Pinková, P., & Kamínková, P. (2012). Corporate life cycle as determinant of capital structure in companies of Czech automotive industry. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, *60*(2), 255-260. https://doi.org/10.11118/actaun201260020255

Psillaki, M., & Daskalakis, N. (2009). Are the determinants of capital structure country or firm specific? *Small Business Economics*, *33*(3), 319-333. https://doi.org/10.1007/s11187-008-9103-4

Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. *The Journal of Finance*, *50*(5), 1421-1460. https://doi.org/10.1111/j.1540-6261.1994.tb00086.x

Rehman, A., Wang, M., & Yu, H. (2016). Dynamics of financial leverage across firm life cycle in Chinese firms: An empirical investigation using dynamic panel data model. *China Finance and Economic Review*, *4*(1), 1-22.

Ross, A.R., Westerfield, R. W, & Jordan, B.D. (2014). *Essentials of Corporate Finance (eight edition).* New York: McGraw-Hill/Irwin.

Shyam-Sunder, L., & Myers, S. C. (1999). Testing static tradeoff against pecking order models of capital structure. *Journal of Financial Economics*, *51*(2), 219-244.

Tian, L., Han, L., & Zhang, S. (2015). Business life cycle and capital structure: Evidence from Chinese manufacturing firms. *China & World Economy*, *23*(2), 22-39. https://doi.org/10.1111/cwe.12105

Titman, S., & Wessels, R. (1988), The determinants of Capital Structure Choice. *The Journal of Finance*, *43*(1), 1-19.

Van der Wijst, D., & Thurik, R. (1993). Determinants of small firm debt ratios: An analysis of retail panel data. *Small Business Economics*, *5*(1), 55-65.

Wernerfelt, B. (1985). The dynamics of prices and market shares over the product life cycle. *Management Science, 31*(8), 928-939. doi:10.1287/mnsc.31.8.928

Zhao, T., & Xiao, X. (2018). The impact of corporate social responsibility on financial constraints: Does the life cycle stage of a firm matter? *International Review of Economics and Finance*. doi:10.1016/j.iref.2018.08.010

Appendices

Appendix A: Classification results: addition profitability/cashflow (EBITDA scaled by total assets)

Table 9: Descriptive statistics classification variables (life cycle descriptors)

	Growth life cycle stage		Maturity life cycle stage		Decline life cycle stage		ANOVA test on mean differences (F test and p value)
Classification variables (life cycle descriptors)	**Mean**	**Std.Deviation**	**Mean**	**Std.Deviation**	**Mean**	**Std.Deviation**	
Logarithm of age	2.92	0.62	3.08	0.50	4.74	0.36	4188.629***
RETA	-4.11	4.45	0.02	0.47	0.20	0.24	1049.860***
Sales growth	0.42	0.84	0.06	0.20	0.04	0.14	1556.578***
Profitability/cashflow	-0.19	0.31	0.11	0.10	0.11	0.07	656.737***
# observations	224		1527		1015		
% Observations	8.09%		55.21%		36.70%		

*Notes: This table shows the descriptive statistics for the classification variables (life cycle descriptors) and the results of the ANOVA test on mean differences for these variables between the different life cycle stages. The definitions of these variables are described in section 3.4.2. ***. - Mean differences significant at the 0.01 level. **. – Mean differences significant at the 0.05 level. *. – Mean differences significant at the 0.1 level.*

Appendix B: Classification results: replacement RETA by RETA growth (% change in RETA)

Table 10: Descriptive statistics classification variables (life cycle descriptors)

	Growth life cycle stage		Maturity life cycle stage		Decline life cycle stage		ANOVA test on mean differences (F test and p value)
Classification variables (life cycle descriptors)	**Mean**	**Std.Deviation**	**Mean**	**Std.Deviation**	**Mean**	**Std.Deviation**	
Logarithm of age	3.09	0.90	3.08	0.51	4.77	0.34	3963.535***
% change in RETA	-41.37	440.02	0.09	4.79	0.07	2.87	11.900***
Sales growth	1.37	0.53	0.05	0.22	0.04	0.14	1556.578***
# observations	81		1690		969		
% Observations	2.96%		61.68%		35.36%		

*Notes: This table shows the descriptive statistics for the classification variables (life cycle descriptors) and the results of the ANOVA test on mean differences for these variables between the different life cycle stages. The definitions of these variables are described in section 3.4.2. ***. - Mean differences significant at the 0.01 level. **. – Mean differences significant at the 0.05 level. *. – Mean differences significant at the 0.1 level.*

Appendix C: Classification results: sub-sample analysis (random 50% of the sample)

Table 11: Descriptive statistics classification variables (life cycle descriptors)

	Growth life cycle stage		Maturity life cycle stage		Decline life cycle stage		ANOVA test on mean differences (F test and p value)
Classification variables (life cycle descriptors)	**Mean**	**Std.Deviation**	**Mean**	**Std.Deviation**	**Mean**	**Std.Deviation**	
Logarithm of age	2.84	0.65	3.07	0.48	4.74	0.36	2206.863***
RETA	-4.77	4.72	0.01	0.45	0.21	0.23	632.707***
Sales growth	0.60	0.86	0.05	0.20	0.04	0.13	177.165***
# observations	106		756		512		
% Observations	7.72%		55.02%		37.26%		

*Notes: This table shows the descriptive statistics for the classification variables (life cycle descriptors) and the results of the ANOVA test on mean differences for these variables between the different life cycle stages. The definitions of these variables are described in section 3.4.2. ***. - Mean differences significant at the 0.01 level. **. – Mean differences significant at the 0.05 level. *. – Mean differences significant at the 0.1 level.*

Appendix D: Robustness test applying fixed effects regressions

Table 12: Fixed effects regression results for the impact of corporate life cycle stages on the leverage ratios (capital structure)

Variables	Expected sign	Total debt ratio			Long-term debt ratio			Short-term debt ratio		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept		0.402***	0.378***	0.419***	0.080***	0.055**	0.097***	0.372***	0.362***	0.378***
		(13.618)	(12.588)	(13.825)	(3.399)	(2.288)	(3.979)	(16.064)	(15.291)	(15.884)
Growth life cycle stage (t-1)	**+**		**0.084*** **			**0.082*** **			**0.036*** **	
			(5.118)			**(6.302)**			**(2.755)**	
Maturity life cycle stage (t-1)	**–**			**-0.020****			**-0.019****			**-0.008**
				(-2.436)			**(-2.853)**			**(-1.154)**
Decline life cycle stage (t-1)	**+**		**0.014**			**0.008**			**0.005**	
			(1.458)			**(0.266)**			**(0.681)**	
LN_Size 1 (t-1)		0.014***	0.015***	0.014***	0.010***	0.011***	0.009***	0.002	0.003*	0.002
		(8.564)	(8.738)	(8.212)	(7.305)	(7.968)	(6.914)	(1.587)	(1.912)	(1.435)
Profitability 1 (t-1)		-0.004***	-0.005**	-0.005***	-0.006***	-0.006***	-0.006***	-0.003**	-0.003**	-0.003**
		(-2.617)	(-2.590)	(-2.513)	(-4.229)	(-4.212)	(-4.109)	(-2.139)	(-2.121)	(-2.088)
Tangibility 1 (t-1)		0.150***	0.154***	0.142***	0.278***	0.285***	0.270***	-0.139***	-0.137***	-0.142***
		(6.825)	(6.787)	(6.384)	(15.795)	(15.730)	(15.204)	(-8.053)	(-7.654)	(-8.137)
Growth opportunities 1 (t-1)		-0.075***	-0.079***	-0.074***	-0.013	-0.018	-0.012	-0.073***	-0.075***	-0.073***
		(-3.900)	(-4.134)	(-3.850)	(-0.824)	(-1.151)	(-0.762)	(-4.845)	(-4.964)	(-4.820)
Year dummies		Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry dummies		Not Included	Not Included	Not Included	Not Included	Not Included	Not Included	Not Included	Not Included	Not Included
N		2527	2527	2527	2527	2527	2527	2527	2527	2527

*Notes: This table shows the unstandardized coefficients with their statistical significance. The t-statistics are represented in the parentheses. Furthermore, the definitions of these variables are described in table 1 and the sample is described in section 4. ***. - Correlation significant at the 0.01 level. **. – Correlation significant at the 0.05 level. *. – Correlation significant at the 0.10 level. As a robustness check, I performed fixed effects regression analyses in order to check whether the main regression results are driven by firm-level unobserved heterogeneity. When the results of these regressions are comparable with the main results (table 8), it can be argued that the results of this research are likely not driven by firm-level unobserved heterogeneity. The following empirical model is estimated:* $Leverage_{it} = \beta_0 + \beta_{1-3}LifeCycle_{i,t-1} + \beta_4 Profitabilty_{i,t-1} + \beta_5 Size_{i,t-1} + \beta_6 Tangibility_{i,t-1} + \beta_7 Growth_{i,t-1} + \beta_8 Year_i + a_i + \epsilon_{it}$*. Models 1, 4 and 7 of this table are the baseline models which include only the control variables. Models 2, 5 and 8 of this table include also the life cycle dummies Growth and Decline life cycle stages. These models are used for testing hypotheses 1 and 3. These models only include the life cycle dummies Growth and Decline life cycle stages since the purpose of hypotheses 1 and 3 is to measure the (incremental) impact of these life cycle stages on the debt ratios, relative to the Maturity life cycle stage (reference/excluded/base group). This in order to investigate whether companies in the Growth and Decline life cycle stages have higher debt ratios compared to companies in the Maturity life cycle stage. The (incremental) impact of the Growth and Decline life cycle stages, relative to the Maturity life cycle stage (reference/excluded/base category), on the debt ratios of the sample companies is captured respectively by the* β_1 *and* β_2 *terms of the models 2, 5 and 8. While, the models 3, 6 and 9 of this table only include the life cycle dummy Maturity life cycle stage and are applied in order to test hypothesis 2. This because of the purpose of hypothesis 2 is to measure the (incremental) impact of Maturity life cycle stage on debt ratios, relative to other life cycle stages (reference/excluded/base groups). In other words, investigating whether companies in the Maturity life cycle stage have lower debt ratios compared to companies in other life cycle stages. The (incremental) impact of the Maturity life cycle stage, relative to the other life cycle stages (reference/excluded/base groups), on the debt ratios of the sample companies is captured by the* β_1 *term of the models 3, 6 and 9.*

Appendix E: Robustness test without lagged variables (endogeneity problem)

Table 13: OLS regression results for the impact of corporate life cycle stages on the leverage ratios (capital structure) without lagged variables

Variables	Expected sign	Total debt ratio			Long-term debt ratio			Short-term debt ratio		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept		0.289***	0.280***	0.314***	0.057***	0.045***	0.068***	0.266***	0.260***	0.286***
		(12.682)	(11.795)	(13.088)	(3.120)	(2.355)	(3.511)	(14.762)	(13.866)	(15.068)
Growth life cycle stage	+		**0.060*** **			**0.050*** **			**0.038*** **	
			(3.743)			**(3.895)**			**(2.968)**	
Maturity life cycle stage	_			**-0.026*** **			**-0.011* **			**-0.021*** **
				(-3.275)			**(-1.741)**			**(-3.285)**
Decline life cycle stage	+		**0.031*** **			**0.008**			**0.023*** **	
			(3.479)			**(1.057)**			**(3.299)**	
LN_Size 1		0.021***	0.020***	0.020***	0.013***	0.013***	0.013***	0.005***	0.005***	0.005***
		(12.680)	(11.924)	(12.166)	(9.972)	(9.946)	(9.663)	(4.168)	(3.657)	(3.711)
Profitability 1		-0.255***	-0.226***	-0.239***	-0.187***	-0.160***	-0.181***	-0.107***	-0.089***	-0.094***
		(-9.742)	(-8.194)	(-9.015)	(-8.911)	(-7.245)	(-8.459)	(-5.141)	(-4.059)	(-4.479)
Tangibility 1		0.207***	0.202***	0.201***	0.281***	0.284***	0.278***	-0.078***	-0.083***	-0.083***
		(9.501)	(9.138)	(9.184)	(16.030)	(15.973)	(15.814)	(-4.514)	(-4.744)	(-4.798)
Growth opportunities 1		-0.053***	-0.058***	-0.054***	-0.004	-0.010	-0.004	-0.054***	-0.056***	-0.055***
		(-3.206)	(-3.471)	(-3.285)	(-0.263)	(-0.733)	(-0.303)	(-3.837)	(-4.252)	(-4.174)
Year dummies		Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry dummies		Included	Included	Included	Included	Included	Included	Included	Included	Included
N		2888	2888	2888	2888	2888	2888	2888	2888	2888
Adjusted R Square		0.104	0.111	0.107	0.169	0.172	0.169	0.056	0.062	0.059

*Notes: This table shows the unstandardized coefficients with their statistical significance. The t-statistics are represented in the parentheses. Furthermore, the definitions of these variables are described in table 1 and the sample is described in section 4. ***. - Correlation significant at the 0.01 level. **. – Correlation significant at the 0.05 level. *. – Correlation significant at the 0.10 level. As a robustness check, I performed the regression analyses without lagged firm-specific independent variables. When the results of these regressions are comparable with the main results (table 8), it can be assumed that endogeneity does not play a role in this research. The following empirical model is estimated:* $Leverage_{it} = \beta_0 + \beta_{1-3} LifeCycle_{i,t} + \beta_4 Profitabilty_{i,t} + \beta_5 Size_{i,t} + \beta_6 Tangibility_{i,t} + \beta_7 Growth_{i,t} + \beta_8 Industry_{i,t} + \beta_9 Year_i + \epsilon_{it}$*. Models 1, 4 and 7 of this table are the baseline models which include only the control variables. Models 2, 5 and 8 of this table include also the life cycle dummies Growth and Decline life cycle stages. These models are used for testing hypotheses 1 and 3. These models only include the life cycle dummies Growth and Decline life cycle stages since the purpose of hypotheses 1 and 3 is to measure the (incremental) impact of these life cycle stages on the debt ratios, relative to the Maturity life cycle stage (reference/excluded/base group). This in order to investigate whether companies in the Growth and Decline life cycle stages have higher debt ratios compared to companies in the Maturity life cycle stage. The (incremental) impact of the Growth and Decline life cycle stages, relative to the Maturity life cycle stage (reference/excluded/base category), on the debt ratios of the sample companies is captured respectively by the* β_1 *and* β_2 *terms of the models 2, 5 and 8. While, the models 3, 6 and 9 of this table only include the life cycle dummy Maturity life cycle stage and are applied in order to test hypothesis 2. This because of the purpose of hypothesis 2 is to measure the (incremental) impact of Maturity life cycle stage on debt ratios, relative to other life cycle stages (reference/excluded/base groups). In other words, investigating whether companies in the Maturity life cycle stage have lower debt ratios compared to companies in other life cycle stages. The (incremental) impact of the Maturity life cycle stage, relative to the other life cycle stages (reference/excluded/base groups), on the debt ratios of the sample companies is captured by the* β_1 *term of the models 3, 6 and 9.*

Appendix F: Robustness test using alternative measure for the control variables

Table 14: OLS regression results for the impact of corporate life cycle stages on the leverage ratios (capital structure) using alternative measure for the control variables

Variables	Expected sign	Total debt ratio			Long-term debt ratio			Short-term debt ratio		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept		0.341***	0.306***	0.355***	0.078***	0.072***	0.100***	0.275***	0.276***	0.307***
		(11.652)	(11.288)	(8.864)	(3.566)	(3.221)	(4.209)	(13.735)	(13.659)	(14.185)
Growth life cycle stage (t-1)	**+**		**0.152*** **			**0.089*** **			**0.104*** **	
			(8.383)			**(5.956)**			**(7.680)**	
Maturity life cycle stage (t-1)	**–**			**-0.043*** **			**-0.026*** **			**-0.026*** **
				(-5.111)			**(-3.702)**			**(-4.070)**
Decline life cycle stage (t-1)	**+**		**0.018***			**0.015** **			**0.000**	
			(1.926)			**(2.013)**			**(0.058)**	
LN_Size 2 (t-1)		0.023***	0.027***	0.022***	0.007***	0.009***	0.007***	0.014***	0.017***	0.013***
		(15.455)	(16.559)	(14.865)	(6.035)	(6.968)	(5.598)	(12.282)	(13.860)	(11.789)
Profitability 2 (t-1)		0.003	0.004	0.002	-0.005	-0.004***	-0.005*	0.001	0.002	0.001
		(0.746)	(1.166)	(0.718)	(-1.644)	(-1.385)	(-1.671)	(0.451)	(0.897)	(0.427)
Tangibility 2 (t-1)		0.016	0.022	0.014	0.240***	0.243***	0.238***	-0.239***	-0.234***	-0.240***
		(0.883)	(1.220)	(0.745)	(15.897)	(16.178)	(15.828)	(-17.344)	(-17.128)	(-17.506)
Growth opportunities 2 (t-1)		-0.040***	-0.099***	-0.050***	-0.016	-0.049***	-0.021**	-0.027***	-0.068***	-0.032***
		(-3.034)	(-6.596)	(-3.757)	(-1.440)	(-3.982)	(-1.963)	(-2.715)	(-6.146)	(-3.284)
Year dummies		Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry dummies		Included	Included	Included	Included	Included	Included	Included	Included	Included
N		2463	2463	2463	2463	2463	2463	2463	2463	2463
Adjusted R Square		0.100	0.125	0.109	0.166	0.178	0.170	0.174	0.193	0.179

*Notes: This table shows the unstandardized coefficients with their statistical significance. The t-statistics are represented in the parentheses. Furthermore, the definitions of these variables are described in table 1 and the sample is described in section 4. ***. - Correlation significant at the 0.01 level. **. – Correlation significant at the 0.05 level. *. – Correlation significant at the 0.10 level. As the robustness of using alternative measures for dependent variable (total debt ratio, long-term debt ratio and short-term debt ratio) is already taken into account in table 8, this table presents the regression results using the alternative measure for the control variables. The following empirical model is estimated:* $Leverage_{it} = \beta_0 + \beta_{1-3}LifeCycle_{i,t-1} + \beta_4 Profitabilty_{i,t-1} + \beta_5 Size_{i,t-1} + \beta_6 Tangibility_{i,t-1} + \beta_7 Growth_{i,t-1} + \beta_8 Industry_{i,t} + \beta_9 Year_i + \epsilon_{it}$*. Models 1, 4 and 7 of this table are the baseline models which include only the control variables. Models 2, 5 and 8 of this table include also the life cycle dummies Growth and Decline life cycle stages. These models are used for testing hypotheses 1 and 3. These models only include the life cycle dummies Growth and Decline life cycle stages since the purpose of hypotheses 1 and 3 is to measure the (incremental) impact of these life cycle stages on the debt ratios, relative to the Maturity life cycle stage (reference/excluded/base group). This in order to investigate whether companies in the Growth and Decline life cycle stages have higher debt ratios compared to companies in the Maturity life cycle stage. The (incremental) impact of the Growth and Decline life cycle stages, relative to the Maturity life cycle stage (reference/excluded/base category), on the debt ratios of the sample companies is captured respectively by the* β_1 *and* β_2 *terms of the models 2, 5 and 8. While, the models 3, 6 and 9 of this table only include the life cycle dummy Maturity life cycle stage and are applied in order to test hypothesis 2. This because of the purpose of hypothesis 2 is to measure the (incremental) impact of Maturity life cycle stage on debt ratios, relative to other life cycle stages (reference/excluded/base groups). In other words, investigating whether companies in the Maturity life cycle stage have lower debt ratios compared to companies in other life cycle stages. The (incremental) impact of the Maturity life cycle stage, relative to the other life cycle stages (reference/excluded/base groups), on the debt ratios of the sample companies is captured by the* β_1 *term of the models 3, 6 and 9.*

Appendix G: Robustness test applying an alternative life cycle proxy (MLDA-analysis)

Table 15: OLS regression results for the impact of corporate life cycle stages on the leverage ratios (capital structure) applying an alternative life cycle proxy (MLDA-analysis)

Variables	Expected sign	Total debt ratio			Long-term debt ratio			Short-term debt ratio		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept		0.413***	0.379***	0.454***	0.104***	0.080***	0.127***	0.270***	0.334***	0.378***
		(13.366)	(12.389)	(14.523)	(5.377)	(3.253)	(5.038)	(14.309)	(13.887)	(15.446)
Growth life cycle stage (t-1)	**+**		**0.135*** **			**0.094*** **			**0.073*** **	
			(7.526)			**(6.529)**			**(5.194)**	
Maturity life cycle stage (t-1)	**–**			**-0.036*** **			**-0.016** **			**-0.025*** **
				(-4.181)			**(-2.263)**			**(-3.669)**
Decline life cycle stage (t-1)	**+**		**0.012**			**-0.004**			**0.013***	
			(1.271)			**(-0.462)**			**(1.757)**	
LN_Size 1 (t-1)		0.015***	0.019***	0.014***	0.009***	0.012***	0.008***	0.004***	0.005***	0.003***
		(9.107)	(10.372)	(8.602)	(6.570)	(8.165)	(6.275)	(3.039)	(3.874)	(2.610)
Profitability 1 (t-1)		-0.005**	-0.003*	-0.004**	-0.006***	-0.005***	-0.006***	-0.003***	-0.002	-0.003*
		(-2.516)	(-1.806)	(-2.321)	(-4.216)	(-3.604)	(-4.106)	(-2.050)	(-1.549)	(-1.877)
Tangibility 1 (t-1)		0.178***	0.195***	0.171***	0.254***	0.270***	0.251***	-0.088***	-0.081***	-0.093***
		(7.548)	(8.227)	(7.243)	(13.434)	(14.175)	(13.241)	(-4.756)	(-4.333)	(-5.026)
Growth opportunities 1 (t-1)		-0.080***	-0.089***	-0.078***	-0.013	-0.022	-0.013	-0.077***	-0.081***	-0.075***
		(-4.155)	(-4.669)	(-4.062)	(-0.879)	(-1.413)	(-0.822)	(-5.135)	(-5.416)	(-5.054)
Year dummies		Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry dummies		Included	Included	Included	Included	Included	Included	Included	Included	Included
N		2527	2527	2527	2527	2527	2527	2527	2527	2527
Adjusted R Square		0.074	0.094	0.080	0.143	0.157	0.144	0.053	0.063	0.057

*Notes: This table shows the unstandardized coefficients with their statistical significance. The t-statistics are represented in the parentheses. Furthermore, the definitions of these variables are described in table 1 and the sample is described in section 4. ***. - Correlation significant at the 0.01 level. **. – Correlation significant at the 0.05 level. *. – Correlation significant at the 0.10 level. This table presents, as a robustness check, the OLS regression results with MLDA-analysis as life cycle proxy. The following empirical model is estimated:* $Leverage_{it} = \beta_0 + \beta_{1-3}LifeCycle_{i,t-1} + \beta_4 Profitabilty_{i,t-1} + \beta_5 Size_{i,t-1} + \beta_6 Tangibility_{i,t-1} + \beta_7 Growth_{i,t-1} + \beta_8 Industry_{i,t} + \beta_9 Year_i + \epsilon_{it}$*. Models 1, 4 and 7 of this table are the baseline models which include only the control variables. Models 2, 5 and 8 of this table include also the life cycle dummies Growth and Decline life cycle stages. These models are used for testing hypotheses 1 and 3. These models only include the life cycle dummies Growth and Decline life cycle stages since the purpose of hypotheses 1 and 3 is to measure the (incremental) impact of these life cycle stages on the debt ratios, relative to the Maturity life cycle stage (reference/excluded/base group). This in order to investigate whether companies in the Growth and Decline life cycle stages have higher debt ratios compared to companies in the Maturity life cycle stage. The (incremental) impact of the Growth and Decline life cycle stages, relative to the Maturity life cycle stage (reference/excluded/base category), on the debt ratios of the sample companies is captured respectively by the* β_1 *and* β_2 *terms of the models 2, 5 and 8. While, the models 3, 6 and 9 of this table only include the life cycle dummy Maturity life cycle stage and are applied in order to test hypothesis 2. This because of the purpose of hypothesis 2 is to measure the (incremental) impact of Maturity life cycle stage on debt ratios, relative to other life cycle stages (reference/excluded/base groups). In other words, investigating whether companies in the Maturity life cycle stage have lower debt ratios compared to companies in other life cycle stages. The (incremental) impact of the Maturity life cycle stage, relative to the other life cycle stages (reference/excluded/base groups), on the debt ratios of the sample companies is captured by the* β_1 *term of the models 3, 6 and 9.*

Appendix H: Robustness test using subsamples (four different industries groups)

Table 16: OLS regression results for the impact of corporate life cycle stages on the leverage ratios (capital structure) of the sample companies in the Manufacturing industry.

		Manufacturing industry								
Variables	**Expected sign**	**Total debt ratio**			**Long-term debt ratio**			**Short-term debt ratio**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Intercept		0.320***	0.340***	0.346***	0.081**	0.070**	0.076**	0.298***	0.328***	0.332***
		(7.856)	(8.198)	(9.362)	(2.529)	(2.149)	(2.282)	(9.697)	(10.481)	(10.353)
Growth life cycle stage (t-1)	**+**		**-0.014**			**0.037***			**-0.029**	
			(-0.575)			**(1.916)**			**(1.599)**	
Maturity life cycle stage (t-1)	**–**			**-0.020***			**-0.001**			**-0.017****
				(-1.839)			**(-0.156)**			**(-2.129)**
Decline life cycle stage (t-1)	**+**		**0.047*****			**0.017****			**0.029*****	
			(4.217)			**(1.960)**			**(3.481)**	
LN_Size 1 (t-1)		0.019***	0.016***	0.018***	0.012***	0.012***	0.012***	0.006***	0.004**	0.005***
		(8.965)	(7.169)	(8.285)	(7.325)	(6.613)	(7.079)	(3.635)	(2.172)	(3.034)
Profitability 1 (t-1)		-0.253***	-0.280***	-0.242***	-0.181***	-0.159***	-0.180***	-0.130***	-0.163***	-0.121***
		(-6.949)	(-6.893)	(-6.568)	(-6.349)	(-4.978)	(-6.238)	(-4.750)	(5.314)	(-4.351)
Tangibility 1 (t-1)		0.316***	0.305***	0.316***	0.331***	0.333***	0.331***	-0.039	-0.049**	-0.039
		(9.819)	(9.453)	(9.822)	(13.141)	(13.132)	(13.135)	(-1.604)	(-2.011)	(-1.612)
Growth opportunities 1 (t-1)		-0.082***	-0.073***	-0.082***	-0.037*	-0.038*	-0.037*	-0.076***	-0.068***	-0.076***
		(-2.951)	(-2.598)	(-2.935)	(-1.677)	(-1.716)	(-1.675)	(-3.619)	(-3.215)	(-3.602)
Year dummies		Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry dummies		Not included	Not included	Not included	Not included	Not included	Not included	Not included	Not included	Not included

N	1386	1386	1386	1386	1386	1386	1386	1386	1386
Adjusted R Square	0.119	0.130	0.120	0.141	0.144	0.140	0.030	0.039	0.032

*Notes: This table shows the unstandardized coefficients with their statistical significance. The t-statistics are represented in the parentheses. Furthermore, the definitions of these variables are described in table 1 and the sample is described in section 4. ***. - Correlation significant at the 0.01 level. **. – Correlation significant at the 0.05 level. *. – Correlation significant at the 0.10 level. This table presents, as a robustness check, the OLS regression results for the sample companies in the Manufacturing industry. The following empirical model is estimated:* $Leverage_{it} = \beta_0 + \beta_{1-3} LifeCycle_{i,t-1} + \beta_4 Profitabilty_{i,t-1} + \beta_5 Size_{i,t-1} + \beta_6 Tangibility_{i,t-1} + \beta_7 Growth_{i,t-1} + \beta_8 Industry_{i,t} + \beta_9 Year_i + \epsilon_{it}$*. Models 1, 4 and 7 of this table are the baseline models which include only the control variables. Models 2, 5 and 8 of this table include also the life cycle dummies Growth and Decline life cycle stages. These models are used for testing hypotheses 1 and 3. These models only include the life cycle dummies Growth and Decline life cycle stages since the purpose of hypotheses 1 and 3 is to measure the (incremental) impact of these life cycle stages on the debt ratios, relative to the Maturity life cycle stage (reference/excluded/base group). This in order to investigate whether companies in the Growth and Decline life cycle stages have higher debt ratios compared to companies in the Maturity life cycle stage. The (incremental) impact of the Growth and Decline life cycle stages, relative to the Maturity life cycle stage (reference/excluded/base category), on the debt ratios of the sample companies is captured respectively by the* β_1 *and* β_2 *terms of the models 2, 5 and 8. While, the models 3, 6 and 9 of this table only include the life cycle dummy Maturity life cycle stage and are applied in order to test hypothesis 2. This because of the purpose of hypothesis 2 is to measure the (incremental) impact of Maturity life cycle stage on debt ratios, relative to other life cycle stages (reference/excluded/base groups). In other words, investigating whether companies in the Maturity life cycle stage have lower debt ratios compared to companies in other life cycle stages. The (incremental) impact of the Maturity life cycle stage, relative to the other life cycle stages (reference/excluded/base groups), on the debt ratios of the sample companies is captured by the* β_1 *term of the models 3, 6 and 9.*

Table 17: OLS regression results for the impact of corporate life cycle stages on the leverage ratios (capital structure) of the sample companies in the Information and Communication industry.

		Information and Communication								
Variables	**Expected sign**	**Total debt ratio**			**Long-term debt ratio**			**Short-term debt ratio**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Intercept		0.544***	0.463***	0.549***	0.018	0.036	0.064	0.481***	0.427***	0.483***
		(8.749)	(7.457)	(9.496)	(0.380)	(0.711)	(1.395)	(10.279)	(9.149)	(11.022)
Growth life cycle stage (t-1)	**+**		**0.183*** **			**0.077*** **			**0.139*** **	
			(5.358)			**(2.791)**			**(5.431)**	
Maturity life cycle stage (t-1)	**–**			**-0.119*** **			**-0.068*** **			**-0.072*** **
				(-4.634)			**(-3.305)**			**(-3.702)**
Decline life cycle stage (t-1)	**+**		**0.013**			**-0.035**			**0.034**	
			(0.312)			**(1.016)**			**(1.052)**	
LN_Size 1 (t-1)		0.007*	0.013***	0.016***	0.010***	0.012***	0.015***	-0.005*	0.000	0.000
		(1.717)	(3.234)	(3.596)	(2.995)	(3.659)	(4.163)	(-1.774)	(-0.152)	(-0.002)
Profitability 1 (t-1)		-0.004*	-0.004*	-0.003	-0.006*	-0.006***	-0.006***	-0.002	-0.002	-0.002
		(-1.784)	(-1.900)	(-1.487)	(-3.821)	(-3.864)	(-3.615)	(-1.444)	(1.566)	(-1.196)
Tangibility 1 (t-1)		0.090	0.069	0.028	0.309***	0.314***	0.273***	-0.126**	-0.151**	-0.164***
		(1.069)	(0.820)	(0.330)	(4.626)	(4.654)	(4.078)	(-1.991)	(-2.401)	(-2.585)
Growth opportunities 1 (t-1)		-0.073**	-0.093***	-0.083**	0.015	0.005	0.010	-0.066**	-0.080***	-0.072***
		(-2.004)	(-2.597)	(-2.331)	(0.538)	(0.186)	(0.334)	(-2.404)	(-2.976)	(-2.662)
Year dummies		Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry dummies		Not included	Not included	Not included	Not included	Not included	Not included	Not included	Not included	Not included
N		518	518	518	518	518	518	518	518	518
Adjusted R Square		0.010	0.060	0.049	0.093	0.106	0.111	0.027	0.078	0.051

*Notes: This table shows the unstandardized coefficients with their statistical significance. The t-statistics are represented in the parentheses. Furthermore, the definitions of these variables are described in table 1 and the sample is described in section 4. ***. - Correlation significant at the 0.01 level. **. – Correlation significant at the 0.05 level. *. – Correlation significant at the 0.10 level. This table presents, as a robustness check, the OLS regression results for the sample companies in the Information and Communication industry. The following empirical model is estimated:* $Leverage_{it} = \beta_0 + \beta_{1-3} LifeCycle_{i,t-1} + \beta_4 Profitabilty_{i,t-1} + \beta_5 Size_{i,t-1} + \beta_6 Tangibility_{i,t-1} + \beta_7 Growth_{i,t-1} + \beta_8 Industry_{i,t} + \beta_9 Year_i + \epsilon_{it}$*. Models 1, 4 and 7 of this table are the baseline models which include only the control variables. Models 2, 5 and 8 of this table include also the life cycle dummies Growth and Decline life cycle stages. These models are used for testing hypotheses 1 and 3. These models only include the life cycle dummies Growth and Decline life cycle stages since the purpose of hypotheses 1 and 3 is to measure the (incremental) impact of these life cycle stages on the debt ratios, relative to the Maturity life cycle stage (reference/excluded/base group). This in order to investigate whether companies in the Growth and Decline life cycle stages have higher debt ratios compared to companies in the Maturity life cycle stage. The (incremental) impact of the Growth and Decline life cycle stages, relative to the Maturity life cycle stage (reference/excluded/base category), on the debt ratios of the sample companies is captured respectively by the* β_1 *and* β_2 *terms of the models 2, 5 and 8. While, the models 3, 6 and 9 of this table only include the life cycle dummy Maturity life cycle stage and are applied in order to test hypothesis 2. This because of the purpose of hypothesis 2 is to measure the (incremental) impact of Maturity life cycle stage on debt ratios, relative to other life cycle stages (reference/excluded/base groups). In other words, investigating whether companies in the Maturity life cycle stage have lower debt ratios compared to companies in other life cycle stages. The (incremental) impact of the Maturity life cycle stage, relative to the other life cycle stages (reference/excluded/base groups), on the debt ratios of the sample companies is captured by the* β_1 *term of the models 3, 6 and 9.*

Table 18: OLS regression results for the impact of corporate life cycle stages on the leverage ratios (capital structure) for the subsample "Mining, Construction, Retail and Transport"

		Mining, Construction, Retail and Transport								
Variables	**Expected sign**	**Total debt ratio**			**Long-term debt ratio**			**Short-term debt ratio**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Intercept		-0.062	-0.053	-0.095	-0.113	-0.107	-0.104	0.066	0.069	0.025
		(-0.576)	(-0.493)	(0.869)	(-1.234)	(1.157)	(-1.114)	(0.790)	(0.823)	(0.300)
Growth life cycle stage (t-1)	**+**		**-0.129****			**-0.033**			**-0.093****	
			(-2.150)			**(-0.649)**			**(2.005)**	
Maturity life cycle stage (t-1)	**–**			**0.043**			**-0.012**			**0.054*****
				(1.620)			**(-0.519)**			**(2.649)**
Decline life cycle stage (t-1)	**+**		**-0.025**			**-0.019**			**-0.005**	
			(-0.942)			**(0.852)**			**(-0.233)**	
LN_Size 1 (t-1)		0.037***	0.036***	0.039***	0.015***	0.016***	0.015***	0.022***	0.021***	0.024***
		(6.687)	(6.482)	(6.899)	(3.268)	(3.257)	(3.125)	(5.048)	(4.739)	(5.519)
Profitability 1 (t-1)		-0.707***	-0.687***	-0.700***	-0.653***	-0.645***	-0.655***	-0.063	-0.052	-0.055
		(-5.547)	(-5.418)	(-5.519)	(-6.070)	(-5.949)	(-6.070)	(-0.642)	(-0.532)	(-0.566)
Tangibility 1 (t-1)		0.208***	0.204***	0.217***	0.433***	0.439***	0.430***	-0.219***	-0.230***	-0.208***
		(4.292)	(4.063)	(4.478)	(10.590)	(10.238)	(10.425)	(-5.859)	(-5.904)	(-5.606)
Growth opportunities 1 (t-1)		0.129**	0.146**	0.123*	0.151***	0.151***	0.153***	-0.037	-0.019	-0.045
		(2.019)	(2.250)	(1.924)	(2.797)	(2.705)	(2.817)	(-0.742)	(-0.379)	(-0.921)
Year dummies		Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry dummies		Not included	Not included	Not included	Not included	Not included	Not included	Not included	Not included	Not included
N		168	168	168	168	168	168	168	168	168
Adjusted R Square		0.313	0.325	0.320	0.492	0.488	0.490	0.237	0.247	0.265

*Notes: This table shows the unstandardized coefficients with their statistical significance. The t-statistics are represented in the parentheses. Furthermore, the definitions of these variables are described in table 1 and the sample is described in section 4. ***. - Correlation significant at the 0.01 level. **. – Correlation significant at the 0.05 level. *. – Correlation significant at the 0.10 level. This table presents, as a robustness check, OLS regression results for the subsample "Mining, Construction, Retail and Transport". The following empirical model is estimated:* $Leverage_{it} = \beta_0 + \beta_{1-3} LifeCycle_{i,t-1} + \beta_4 Profitabilty_{i,t-1} + \beta_5 Size_{i,t-1} + \beta_6 Tangibility_{i,t-1} + \beta_7 Growth_{i,t-1} + \beta_8 Industry_{i,t} + \beta_9 Year_i + \epsilon_{it}$*. Models 1, 4 and 7 of this table are the baseline models which include only the control variables. Models 2, 5 and 8 of this table include also the life cycle dummies Growth and Decline life cycle stages. These models are used for testing hypotheses 1 and 3. These models only include the life cycle dummies Growth and Decline life cycle stages since the purpose of hypotheses 1 and 3 is to measure the (incremental) impact of these life cycle stages on the debt ratios, relative to the Maturity life cycle stage (reference/excluded/base group). This in order to investigate whether companies in the Growth and Decline life cycle stages have higher debt ratios compared to companies in the Maturity life cycle stage. The (incremental) impact of the Growth and Decline life cycle stages, relative to the Maturity life cycle stage (reference/excluded/base category), on the debt ratios of the sample companies is captured respectively by the* β_1 *and* β_2 *terms of the models 2, 5 and 8. While, the models 3, 6 and 9 of this table only include the life cycle dummy Maturity life cycle stage and are applied in order to test hypothesis 2. This because of the purpose of hypothesis 2 is to measure the (incremental) impact of Maturity life cycle stage on debt ratios, relative to other life cycle stages (reference/excluded/base groups). In other words, investigating whether companies in the Maturity life cycle stage have lower debt ratios compared to companies in other life cycle stages. The (incremental) impact of the Maturity life cycle stage, relative to the other life cycle stages (reference/excluded/base groups), on the debt ratios of the sample companies is captured by the* β_1 *term of the models 3, 6 and 9.*

Table 19: OLS regression results for the impact of corporate life cycle stages on the leverage ratios (capital structure) for the subsample "Other service companies".

		Other service companies								
Variables	**Expected sign**	**Total debt ratio**			**Long-term debt ratio**			**Short-term debt ratio**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Intercept		0.195***	0.140*	0.192**	0.087	0.052	0.122*	0.169***	0.141*	0.144*
		(2.633)	(1.838)	(2.464)	(1.423)	(0.820)	(1.900)	(2.380)	(1.929)	(1.934)
Growth life cycle stage (t-1)	**+**		**0.102*** **			**0.102*** **			**0.030**	
			(2.669)			**(3.238)**			**(0.812)**	
Maturity life cycle stage (t-1)	**–**			**0.002**			**-0.039** **			**0.030**
				(0.090)			**(-2.262)**			**(1.482)**
Decline life cycle stage (t-1)	**+**		**-0.030**			**0.022**			**-0.046** **	
			(-1.233)			**(1.066)**			**(-1.963)**	
LN_Size 1 (t-1)		0.034***	0.039***	0.034***	0.015***	0.016***	0.014***	0.015***	0.019***	0.016***
		(7.512)	(8.015)	(7.452)	(3.865)	(4.038)	(3.559)	(3.440)	(3.983)	(3.607)
Profitability 1 (t-1)		-0.624***	-0.605***	-0.624***	-0.556***	-0.531***	-0.542***	-0.300***	-0.300***	-0.311***
		(-7.611)	(-7.396)	(-7.578)	(-8.205)	(-7.862)	(-7.995)	(-3.836)	(-3.818)	(-3.963)
Tangibility 1 (t-1)		0.041	0.071	0.043	0.078**	0.070*	0.053	-0.024	0.012	-0.005
		(0.869)	(1.409)	(0.860)	(1.978)	(1.683)	(1.298)	(-0.523)	(0.248)	(-0.101)
Growth opportunities 1 (t-1)		-0.007	-0.020	-0.006	0.027	0.015	0.024	-0.018	-0.024	-0.016
		(-0.145)	(-0.437)	(-0.142)	(0.705)	(0.410)	(0.640)	(-0.422)	(-0.544)	(-0.378)
Year dummies		Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry dummies		Not included	Not included	Not included	Not included	Not included	Not included	Not included	Not included	Not included
N		455	455	455	455	455	455	455	455	455
Adjusted R Square		0.178	0.191	0.176	0.138	0.155	0.145	0.032	0.038	0.035

*Notes: This table shows the unstandardized coefficients with their statistical significance. The t-statistics are represented in the parentheses. Furthermore, the definitions of these variables are described in table 1 and the sample is described in section 4. ***. - Correlation significant at the 0.01 level. **. – Correlation significant at the 0.05 level. *. – Correlation significant at the 0.10 level. This table presents, as a robustness check, the OLS regression results for the subsample "Other service companies". The following empirical model is estimated:* $Leverage_{it} = \beta_0 + \beta_{1-3}LifeCycle_{i,t-1} + \beta_4 Profitabilty_{i,t-1} + \beta_5 Size_{i,t-1} + \beta_6 Tangibility_{i,t-1} + \beta_7 Growth_{i,t-1} + \beta_8 Industry_{i,t} + \beta_9 Year_i + \epsilon_{it}$*. Models 1, 4 and 7 of this table are the baseline models which include only the control variables. Models 2, 5 and 8 of this table include also the life cycle dummies Growth and Decline life cycle stages. These models are used for testing hypotheses 1 and 3. These models only include the life cycle dummies Growth and Decline life cycle stages since the purpose of hypotheses 1 and 3 is to measure the (incremental) impact of these life cycle stages on the debt ratios, relative to the Maturity life cycle stage (reference/excluded/base group). This in order to investigate whether companies in the Growth and Decline life cycle stages have higher debt ratios compared to companies in the Maturity life cycle stage. The (incremental) impact of the Growth and Decline life cycle stages, relative to the Maturity life cycle stage (reference/excluded/base category), on the debt ratios of the sample companies is captured respectively by the* β_1 *and* β_2 *terms of the models 2, 5 and 8. While, the models 3, 6 and 9 of this table only include the life cycle dummy Maturity life cycle stage and are applied in order to test hypothesis 2. This because of the purpose of hypothesis 2 is to measure the (incremental) impact of Maturity life cycle stage on debt ratios, relative to other life cycle stages (reference/excluded/base groups). In other words, investigating whether companies in the Maturity life cycle stage have lower debt ratios compared to companies in other life cycle stages. The (incremental) impact of the Maturity life cycle stage, relative to the other life cycle stages (reference/excluded/base groups), on the debt ratios of the sample companies is captured by the* β_1 *term of the models 3, 6 and 9.*