Empirical Evidence on the U-shaped Nexus between Firm Slack and Future Profitability: The Moderating Role of Corporate Life Cycle

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Abstract:

Purpose: The current study mainly aims to examine the linear impact of firm slack on future profitability and the U-shaped nexus between firm slack and future profitability. Further, the current study seeks to investigate the moderator role of corporate lifecycle among these variables.

Design/methodology/approach: This current study uses a quantitative research method to achieve its objectives depending on (104) firms of Egyptian-listed firms from 2015 to 2022, using the Generalized Least Squares (GLS) and U-shaped test in Stata/IC15 to test the hypotheses.

Findings: The findings reveal that firm slack had a significant linear impact on future profitability as absorbed slack has a significant negative impact on future profitability, while unabsorbed and potential slack has a significant positive impact on future profitability. Also, the results indicate that there is a U-shaped nexus between firm slack and future profitability as absorbed slack has a significant U-shaped nexus with future profitability, whilst unabsorbed and potential slack have a significant inverted U-shaped nexus with future profitability. Moreover, the maturity, shake-out, and decline phases of the corporate life cycle have a moderator role in the linear impact of firm slack (absorbed, unabsorbed, and potential) on future profitability and the U-shaped nexus among these variables. In contrast, the introduction and growth phases of the corporate life cycle moderate the linear impact of firm slack (absorbed, unabsorbed, and potential) on future profitability; however, they do not moderate the U-shaped nexus among these variables.

Originality/value: The current study extends future profitability literature by examining the linear impact of firm slack on future profitability, especially in Egypt. Furthermore, the current study contributes to enhancing the understanding of the nexus between firm slack and future profitability by

examining the U-shaped nexus among these variables. It illustrates when firm slack positively influences future profitability and when it negatively impacts it. Moreover, the current study clarifies the role of the corporate life cycle in moderating the linear impact and U-shaped nexus.

Keywords: Firm Slack, Absorbed Slack, Unabsorbed Slack, Potential Slack, Corporate Life Cycle, U-shaped Nexus.

الملخص:

الغرض :تهدف الدراسة الحالية بشكل رئيسي إلى فحص التأثير الخطي للركود المالي للشركات (الممتص، غير الممتص، والمحتملة) على الربحية المستقبلية، وكذلك العلاقة غير الخطية على شكل حرف U بين الركود المالي والربحية المستقبلية. كما تسعى هذه الدراسة إلى استكشاف دور دورة حياة الشركة كمتغير معدل بين الركود المالي للشركات والربحية المستقبلية.

التصميم/المنهجية/الأسلوب: تعتمد الدراسة الحالية على منهج البحث الكمي لتحقيق أهدافها، استنادًا إلى بيانات ١٠٤ شركة مدرجة في البورصة المصرية خلال الفترة من ٢٠١٥ إلى ٢٠٢٢، بإجمالي عدد مشاهدات ٧٢٨ مشاهدة، باستخدام طريقة المربعات الصغرى المعممة (GLS) للتحقق من العلاقة الخطية وغير الخطية على شكل U لاختبار فروض الدراسة.

النتائج :كشفت النتائج أن الركود المالي للشركات لها تأثير خطي معنوي على الربحية المستقبلية، حيث أن الركود الممتص له تأثير سلبي خطى معنوي على الربحية المستقبلية، في حين أن الركود غير الممتص والركود المحتملة لهما تأثير إيجابي خطى معنوي على الربحية المستقبلية. كما أشارت النتائج إلى وجود علاقة غير خطية على شكل حرف U بين الركود المالي للشركات والربحية المستقبلية، حيث أن الركود الممتصة يرتبط بعلاقة على شكل حرف U مع الربحية المستقبلية، في حين أن الركود غير الممتصة والركود المحتملة يرتبطان بعلاقة غير خطية على شكل مقلوب حرف U مع الربحية المستقبلية. علاوة على ذلك، تلعب مراحل النضج والانكماش والتراجع في دورة حياة الشركة دورًا معدلاً في التأثير الخطي للركود المالي للشركات على الربحية المستقبلية وفي العلاقة غير الخطية على شكل حرف U بين هذه المتغيرات. كما وحدت الدارسة أن مرحلتا التقديم والنمو في دورة حياة الشركة تعمل

على تعديل التأثير الخطي للركود المالي على الربحية المستقبلية؛ ومع ذلك، لا تعدّلان العلاقة غير الخطية بين هذه المتغيرات.

الأصالة/القيمة: تسهم الدراسة الحالية في إثراء أدبيات الربحية المستقبلية من خلال فحص التأثير الخطي للركود المالي للشركات على الربحية المستقبلية، وخاصة في مصر. علاوة على ذلك، تسهم الدراسة في تعزيز فهم العلاقة بين الركود المالي للشركات والربحية المستقبلية من خلال فحص العلاقة غير الخطية على شكل حرف U بين هذه المتغيرات، مما يوضح متى تؤثر الركود المالي بشكل إيجابي على الربحية المستقبلية ومتى تؤثر عليها سلبًا. كما توضح الدراسة دور دورة حياة الشركة في تعديل كل من التأثير الخطي والعلاقة غير الخطية.

الكلمات المفتاحية: الركود المالي للشركات، الركود الممتص، الركود غير الممتص، الركود المحتملة، دورة حياة الشركة، العلاقة غير الخطية على شكل حرف U.

1. Introduction

Profitability is one of the firm pillars in all types of business. Past and current profitability is substantial, but future profitability continues to be one of the measures used in assessing strategic management success for the following reasons. First, future profitability captures the ability of firms to sustain into the future. Second, high future profitability translates into increased dividends, decreased bankruptcy risk, and more investment protection. Third, high future profitability enables firms to retain employees, invest in employee development, and offer competitive compensation packages. Fourth, firms with high future profitability can invest in research and development, leading to improved productivity; moreover, they have a higher capacity to repay loans and interest, reducing credit risk for creditors. The analysis of determinants arguably affecting future profitability is one of the crucial challenges in contemporary accounting research because future profitability is affected by various factors such as economic conditions, industry dynamics, competitive environment, operational efficiency, employee productivity, and innovation capabilities.

Firm slack is considered one of the essential determinants of future profitability. Cyert and March (1956), one of the seminal studies, defined firm slack as the excess resources above the minimal essential resources needed for a firm's output which can happen because of internal factors (e.g., poor planning and budgeting) and external factors (e.g., economic downturn). Firm slack is classified into absorbed, unabsorbed, and potential slack depending on the existence state of slack (Duan et al., 2020). The impact of firm slack is a double-edged sword. Firm slack can have a positive effect (Organizational Behavior Theory), for instance, Li (2021) found that firm slack weakened the negative impact of COVID-19 on performance among American firms. This positive impact happens because firm slack can increase the firm's flexibility in dealing with new opportunities, encourage innovative performance, face or avoid economic crises, and enable firms to undertake proactive initiatives toward environmental uncertainties (Laffranchini and Braun, 2014; Deb et al., 2017; Geiger et al., 2019; Titus et al., 2022; Du et al., 2022; Jermias and Yigit, 2023).

On the other hand, firm slack can have a negative effect (Agency Theory) as it reflects resources ineffective allocation and gives managers more opportunities to maximize their self-interests and objectives at the expense of shareholders' benefits (Alrashdan and Alnahedh, 2023; Singh et al., 2023; Tariq et al., 2023). Consequently, firm slack per se is neither beneficial nor harmful for future profitability because its consequences rely mainly on how managers utilize this slack. Thus, the current study primarily aims to examine not only the linear impact of firm slack (absorbed, unabsorbed, and potential slack) on future profitability but also the U-shaped nexus between them using (104) Egyptian-listed firms covering the period from 2015 to 2021.

A U-shaped[1] nexus, in general, occurs if the dependent variable first decreases with the increase in the independent variable at a decreasing rate until reaching a minimum (reflecting the left leg of the U). Then, after this minimum, the effect flips and the dependent variable starts to increase with further increase in the independent variable at an increasing rate (reflecting the right leg of the U). In contrast, an inverted U-shaped nexus, an upside-down U, happens if the dependent variable first increases with the increase in the independent variable at a decreasing rate until reaching a maximum (reflecting the left leg of the upside-down U). Then, after this maximum, the effect changes and the dependent variable begins decreasing with the additional increase in the independent variable at an increasing rate (reflecting the right leg of the upside-down U). The justification for a U-shaped or inverted-U-shaped nexus between firm slack and future profitability is that the impact of firm slack changes according to some factors like managerial behavior, duration, economic context, market dynamics, institutional frameworks, and environmental complexity (Wiersma, 2017; Agusti-Perez et al., 2020; Godoy-Bejarano et al., 2020).

The nexus between firm slack and future profitability can be moderated through factors such as the corporate life cycle. The corporate life cycle indicates a series of phases that differ due to changes in internal factors and

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[1] For more details about the U-shaped and inverted U-shaped nexus, see Haans, R. F., Pieters, C., & He, Z. L. (2016). Thinking about U: Theorizing and testing U-and inverted U-shaped nexus in strategy research. *Strategic management journal*, *37*(7), 1177-1195. https://doi.org/10.1002/smj.2399

external factors (Hamers, 2017; Yang and Shyu, 2019); moreover, each phase in the corporate life cycle has special characteristics that are attributed to economic conditions, marketing strategies, production strategies, risk levels, ownership structure, and cash flows (Hamers, 2017; Irawan and Afif, 2020). Therefore, the second purpose of the current study is to examine how the corporate life cycle moderates the nexus between firm slack and future profitability, whether the linear impact or the U-shaped nexus.

The present study contributes to the literature in several ways. It extends future profitability literature by examining the linear impact of firm slack on future profitability. Also, the existing study analyses the U-shaped nexus between firm slack and future profitability. Further, it enhances the understanding of the role of the corporate life cycle in moderating the linear impact and U-shaped nexus. Moreover, the current study examines the implications of various types of firm slack on future profitability. It clarifies when firm slack positively influences future profitability and when it negatively impacts it. From a practical perspective, the findings show the disparate effects of the different kinds of slack; thus, managers should increase their awareness when allocating resources inside firms since they are responsible for determining how resources are distributed among various activities, projects, and departments.

The remainder of the current study is organized as follows. Section 2 includes background, literature, and hypotheses development. Section 3 clarifies the empirical methodology. Section 4 illustrates the results and discussion. Finally, section 5 displays the conclusion.

2. Background, Literature and Hypotheses Development

2.1 Firm slack

Cyert and March (1956), one of the seminal studies that presented the concept of firm slack, defined firm slack as the excess resources above the minimal essential resources needed for a firm's output. In general, firm slack can occur from several factors, both internal and external. Internal factors are related to conservative management, which prefers to hold onto resources rather than invest in growth or innovation, poor planning and budgeting, and lack of communication, leading to duplication of effort and slack in some areas.

External factors relate to the economic downturn and rapid technological changes. In the literature, there are two classifications of firm slack. The first is slack availability which classifies firm slack into available slack, recoverable slack, and potential slack depending on how easily the firm can be recovered for substitute use (Agusti-Perez et al., 2020), while the second is the slack existence state which sorts firm slack into absorbed, unabsorbed, and potential slack depending on the existence state of slack (Duan et al., 2020). Figure (1) demonstrates types of firm slack.
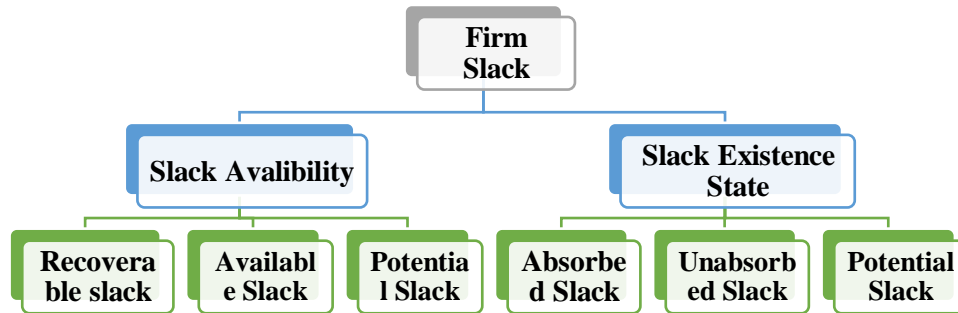

Figure (1) Types of Firm Slack

Source: prepared by the researchers

Recoverable slack, another internal firm slack, is less liquid as it refers to resources already allocated; therefore, they need the decision to be reallocated such as unused equipment, sales promotion, support IT staff, utilities, consultant fees, underutilized staff time, and excess office space (Wiersma, 2017; Geiger et al., 2019; Alrashdan and Alnahedh, 2023). Likewise, absorbed slack refers to resources that are being used but not necessarily at full capacity; thus, absorbed slack is less easily adapted or adjusted to substitute uses as it needs time and effort to reallocate to another purpose such as inventory and selling, general, and administrative expenses (Rau et al., 2021; Du et al., 2022; Titus et al., 2022; Luu et al., 2023). As a result, previous studies have used the terms recoverable and absorbed slack alternately. Available slack refers to the most liquid and flexible type of internal firm resources, meaning they are not currently used but can be readily deployed, such as cash reserves and unused office space (Wiersma, 2017; Carnes et al., 2019). Similarly, unabsorbed slack

indicates resources that can be used at any time and easily allocated to new uses and alternative projects, so unabsorbed slack reflects excess and uncommitted resources such as cash on hand and unemployed inventory (Lee and Wu, 2016; Rau et al., 2021; Shang et al., 2022; Luu et al., 2023). Therefore, prior studies have used the terms available and unabsorbed slack interchangeably.

Potential slack reflects the capability of the firm to secure expansion purposes using current levels of debt or equity capital in the future; hence, potential slack is considered an external type of firm slack that is affected by the firm's market value and capital markets characteristics such as unused credit lines, supplier nexuses (Rau et al., 2021; Carnes et al., 2019; Godoy-Bejarano et al., 2020). Notably, potential slack is less commonly used in firm slack research than absorbed (recoverable) and unabsorbed (available) slack. Moreover, managerial discretion regarding potential slack is less than absorbed slack and unabsorbed slack because potential slack requires external stakeholders such as other firms, institutions, banks, and bond or equity markets (Titus et al., 2022). It is worth mentioning that most accounting literature uses the second classification, while managerial literature prefers the first classification. Thus, the current study will use the second classification of firm slack. Table (1) summarizes the main differences among firm slack types.

Table (1)
Main Differences Among Firm Slack Types

Feature	Unabsorbed (Available) Slack	Absorbed (Recoverable) Slack	Potential Slack
Definition	Resources that are currently unused and readily available for immediate use	Excess resources used but not at full capacity, i.e., resources that are currently allocated in operations but can be reallocated when needed	The capability of a firm to access additional resources in the future using current levels of debt or equity capital
Examples	Cash on hand, cash reserves, unemployed inventory, unassigned employees, unused	Fixed assets, human capital, underutilized staff time, excess office space, underutilized equipment, excess management	Debt capacity, unused credit lines,

	office space, readily available but underutilized employee skills	overhead, and idle employee time for specific tasks	supplier nexuses
Accessibility	Most readily accessible	Requires some effort to free up and reallocate	Requires action (borrowing, negotiation) to access

Source: prepared by the researchers

The consequences of firm slack can be interpreted according to two perspectives. The first perspective is related to the organizational behavior theory, while the second concerns the agency theory. The organizational behavior theory postulates that firm slack, at a certain level of excess resources, has positive effects for many reasons. Firstly, firm slack increases the firm's flexibility in dealing with new opportunities, new markets, and riskier projects without threatening the current business of the firm; thus, it encourages innovative performance and thinking, particularly in a dynamic environment (Argiles-Bosch et al., 2016; Geiger et al., 2019; Duan et al., 2020; Titus et al., 2022; Jermias and Yigit, 2023). Also, firm slack enables firms to face or avoid economic crises and raise their adaptability to handle aggressive competition by facilitating competitive actions (Deb et al., 2017; Argilés-Bosch et al., 2018; Lefebvre, 2023). Moreover, firm slack permits managers to undertake proactive initiatives to face environmental uncertainties, and it averts managers from over-thinking the failure risk as they have excess resources to recoup any losses (Laffranchini and Braun, 2014; Argiles-Bosch et al., 2016; Du et al., 2022). According to the agency theory, firm slack has negative impacts because it wastes resources and indicates ineffective allocation (Duan et al., 2020; Alrashdan and Alnahedh, 2023). Additionally, firm slack permits managers a great space of freedom and more opportunities to maximize their self-interests and objectives at the expense of shareholders' benefits (Jermias and Yigit, 2023; Singh et al., 2023).

2.2 Firm Slack and Future Profitability

2.2.1 Absorbed Slack and Future Profitability

A stream of prior studies demonstrated that absorbed slack had negative effects. For instance, Argilés-Bosch et al. (2016) found that absorbed slack negatively affected future profitability. Also, Wiersma (2017) denoted that absorbed slack had a negative impact on firm profitability among Taiwanese. In the same vein, Agusti-Perez et al. (2020) revealed that absorbed slack negatively affected both financial and economic profitability. Similarly, Du et al. (2022) demonstrated that absorbed slack had a negative impact on R&D investment among Chinses firms. The negative impact of absorbed slack is attributed to several key reasons. Firstly, absorbed slack consists of resources primarily related to current operations, limiting their flexibility for reallocating. This constraint indicates that firms cannot easily convert these resources into more profitable opportunities or new investments. Moreover, maintaining underutilized resources can lead to higher operational costs without corresponding revenue generation. Therefore, absorbed slack often reflects the inefficiently used resources within firms which causes a decline in productivity, an increase in operational costs, and an inability to adapt to market conditions, leading to a decrease in future profitability. Based on this, the current study proposes the following hypothesis:

H_{1a}: *There is a significant negative impact of absorbed slack on future profitability*

Another stream of previous studies has begun examining how factors like environmental complexity and duration can determine the effect of absorbed slack. For example, Agusti-Perez et al. (2020) studied the effect of firm slack on profitability among Spanish firms in the short, medium, and long term. They revealed that absorbed slack showed a negative effect on profitability in the short and medium run. Likewise, Godoy-Bejarano et al. (2020) investigated the nexus between environmental complexity and firm slack in Colombia. The results indicated that firms in more complex environments required higher levels of absorbed slack to maximize performance and face challenges in obtaining profits. Depending on this stream of studies, a novel group of literature has started to analyze the existence of a U-shaped or inverted U-

shaped nexus instead of investigating only the positive and negative impacts. For example, Duan et al. (2020) examined the impact of absorbed slack on innovation performance among Chinese firms. The results found that absorbed slack had a significant U-shaped nexus with innovation performance which was projected to affect profitability. The current study expects that absorbed slack will have a significant U-shaped[2] nexus with future profitability. This U-shaped nexus occurs because the existence of absorbed excess resources leads, at the beginning, to the complexity of managing and reallocating these resources as firms may struggle to make effective decisions about how to reallocate these absorbed excess resources. This poor allocation of resources can result in missed opportunities; thus, future profitability can be negatively affected. Then, when managers know how to deal with and reallocate these absorbed excess resources, it becomes an opportunity to exploit these resources to increase performance or innovate and hence increase future profitability. Thus, the current study suggests the following hypothesis:

H_{1b}: *There is a significant U-shaped nexus between absorbed slack and future profitability*

2.2.2 Unabsorbed Slack and Future Profitability

Some previous studies proved that unabsorbed slack had positive effects. For example, Wiersma (2017) found that unabsorbed slack positively affected firm profitability among Taiwanese firms. Also, Agusti-Perez et al. (2020) concluded that unabsorbed slack had a positive impact on both economic and financial performance. Likewise, Du et al. (2022) demonstrated that unabsorbed slack positively affected R&D investment among Chinses firms. In the same context, Jermias and Yigit (2023) noted that unabsorbed slack had a positive impact on firm profitability and by extension future profitability. The positive impact of unabsorbed slack happens because it enables firms to respond quickly to internal and external changes. Additionally, unabsorbed slack allows firms to react immediately to fluctuations in demand and market conditions; therefore,

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[2] The U-shaped nexus of absorbed slack with future profitability means that, firstly, the increase in absorbed slack leads to a decrease in future profitability at a decreasing rate until reaching a minimum (reflecting the left leg of the U). Then, after this minimum, this effect changes as the increase in absorbed slack causes an increase in future profitability at an increasing rate (reflecting the right leg of the U).

firms with unabsorbed slack can easily face challenges such as economic downturns, supply chain disruptions, and increased competition. Furthermore, unabsorbed slack permits firms to experiment with new ideas and opportunities without immediate pressure on utilized resources since it can be reallocated easily, improving the decision-making process and competitive advantages. Accordingly, the current study postulates the following hypothesis:

*H$_{2a}$: **There is a significant positive impact of unabsorbed slack on future profitability***

Analyzing the presence of a U-shaped or inverted U-shaped nexus rather than examining only the positive and negative impacts of unabsorbed slack has skyrocketed recently. As a case in point, Agusti-Perez et al. (2020) revealed that unabsorbed slack positively affected economic profitability in the short term, while this impact decreased over the medium and long term. Also, Duan et al. (2020) concluded that unabsorbed slack among Chinese firms had an inverted U-shaped nexus with innovation performance. The present study proposes that unabsorbed slack will have a significant inverted U-shaped[3] nexus with future profitability. This inverted U-shaped nexus arises because having some unabsorbed slack is beneficial for effectively leveraging firms' resources for innovation and unexpected challenges by balancing their operational needs with the pursuit of innovative projects, leading to maximizing performance and future profitability. However, if unabsorbed slack is not effectively managed or utilized, it may lead to inefficiencies and underperformance. In other words, holding excess resources at a suitable level, specifically cash on hand and cash reserves, allows firms to exploit opportunities, face risks, and absorb market changes. On the contrary, when unabsorbed slack increases above the optimal level without a clear strategic purpose, the management of this slack will be more complex, resulting in decreasing performance and thus future profitability. Therefore, the present study implies the following hypothesis:

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[3] The inverted U-shaped nexus, an upside-down U, of unabsorbed slack with future profitability happens if future profitability, first, increases with the increase in unabsorbed slack at a decreasing rate until reaching a maximum (reflecting the left leg of the upside-down U). Then, after this maximum, the effect changes and future profitability begins decreasing with the additional increase in unabsorbed slack at an increasing rate (reflecting the right leg of the upside-down U).

H₂ᵦ: There is a significant inverted U-shaped nexus between unabsorbed slack and future profitability

2.2.3 Potential Slack and Future Profitability

Potential slack refers to the capability of a firm to access additional resources in the future using current levels of debt or equity capital. Limited studies have examined the implications of this type of firm slack. Some of these studies indicated that potential slack positively impacted profitability (Geiger et al., 2019; Agusti-Perez et al., 2020). This positive impact occurs because potential slack provides firms with the resources and flexibility needed to deal with challenges such as economic downturns and competitive pressures. Further, firms with potential slack may feel more secure in taking calculated risks and adopting innovative ideas as the availability of resources that can be used when needed encourages experimentation and creativity, leading to the development of new products, services, or processes that can drive performance improvements and hence future profitability. Also, potential slack improves strategic management as it can enhance firms' resilience and competitive advantage in complex and dynamic environments. Accordingly, the current study assumes the next hypothesis:

H₃ₐ: There is a significant positive impact of potential slack on future profitability

On the other hand, relying too heavily on potential slack without a clear plan or risk management strategy can expose firms to financial vulnerabilities and instability. In other words, insufficient employment of potential slack can impede long-term performance and sustainability, which affects future profitability. Therefore, potential slack can, firstly, cause a positive impact on future profitability, and then this impact changes to a negative effect. Agusti-Perez et al. (2020) revealed this as they found that potential slack had a positive effect on financial profitability, while in other years, it had a negative effect. In the same context, Duan et al. (2020) demonstrated that potential slack exhibited a significantly inverted U-shaped nexus with innovation performance. Thus, the existing study postulates the following hypothesis:

H₃b: There is a significant inverted U-shaped nexus between potential slack and future profitability

2.3 Corporate Life Cycle, Firm Slack, and Future Profitability

Corporate life cycle theory is an extension of product life cycle theory as it also postulates that the corporation is like a living organism going through distinct development from birth to decline (Chireka, 2020). The corporate life cycle is a series of phases that differ due to changes in internal factors (managerial skills, financial resources, strategic choices, organizational structure, and performance) and external factors (macroeconomic and competitive factors) (Hamers, 2017; Yang and Shyu, 2019). Each phase in the corporate life cycle has distinct characteristics concerning economic conditions, marketing strategies, production strategies, risk levels, ownership structure, and cash flows (Hamers, 2017; Irawan and Afif, 2020).

In the literature, there is no consensus on the phases number of the corporate life cycle as some studies have depended on the classification proposed by Dickinson (2011) which classified the corporate life cycle into five phases: introduction, growth, maturity, shake-out, and decline (Michalkova et al., 2022; Fodor et al., 2024). A number of studies has used the classification which classifies corporate life cycle into four phases: introduction, growth, maturity, and decline (Alzoubi, 2019; Irawan and Afif, 2020; Abuhommous, 2023), while other studies have classified corporate life cycle into three phases: growth, maturity, and decline (Chang et al., 2017; Lee and Choi, 2018). In the Egyptian environment, some studies have depended on the latter stream because of the nature of data as the number of observations in the introduction and shake-out phases are small (Zalat, 2020). Therefore, the current study will also classify the corporate life cycle into three phases: growth, maturity, and decline; in other words, the current study will combine the introduction phase with the growth phase and the shake-out phase with the decline phase.

2.3.1 Introduction and Growth Phases, Firm Slack, and Future Profitability

Firms in the introduction phase seek to begin their activities, obtain the acceptance of their products, and increase their market share even though they

are still unstructured and have little reputation, i.e., they have the liability of newness (Hasan and Habib, 2017; Chireka, 2020). The introduction phase is full of challenges as firms face low levels of sales, high levels of capital cost, inability to benefit from economies of scale, high levels of uncertainty of expected revenues, negative operating cash flows, positive financing cash flows as a result from depending on external financing, and negative investing cash flows because of the increase in capital expenditure (Hamers, 2017; Chireka, 2020; Irawan and Afif, 2020). After success in the introduction phase, firms can move forward to the second (growth phase) phase. In the growth phase, the focus shifts to achieving rapid growth, solidifying their market position, and increasing market share. As a consequence, this phase is characterized by increased sales and profits leading to positive cash flow, high capital expenditure spending in expansion, product development, and marketing resulting in negative investing cash flows, increased reliance on external financing with positive financing cash flows, a shift towards a more complex organizational structure with less centralized management, focus on product differentiation to stand out in the market, and intensified competition to gain market share (Hasan and Habib, 2017; Chireka, 2020; Abuhommous, 2023; Fodor et al., 2024). Therefore, firms in these phases do not suffer from high levels of firm slack as they use all available resources to meet challenges and seize opportunities; additionally, firms in these phases demonstrate low profitability. As a result, the introduction and growth phase can moderate the linear impact of firm slack (absorbed, unabsorbed, and potential) on future profitability and the U-shaped or inverted U-shaped nexus among these variables. Thus, the current study suggests the following hypotheses:

H$_{4a}$: The introduction and growth phases play a significant moderator role in the negative impact of absorbed slack on future profitability

H$_{4b}$: The introduction and growth phases play a significant moderator role in the U-shaped nexus between absorbed slack and future profitability

H$_{4c}$: The introduction and growth phases play a significant moderator role in the positive impact of unabsorbed slack on future profitability

H₄d: The introduction and growth phases play a significant moderator role in the inverted U-shaped nexus between unabsorbed slack and future profitability

H₄e: The introduction and growth phases play a significant moderator role in the positive impact of potential slack on future profitability

H₄f: The introduction and growth phases play a significant moderator role in the inverted U-shaped nexus between potential slack and future profitability

2.3.2 Maturity Phase, Firm Slack, and Future Profitability

In the maturity phase, firms are characterized by stable sales growth, persistent net income, a stable increase in sales demand, and an increase in competition rate (Yang and Shyu, 2019; Michalkova et al., 2022). Additionally, in this phase, firms show positive operating cash flows as a result of the stable increase in sales, negative investing cash flows due to the decline in investment opportunities, and negative financing cash flows because of the existence of cash surplus to retire their debts (Chireka, 2020; Irawan and Afif, 2020). Therefore, mature firms can easily obtain resources from their internal environment, face a low level of cash flow volatility and earnings risk, and make excessive investments in working capital without meeting any decrease in profitability (Al-Hadi et al., 2019; Akbar et al., 2020; Irawan and Afif, 2020; Wang et al., 2020). Therefore, the maturity phase can moderate the linear impact of firm slack (absorbed, unabsorbed, and potential) on future profitability and the U-shaped or inverted U-shaped nexus among these variables. Hence, the existing study proposes the subsequent hypotheses:

H₅a: The maturity phase plays a moderator role in the negative impact of absorbed slack on future profitability

H₅b: The maturity phase plays a moderator role in the U-shaped nexus between absorbed slack and future profitability

H₅c: The maturity phase plays a moderator role in the positive impact of unabsorbed slack on future profitability

H₅d: The maturity phase plays a moderator role in the inverted U-shaped nexus between unabsorbed slack and future profitability

H₅e: The maturity phase plays a moderator role in the positive impact of potential slack on future profitability

H₅f: The maturity phase plays a moderator role in the inverted U-shaped nexus between potential slack and future profitability

2.3.3 Shake-out phase and Decline phases, Firm Slack, and Future Profitability

Firms that fail to preserve their competitive position due to weak operating efficiency, a lack of innovation, or an uncertain business environment, may enter the shake-out phase (Hamers, 2017). Thus, the shake-out phase occurs when firms struggle to innovate and compete. This phase is characterized by a decrease in market share and a decline in all major financial indicators such as revenues, earnings, and net income (Michalkova et al.,2022; Fodor et al., 2024). Furthermore, operating cash flows become volatile due to declining revenue, often turning negative, and cash flows from investing and financing activities are less predictable during this stage (Dickinson et al., 2018). When firms fail to solve their problems related to sales decrease, they enter the decline phase. In the decline phase, firms suffer from an increase in the cost of capital and an enormous decline in revenues, earnings, and net income, leading to negative operating cash flows (Michalkova et al. 2022; Fodor et al. 2024). Also, they face positive investing cash flows due to losing investment opportunities and negative financing cash flows due to the inability to pay debts (Irawan and Afif 2020; Abuhommous 2023). Therefore, firms in this phase must either exit the market or restructure their competitive advantage using innovation and begin a new life cycle (Hamers, 2017; Chireka, 2020). Consequently, firms in the shake-out phase and decline phases may have high levels of firm slack as they cannot use all available resources efficiently due to the volatility in sales, revenues, and cash flows. Thus, the shake-out phase and decline phases can moderate the linear impact of firm slack (absorbed, unabsorbed, and potential) on future profitability and the U-shaped or inverted U-shaped nexus among these variables. Hence, the current study proposes the consequent hypotheses:

H_{6a}: The shake-out and decline phases play a moderator role in the negative impact of absorbed slack on future profitability

H_{6b}: The shake-out and decline phases play a moderator role in the U-shaped nexus between absorbed slack and future profitability

H_{6c}: The shake-out and decline phases play a moderator role in the positive impact of unabsorbed slack on future profitability

H_{6d}: The shake-out and decline phases play a moderator role in the inverted U-shaped nexus between unabsorbed slack and future profitability

H_{6e}: The shake-out and decline phases play a moderator role in the positive impact of potential slack on future profitability

H_{6f}: The shake-out and decline phases play a moderator role in the inverted U-shaped nexus between potential slack and future

3. Empirical Methodology

3.1 Sample and Data Collection

The initial sample of the present study includes all firms listed on the Egyptian Security Exchange (ESE) comprised of (222) firms distributed into (18) sectors (ESE, 2023). The final sample covers (104) firms in (14) sectors representing (47%) of the total number of all firms listed on ESE with (728) firm-year observations after employing the following criteria. First, firms must have been listed on ESE from 2015 to 202٢. Second, firms with a financial year ending on 30th June were excluded to ease the comparability among firms. Third, firms with missing data were excluded. Fourth, all financial statements must have been published in the Egyptian pound. Fifth, banks and financial services firms were excluded due to the distinctiveness of their activities as they are subject to the regulations of the Egyptian Central Bank. Table (2) shows sample distribution by sector. The study used a quantitative research method based on secondary data using he Generalized Least Squares (GLS) and U-shaped test in Stata/IC15. Data for all variables were obtained from annual

financial statements published on firms' websites, the Mubasher website[4], and ESE website[5].

Table (2)

Sample Distribution by Sector

No.	Sector name	Listed firms	Firms issued statements in dollars	Firms issued statements on 30/6	Outside sample period	Firms with missing data	Excluded firms	Sample firms	%
1	IT, Media & Communication Services	7	1	0	1	-	2	5	71%
2	Food, Beverages and Tobacco	28	-	12	0	1	13	15	54%
3	Health Care & Pharmaceuticals	19	-	5	3	0	8	11	58%
4	Real Estate	33	-	1	5	2	8	25	76%
5	Building Materials	11	-	1	-	-	1	10	91%
6	Basic Resources	16	-	6	1	-	7	9	56%
7	Contracting and Construction Engineering	11	1	3	0	1	5	6	55%
8	Travel & Leisure	13	2	1	0	2	5	8	62%
9	Industrial Goods, Services and Automobiles	6	-	0	1	1	2	4	67%
10	Textile & Durables	8	0	4	-	-	4	4	50%
11	Paper & Packaging	5	-	2	-	-	2	3	60%
12	Trade & Distributors	5	-	2	-	1	3	2	40%

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[4] https://www.mubasher.info/countries/eg
[5] https://www.egx.com.eg/ar/homepage.aspx

13	Shipping & Transportation Services	6	-	5	-	-	5	1	17%
14	Utilities	2	-	-	1	-	1	1	50%
15	Education Services	5	-	5	0	0	5	0	0%
16	Energy & Support Services	3	2	1	-	-	3	0	0%
17	Non-bank financial services	30	2	0	28	0	30	0	0%
18	Banks	14	2	0	12	0	14	0	0%
	Total	**222**	**10**	**48**	**52**	**7**	**117**	**104**	**47%**

Source: prepared by the researchers

3.2 Variables Measurement

Table (3) describes the variables used in the current study and shows how each variable can be measured.

Table (3) Variables Description

Variable	**Notation**	**Definition**	**Reference**
Dependent Variable			
Future Profitability	*Y*	ROA_{it+1} $= \dfrac{net\ income\ pefore\ tax}{Total\ Asset_{it+1}}$	Rau et al. (2021) He et al. (2023) Luu et al., (2023) Lefebvre (2024)
Independent Variables			
Absorbed Slack	X_1	The absorbed slack is proxied by the mean of the next three ratios less the industry mean ratio	Godoy-Bejarano et al. (2020) Guo et al. (2020)
	X_{11}	$\dfrac{Inventory_{it}}{Sales_{it}}$	Argilés-Bosch, et al. (٢٠١٨) Rudyanto (2023)
	X_{12}	$\dfrac{property, plant\ \&\ equipment_{it}}{Sales_{it}}$	Argilés-Bosch, et al. (2016) Argilés-Bosch,

			et al. (٢٠١٨)
	X_{13}	$$\frac{Selling, General \& Administrative}{Sales_{it}}$$	Duan et al. (2020) Du, et al. (2022) Shang et al.(2022)
Unabsorbed Slack	X_2	The unabsorbed slack is proxied by the mean of the following three ratios less the industry mean ratio	Guo et al. (2020) Titus et al. (2022)
	X_{21}	$$\frac{current\ assets_{it} - short\ trim\ liab}{Total\ Assets\ _{it}}$$	Geiger et al. (2019) Lefebvre (2024)
	X_{22}	$$\frac{Cash\ \&\ Cassh\ equivalens\ _{it}}{Total\ Assets\ _{it}}$$	Rau et al. (2021) Lefebvre (2023) Rudyanto (2023)
	X_{23}	$$\frac{current\ assets\ _{it}}{short\ term\ liabilities\ _{it}}$$	Li (2021) Tariq et al. (2023) Luu et al. (2023)
Potential Slack	X_3	$$= \text{Log}\ (\frac{Dabt_{it}}{Equity\ _{it}})$$	Duan et al. (2020) Du et al. (2022) Alrashdan and Alnahedh (2023)
Moderating Variables			
Firm Life Cycle	*M*	There are five stages of firm life cycle of every company at that specific year, introduction, growth, mature, decline and shake-out. Evey stage was categorized based on their cash flow from in operation (CFO), investing (CFI), and financing (CFF) pattern *1- Introduction stage:* if (CFO) < 0, (CFI) < 0 and (CFF) > 0 *2- Growth stage:* if (CFO) > 0, (CFI) < 0 and (CFF) > 0 *3- Mature stage:* if (CFO) > 0, (CFI) < 0 and (CFF) < 0	Widyasari, et al., (2019) Chireka (2020) Michalkova et al. (2022) Abuhommous (2023) Fodor et al. (2024)

		4- *Decline stage:* if (CFO) < 0, (CFI) > 0 and (CFF) < or > 0 5- *Shake-out stage:* the remaining firm years are classified into the shake-out stage.	

	CFO	C
Introduction stage	< 0	
Growth stage	> 0	
Mature stage	> 0	
Decline stage	< 0	
Shake-out stage	the remair	

		According to the nature of the data in the Egyptian environment, these stages were combined into three stages (Zalat, 2020): M_1: *Introduction & Growth stage* M_2: *Mature stage* M_3: *Decline & Shake-out stage*	

Control Variables			
Firm Size	Z_1	Log (total assets $_{it}$)	Guo et al. (2020) Titus et al. (2022) He et al. (2023)
Tangible Assets Ratio	Z_2	$$\frac{property, plant \& equipment_{it}}{total\ assets_{it}}$$	Alnori (2020) He et al. (2023) Lefebvre (2024)
Asset Utilization Ratio	Z_3	$$\frac{Sales_{it}}{average\ total\ assets_{it}}$$	He et al., 2023
Firm Age	Z_4	= Ln (the number of firm years) or (number of years of existence)	Guo et al. (2020) Lefebvre (2023)
Audit Quality	Z_5	dummy variable, coded as 1 if the firm's auditors belong to the prestigious big four auditing firms audit and 0 otherwise	Abuhommous (2023) Yao et al. (2024)
Internal Control Effectiveness	Z_6	A dummy value that equals 1 if the opinion of the external auditor on the effectiveness of internal control is clear and 0 otherwise.	Elsayed and Elshandidy (2021) Yao et al. (2024)

Cash Holding	Z_7	$\dfrac{Cash\ \&\ short\ term\ investments_{it}}{Total\ Assets_{it}}$	Alnori (2020) Alrashdan and Alnahedh (2023)

3.3 Models Construction

The current study uses several models in order to achieve its objectives as follows:

3.3.1 Model (1) Examining the Linear Impact of Absorbed Slack on Future Profitability and the U-shaped Nexus

The present study depends on model (1) to examine the linear impact of absorbed slack on future profitability and the U-shaped nexus. Model (1) can be formulated as follows:

$$Y_{t+1} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_1{}^2{}_{it} + \beta_3 Z_{1it} + \beta_4 Z_{2it} + \beta_5 Z_{3it} + \beta_6 Z_{4it} + \beta_7 Z_{5it} + \quad (1)$$
$$\beta_8 Z_{6it} + \beta_9 Z_{7it} + \mu_{it}$$

Where Y_{t+1} refers to future profitability of firm (i) in the year (t+1), X_{1it} is the absorbed slack of firm (i) in the year (t), $X_1{}^2{}_{it}$ is the quadratic term of absorbed slack of firm (i) in the year (t), Z_{1it} is the firm size of firm (i) in the year (t), Z_{2it} is the tangible assets ratio of firm (i) in the year (t), Z_{3it} is the asset utilization ratio of firm (i) in the year (t), Z_{4it} is the firm age of firm (i) in the year (t), Z_{5it} is the audit quality of firm (i) in the year (t), Z_{6it} is the internal control effectiveness of firm (i) in the year (t), Z_{7it} is the cash holding of firm (i) in the year (t), and μ_{it} is the standard error.

3.3.2 Model (2) Examining the Linear Impact of Unabsorbed Slack on Future Profitability and the U-shaped Nexus

Model (2) shows the linear impact of unabsorbed slack on future profitability and the U-shaped nexus and it can be formulated as follows:

$$Y_{t+1} = \beta_0 + \beta_1 X_{2it} + \beta_2 X_2{}^2{}_{it} + \beta_3 Z_{1it} + \beta_4 Z_{2it} + \beta_5 Z_{3it} + \beta_6 Z_{4it} + \beta_7 Z_{5it} + \quad (2)$$
$$\beta_8 Z_{6it} + \beta_9 Z_{7it} + \mu_{it}$$

Where X_{2it} is the unabsorbed slack of firm (i) in the year (t), $X_2{}^2{}_{it}$ is the quadratic term of unabsorbed slack of firm (i) in the year (t), and the remainder variables is previously explained in model (1).

3.3.3 Model (3) Examining the Linear Impact of Potential Slack on Future Profitability and the U-shaped Nexus

To examine the linear impact of potential slack on future profitability and the U-shaped nexus, model (3) is formulated as follows:

$$Y_{t+1} = \beta_0 + \beta_1 X_{3it} + \beta_2 X_3^2{}_{it} + \beta_3 Z_{1it} + \beta_4 Z_{2it} + \beta_5 Z_{3it} + \beta_6 Z_{4it} + \beta_7 Z_{5it} \qquad (3)$$
$$+ \beta_8 Z_{6it} + \beta_9 Z_{7it} + \mu_{it}$$

Where X_{3it} is the potential slack of firm (i) in the year (t), $X_3^2{}_{it}$ is the quadratic term of potential slack of firm (i) in the year (t), and the remainder variables is previously explained in model (1).

3.3.4 Model (4) Examining the Moderating Role of the Introduction and Growth Phases on the Linear Impact and the U-shaped Nexus of Absorbed Slack

The moderating role of the introduction and growth phases on the linear impact and the U-shaped nexus is tested by using model (4) as follows:

$$Y_{t+1} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_1^2{}_{it} + \beta_3 (X_1 M_1)_{it} + \beta_4 (X_1^2 M_1)_{it} + \beta_5 Z_{1it} + \qquad (4)$$
$$\beta_6 Z_{2it} + \beta_7 Z_{3it} + \beta_8 Z_{4it} + \beta_9 Z_{5it} + \beta_{10} Z_{6it} + \beta_{11} Z_{7it} + \mu_{it}$$

Where $(X_1 M_1)_{it}$ refers to the interaction term of absorbed slack and introduction and growth phases of firm (i) in the year (t), $(X_1^2 M_1)_{it}$ is the interaction term of absorbed slack quadratic term and introduction and growth phases of firm (i) in the year (t), and the remainder variables is previously explained in model (1).

3.3.5 Model (5) Examining the Moderating Role of the Introduction and Growth Phases on the Linear Impact and the U-shaped Nexus of Unabsorbed Slack

The existing study relies on model (5) to examine moderating role of the introduction and growth phases on the linear impact and the U-shaped nexus of unabsorbed slack. Model (5) can be formulated as follows:

$$Y_{t+1} = \beta_0 + \beta_1 X_{2it} + \beta_2 X_2^2{}_{it} + \beta_3 (X_2 M_1)_{it} + \beta_4 (X_2^2 M_1)_{it} + \beta_5 Z_{1it} + \qquad (5)$$
$$\beta_6 Z_{2it} + \beta_7 Z_{3it} + \beta_8 Z_{4it} + \beta_9 Z_{5it} + \beta_{10} Z_{6it} + \beta_{11} Z_{7it} + \mu_{it}$$

Where $(X_2 M_1)_{it}$ refers to the interaction term of unabsorbed slack and introduction and growth phases of firm (i) in the year (t), $(X_2^2 M_1)_{it}$ is the interaction term of unabsorbed slack quadratic term and introduction and

growth phases of firm (i) in the year (t), and the remainder variables is previously explained in model (2).

3.3.6 Model (6) Examining the Moderating Role of the Introduction and Growth Phases on the Linear Impact and the U-shaped Nexus of Potential Slack

To examine the moderating role of the introduction and growth phases on the linear impact and the U-shaped nexus of potential slack, model (6) is formulated as follows:

$$Y_{t+1} = \beta_0 + \beta_1 X_{3it} + \beta_2 X_3{}^2{}_{it} + \beta_3 (X_3 M_1)_{it} + \beta_4 (X_3{}^2 M_1)_{it} + \beta_5 Z_{1it} + \qquad (6)$$
$$\beta_6 Z_{2it} + \beta_7 Z_{3it} + \beta_8 Z_{4it} + \beta_9 Z_{5it} + \beta_{10} Z_{6it} + \beta_{11} Z_{7it} + \mu_{it}$$

Where $(X_3 M_1)_{it}$ refers to the interaction term of potential slack and introduction and growth phases of firm (i) in the year (t), $(X_3{}^2 M_1)_{it}$ is the interaction term of potential slack quadratic term and introduction and growth phases of firm (i) in the year (t), and the remainder variables is previously explained in model (3).

3.3.7 Model (7) Examining the Moderating Role of the Maturity Phase on the Linear Impact and the U-shaped Nexus of Absorbed Slack

Model (7) displays the moderating role of the maturity phase on the linear impact and the U-shaped nexus of absorbed slack and it can be formulated as follows:

$$Y_{t+1} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_1{}^2{}_{it} + \beta_3 (X_1 M_2)_{it} + \beta_4 (X_1{}^2 M_2)_{it} + \beta_5 Z_{1it} + \qquad (7)$$
$$\beta_6 Z_{2it} + \beta_7 Z_{3it} + \beta_8 Z_{4it} + \beta_9 Z_{5it} + \beta_{10} Z_{6it} + \beta_{11} Z_{7it} + \mu_{it}$$

Where $(X_1 M_2)_{it}$ refers to the interaction term of absorbed slack and maturity phase of firm (i) in the year (t), $(X_1{}^2 M_2)_{it}$ is the interaction term of absorbed slack quadratic term and maturity phase of firm (i) in the year (t), and the remainder variables is previously explained in model (1).

3.3.8 Model (8) Examining the Moderating Role of the Maturity Phase on the Linear Impact and the U-shaped Nexus of Unabsorbed Slack

To examine the moderating role of the maturity phase on the linear impact and the U-shaped nexus of unabsorbed slack, model (8) is formulated as follows:

$$Y_{t+1} = \beta_0 + \beta_1 X_{2it} + \beta_2 X_2{}^2{}_{it} + \beta_3 (X_2 M_2)_{it} + \beta_4 (X_2{}^2 M_2)_{it} + \beta_5 Z_{1it} + \qquad (8)$$
$$\beta_6 Z_{2it} + \beta_7 Z_{3it} + \beta_8 Z_{4it} + \beta_9 Z_{5it} + \beta_{10} Z_{6it} + \beta_{11} Z_{7it} + \mu_{it}$$

Where $(X_2M_2)_{it}$ refers to the interaction term of unabsorbed slack and maturity phase of firm (i) in the year (t), $(X_2{}^2M_2)_{it}$ is the interaction term of unabsorbed slack quadratic term and maturity phase of firm (i) in the year (t), and the remainder variables is previously explained in model (2).

3.3.9 Model (9) Examining the Moderating Role of the Maturity Phase on the Linear Impact and the U-shaped Nexus of Potential Slack

The existing study depends on model (9) to examine moderating role of the maturity phase on the linear impact and the U-shaped nexus of potential slack. Model (9) can be formulated as follows:

$$Y_{t+1} = \beta_0 + \beta_1X_{3it} + \beta_2X_3{}^2{}_{it} + \beta_3(X_3M_2)_{it} + \beta_4(X_3{}^2M_2)_{it} + \beta_5Z_{1it} + \qquad (9)$$
$$\beta_6Z_{2it} + \beta_7Z_{3it} + \beta_8Z_{4it} + \beta_9Z_{5it} + \beta_{10}Z_{6it} + \beta_{11}Z_{7it} + \mu_{it}$$

Where $(X_3M_2)_{it}$ refers to the interaction term of potential slack and maturity phase of firm (i) in the year (t), $(X_3{}^2M_2)_{it}$ is the interaction term of potential slack quadratic term and maturity phase of firm (i) in the year (t), and the remainder variables is previously explained in model (3).

3.3.10 Model (10) Examining the Moderating Role of the Shake-out and Decline phases on the Linear Impact and the U-shaped Nexus of Absorbed Slack

Model (10) demonstrates the moderating role of the shake-out and decline phase on the linear impact and the U-shaped nexus of absorbed slack and it can be formulated as follows:

$$Y_{t+1} = \beta_0 + \beta_1X_{1it} + \beta_2X_1{}^2{}_{it} + \beta_3(X_1M_3)_{it} + \beta_4(X_1{}^2M_3)_{it} + \beta_5Z_{1it} + \qquad (10)$$
$$\beta_6Z_{2it} + \beta_7Z_{3it} + \beta_8Z_{4it} + \beta_9Z_{5it} + \beta_{10}Z_{6it} + \beta_{11}Z_{7it} + \mu_{it}$$

Where $(X_1M_3)_{it}$ refers to the interaction term of absorbed slack and shake-out and decline phases of firm (i) in the year (t), $(X_1{}^2M_3)_{it}$ is the interaction term of absorbed slack quadratic term and shake-out and decline phases of firm (i) in the year (t), and the remainder variables is previously explained in model (1).

3.3.11 Model (11) Examining the Moderating Role of the Shake-out and Decline phases on the Linear Impact and the U-shaped Nexus of Unabsorbed Slack

To examine the moderating role of the shake-out and decline phases on the linear impact and the U-shaped nexus of unabsorbed slack, model (11) is formulated as follows:

$$Y_{t+1} = \beta_0 + \beta_1 X_{2it} + \beta_2 X_2{}^2{}_{it} + \beta_3 (X_2 M_3)_{it} + \beta_4 (X_2{}^2 M_3)_{it} + \beta_5 Z_{1it} + \quad \textbf{(11)}$$
$$\beta_6 Z_{2it} + \beta_7 Z_{3it} + \beta_8 Z_{4it} + \beta_9 Z_{5it} + \beta_{10} Z_{6it} + \beta_{11} Z_{7it} + \mu_{it}$$

Where $(X_2 M_3)_{it}$ refers to the interaction term of unabsorbed slack and shake-out and decline phases of firm (i) in the year (t), $(X_2{}^2 M_3)_{it}$ is the interaction term of unabsorbed slack quadratic term and shake-out and decline phases of firm (i) in the year (t), and the remainder variables is previously explained in model (2).

3.3.12 Model (12) Examining the Moderating Role of the Shake-out and Decline phases on the Linear Impact and the U-shaped Nexus of Potential Slack

The current study uses on model (12) to examine moderating role of the shake-out and decline phase on the linear impact and the U-shaped nexus of potential slack. Model (12) can be formulated as follows:

$$Y_{t+1} = \beta_0 + \beta_1 X_{3it} + \beta_2 X_3{}^2{}_{it} + \beta_3 (X_3 M_3)_{it} + \beta_4 (X_3{}^2 M_3)_{it} + \beta_5 Z_{1it} + \quad \textbf{(12)}$$
$$\beta_6 Z_{2it} + \beta_7 Z_{3it} + \beta_8 Z_{4it} + \beta_9 Z_{5it} + \beta_{10} Z_{6it} + \beta_{11} Z_{7it} + \mu_{it}$$

Where $(X_3 M_3)_{it}$ refers to the interaction term of potential slack and shake-out and decline phases of firm (i) in the year (t), $(X_3{}^2 M_3)_{it}$ is the interaction term of potential slack quadratic term and shake-out and decline phases of firm (i) in the year (t), and the remainder variables is previously explained in model (3).

4. Results and Discussion

4.1 Descriptive Statistics

The current paper uses some central tendency and dispersion measures to describe the study data briefly. Table (4) demonstrates some descriptive statistics of the study variables.

Table (4)
Descriptive Statistics Results

	Variable	*Min.*	*Max.*	*Mean*	*Std. Dev.*
Panel A: Continuous Variables					
Y_{t+1}	*Future Profitability*	-1.316	0.684	0.042	0.098
X_1	*Absorbed Slack*	0.000	1.333	0.340	0.208
X_2	*Unabsorbed Slack*	-1.438	1.892	0.263	0.366
X_3	*Potential Slack*	-4.957	1.803	-0.688	0.855
X_1*M_1	*Absorbed Slack × Intro. & Gro.*	-0.482	0.837	0.008	0.107
X_1*M_2	*Absorbed Slack × Maturity*	-0.373	0.817	-0.002	0.106
X_1*M_3	*Absorbed Slack × Shake-out & Decline*	-0.385	0.852	-0.006	0.112
X_2*M_1	*Unabsorbed Slack × Intro. & Gro.*	-0.522	1.033	0.057	0.180
X_2*M_2	*Unabsorbed Slack × Maturity*	-0.589	1.674	0.106	0.263
X_2*M_3	*Unabsorbed Slack × Shake-out & Decline*	-1.438	1.892	0.100	0.278
X_3*M_1	*Potential Slack × Intro. & Gro.*	-4.846	1.493	-0.134	0.461
X_3*M_2	*Potential Slack × Maturity*	-4.957	1.803	-0.315	0.674
X_3*M_3	*Potential Slack × Shake-out & Decline*	-3.207	1.041	-0.240	0.604
Z_1	*Firm Size*	17.251	25.656	20.828	1.834
Z_2	*Tangible Assets Ratio*	0.001	0.964	0.434	0.245
Z_3	*Asset Utilization Ratio*	-0.025	3.562	0.612	0.572
Z_4	*Firm Age*	0.000	4.736	3.300	0.548
Z_7	*Cash Holding*	0.000	0.485	0.055	0.066
Panel B: Discrete variables					

	Variable	(1)		(0)	
		Frequency	**%**	**Frequency**	**%**
M_1	**Introduction & Growth**	232	31.9	496	68.1
M_2	**Maturity**	289	39.7	439	60.3
M_3	**Shake-out and Decline**	207	28.4	521	71.6
Z_5	**Audit Quality**	298	40.9	430	59.1
Z_6	**Internal Control Effectiveness**	207	28.4	521	71.6

As can be seen in Table (4), the mean of future profitability (Y t+1) is (0.042), with a range between (-1.316) and (0.684) and a standard deviation of (0.098). The mean value of future profitability is consistent with the study of Rau et al. (2021), Alrashdan and Alnahedh (2023), and He et al. (2023) as the mean value of future profitability in these studies was 0.05 %, 0.04 %, and 0.0435 respectively. The minimum and maximum values, concerning future profitability, vary greatly between the sample firms. Nevertheless, the low mean value points out the low value of future profitability among firms involved in the sample. About absorbed slack (X 1), the mean is (0.340), with a range between (0.000) and (1.333), and a standard deviation of (0.208). Thus, there is also a large disparity between the sample firms regarding absorbed slack, as revealed by the minimum and maximum values. The mean value of absorbed slack is different from the study of Duan et al. (2020), Titus et al. (2022), and Luu et al. (2023) as the mean value of absorbed slack in these studies was (0.122), (0.19), and (0.1672) respectively. Turning to unabsorbed slack, the mean is (0.263), with a range between (-1.438) and (1.892) and a standard deviation of (0.366). The mean value of unabsorbed slack follows Lefebvre (2024) as the mean value of this study was (0.236), but it is inconsistent with the study of Tariq et al. (2023) as the mean value of this study was (2.89). Regarding potential slack, the mean is (-0.688), with a range between (-4.957) and (1.803) and a standard deviation of (0.855). The mean value of potential slack does not match the study of Godoy-Bejarano et al. (2020) and Lefebvre

(2024) as the mean value of potential slack in these studies was (3.47) and (0.191) respectively.

Turning to the moderator variables, Table (4) indicates that the frequency of introduction and growth phases (M_1) is (232) with (31.9%), while the frequency of maturity phase (M_2) is (289) with (39.7%). The frequency of shake-out and decline phases is (M_3) is (207) with (28.4%).

4.2 Data Validation

4.2.1 Normal Distribution Test

The current study depends on The Kolmogorov-Smirnov and Shapiro-Wilk tests to determine if the variables show the normal distribution. When the significance values of tests are greater than 0.05, the variables have a normal distribution (Pallant, 2020). Table (5) displays the results of the Kolmogorov-Smirnov and Shapiro-Wilk tests.

Table (5)

Results of Kolmogorov-Smirnov and Shapiro-Wilk Tests

	Kolmogorov-Smirnova		*Shapiro-Wilk*	
	Statistic	*Sig.*	*Statistic*	*Sig.*
Y_{t+1}	0.132	0.000	0.760	0.000
X_1	0.104	0.000	0.923	0.000
X_2	0.109	0.000	0.937	0.000
X_3	0.136	0.000	0.913	0.000
X_1*M_1	0.358	0.000	0.596	0.000
X_1*M_2	0.325	0.000	0.677	0.000
X_1*M_3	0.377	0.000	0.571	0.000
X_2*M_1	0.372	0.000	0.649	0.000
X_2*M_2	0.329	0.000	0.662	0.000
X_2*M_3	0.395	0.000	0.556	0.000
X_3*M_1	0.377	0.000	0.521	0.000
X_3*M_2	0.347	0.000	0.614	0.000
X_3*M_3	0.429	0.000	0.508	0.000
Z_1	0.052	0.000	0.979	0.000

Z_2	0.049	0.000	0.976	0.000
Z_3	0.138	0.000	0.849	0.000
Z_4	0.092	0.000	0.938	0.000
Z_7	0.201	0.000	0.769	0.000

As shown in Table (5), all variables do not follow the normal distribution as the significance values of the (Kolmogorov-Smirnov) and (Shapiro-Wilk) tests of all variables are less than 0.05. Introduction and growth phases (M_1), maturity phase (M_2), shake-out phase and decline phases (M_3), audit quality (Z_5), and internal control effectiveness (Z_6) are binary variables that do not follow the normal distribution.

4.2.2 OLS Regression Validation

Using Ordinary Least Squares (OLS) regression depends on some assumptions. The most important assumptions for applying this regression are normality test, autocorrelation test, and heteroskedasticity test. Table (6) shows the results of OLS analysis validation using normality test, autocorrelation test, and heteroskedasticity test.

Table (6)
Results of OLS Analysis Validation

Models	Normality of residuals		Autocorrelation		Heteroskedasticity	
	Test statistic	P-value (1)	Test statistic	P-value (2)	Test statistic	P-value (3)
$Model_1$	12726	0.000	76.32	0.000	66.66	0.02٠
$Model_2$	15928	0.000	88.98	0.000	67.29	0.022
$Model_3$	9272	0.000	74.84	0.005	92.22	0.000
$Model_4$	11343	0.000	62.57	0.021	93.36	0.000
$Model_5$	15443	0.000	57.66	0.032	94.35	0.000
$Model_6$	176594	0.000	92.39	0.000	104.85	0.000
$Model_7$	12984	0.000	73.93	0.000	64.29	0.011
$Model_8$	11998	0.000	86.79	0.000	69.43	0.008
$Model_9$	10008	0.000	96.06	0.000	90.57	0.000
$Model_{10}$	12726	0.000	71.70	0.023	106.05	0.000
$Model_{11}$	12988	0.000	108.47	0.000	89.14	0.000

$Model_{12}$	13982	0.000	96.72	0.000	97.60	0.000

(1) If p-value is less than 0.05, means that the error term does not follow normal distribution.

(2) If p-value is less than 0.05, means that there is an autocorrelation problem in the error term.

(3) If p-value is less than 0.05, means that the error term has a heteroscedasticity problem.

According to Table (6), the p-value of the residuals normality test for all variables is less than 0.05 which indicates that the error term does not follow normal distribution. Also, the p-value of the autocorrelation test for all variables is less than 0.05 which means that there is an autocorrelation problem in the error term. Further, the p-value of the heteroskedasticity test for all variables is less than 0.05, i.e., the error term has a heteroscedasticity problem. Therefore, the residuals do not follow the normal distribution and the data suffers from autocorrelation and heteroscedasticity problems. Thus, the current study will use Generalized Least Squares (GLS) regression instead of (OLS) regression to solve these problems.

4.3 Hypotheses Testing Results

4.3.1 Firm Slack and Future Profitability

4.3.1.1 Linear Impact Analysis

Table (7) shows the results of GLS regression for the linear impact of firm slack on future profitability. Model (1) examines the impact of absorbed slack on future profitability. The results reveal that absorbed slack has a significant negative impact on future profitability (*β of X_1=-0.073****) as the increase in absorbed slack drives a decline in future profitability. Consequently, the *H_{1a}* **hypothesis** which indicates that "*There is a significant negative impact of absorbed slack on future profitability*" can be accepted. The reasons for this negative impact, as explained in the hypothesis's development section, are attributed to inefficiencies in resource utilization, opportunity costs, a short-term focus on managing excess resources, and contextual factors that exacerbate these issues. These elements collectively contribute to the detrimental effects of recoverable slack on a company's overall performance.

This result is consistent with Agusti-Perez et al. (2020) which concluded that absorbed slack negatively affected both economic and financial profitability among Spanish industrial companies. Also, this result is in accordance with Du et al. (2022) which proved that absorbed slack had a negative impact on R&D investment among Chinese firms.

Regarding unabsorbed slack, Model (2) studies the linear impact of unabsorbed slack on future profitability. The results indicate that unabsorbed slack has a significant positive impact on future profitability (β *of* X_2=**0.096**[***]) since the increase in unabsorbed slack leads to an increase in future profitability. Accordingly, the H_{2a} **hypothesis** which indicates that "***There is a significant positive impact of unabsorbed slack on future profitability***" is verified. The positive impact of unabsorbed slack on future profitability occurs, as explained in the hypothesis's development section, because of its operational flexibility, ability to reduce pressure on current resources, support to absorb crises, and availability to use in new opportunities or ideas. This result complies with Wiersma (2017) which indicated that unabsorbed slack positively affected firm profitability among Taiwanese firms and hence future profitability. Similarly, the result follows Jermias and Yigit (2023) which showed that unabsorbed slack had a positive impact on firm profitability and thus future profitability.

Model (3) investigates the impact of potential slack on future profitability. The results denote that potential slack has a significant positive impact on future profitability (β *of* X_3=**0.049**[***]) as the increase in potential slack drives an increase in future profitability. Consequently, the H_{3a} **hypothesis** which indicates that "***There is a significant positive impact of potential slack on future profitability***" can be accepted. This positive impact arises, as explained in the hypothesis's development section, because potential slack provides flexibility to firms when dealing with challenges such as economic downturns and competitive pressures. Additionally, firms with potential slack may feel more secure in taking calculated risks and adopting innovative ideas because of the availability of resources. Furthermore, potential slack enhances strategic management by improving its competitive advantage in complex and dynamic environments. This result is consistent with Agusti-Perez et al. (2020) which

concluded that potential slack positively affected financial profitability among Spanish industrial companies.

Table (7)

GLS Regression Results for the Linear Impact of Firm Slack on Future Profitability

Variables	Model₁			Model₂			Model₃		
	β	VIF	Tol.	β	VIF	Tol.	β	VIF	Tol.
X_1	-.073*** (0.001)	1.558	.642						
X_1^2	.117** (0.0١٦)	1.497	.668						
X_2				.096*** (0.000)	3.238	.309			
X_2^2				-.051*** (0.000)	2.582	.387			
X_3							.049*** (0.000)	4.097	.244
X_3^2							-.010*** (0.000)	3.859	.259
Z_1	.003 (0.161)	1.283	.779	.005** (0.028)	1.520	.658	.004** (0.045)	1.266	.790
Z_2	-.044*** (0.004)	1.196	.836	-.007 (0.695)	1.597	.626	-.045*** (0.002)	1.144	.874
Z_3	.025*** (0.000)	1.252	.799	.031*** (0.000)	1.249	.801	.035*** (0.000)	1.225	.816
Z_4	.020*** (0.002)	1.049	.954	.014** (0.02	1.079	.927	.018*** (0.0	1.043	.958

				1)			03)		
Z_5	.009 (0.222)	1.257	.795	.012 (0.125)	1.261	.793	.019** (0.014)	1.312	.762
Z_6	.019** (0.024)	1.092	.916	.011 (0.167)	1.095	.913	.018** (0.026)	1.084	.923
Z_7	.247*** (0.00)	1.136	.881	.206*** (0.000)	1.140	.877	.199*** (0.000)	1.144	.874
Constant	-.116** (0.021)			-.164*** (0.004)			-.158*** (0.001)		
Wald chi2	116.626			143.355			159.701		
Prob > chi2	0.000			0.000			0.000		

4.3.1.2 U-shaped Analysis

Table (8) demonstrates the results of the U-shaped analysis. Model (1) denotes that absorbed slack has a U-shaped nexus with future profitability as (*β of X_I^2=0.117**; Slope X_L=-0.186***; Slope X_H=0.127**; Turning Point=0.3114497; P-value of U-test=0.054*). The U-shaped nexus of absorbed slack with future profitability means that the increase of absorbed slack, first, causes a decrease in future profitability and after the turning point (0.3114497) the impact of absorbed slack converts and causes an increase in future profitability. Thus, the *H_{1b}* hypothesis which indicates that "*There is a significant U-shaped nexus between absorbed slack and future profitability*" is verified. The reasons for the U-shaped nexus, as explained in the hypothesis's development section, are related to managerial behavior towards the absorbed excess resources. This finding is alignment with Duan et al. (2020) which found that absorbed slack had a significant U-shaped nexus with innovation performance which was likely to affect profitability. Nevertheless, this finding is contradicted by Alrashdan and Alnahedh (2023) which investigated the impact of firm slack on firm performance, using profitability

measures, among the Gulf Cooperation Council (GCC) countries. The findings of Alrashdan and Alnahedh (2023) showed that absorbed slack demonstrated an inverted U-shaped nexus with performance. Also, it is inconsistent with Lefebvre (2023) which examined the influence of human resource slack, a type of absorbed slack, on profitability among small and large French firms. The study of Lefebvre (2023) concluded an inverted U-shaped nexus between human resource slack and profitability.

Model (2) indicates that unabsorbed slack has an inverted U-shaped nexus with future profitability because (***β of X_2^2=-0.051***; *Slope X_L=0.244****; *Slope X_H=-0.099****; *Turning Point*=0.9311498; *P-value of U-test*=0.005***). The inverted U-shaped nexus of unabsorbed slack with future profitability indicates that the increase of unabsorbed slack, first, causes an increase in future profitability and after the turning point (0.9411498) the impact of unabsorbed slack changes and reasons a decrease in future profitability. Therefore, the *H_{2b}* **hypothesis** which indicates that "*There is a significant inverted U-shaped nexus between unabsorbed slack and future profitability*" can be accepted. This inverted U-shaped nexus, as explained in the hypothesis's development section, is attributed to the level of unabsorbed slack. This result is consistent with Duan et al. (2020) which revealed that unabsorbed slack had a significant inverted U-shaped nexus with innovation performance which would affect future profitability.

Concerning potential slack, Model (3) shows that potential slack has an inverted U-shaped nexus with future profitability because (***β of X_3^2=-0.010***; *Slope X_L=0.054****; *Slope X_H=-0.087****; *Turning Point*=-2.364812; *P-value of U-test*=0.004***). The inverted U-shaped nexus of potential slack with future profitability denotes that the increase of potential slack, first, causes an increase in future profitability and after the turning point (-2.364812) the impact of potential slack changes and reasons a decline in future profitability. Therefore, the *H_{3b}* **hypothesis** which indicates that "*There is a significant inverted U-shaped nexus between potential slack and future profitability*" is verified. This inverted U-shaped nexus, as explained in the hypothesis's development section, is related to the level of potential slack and its insufficient utilization. This

result aligns Duan et al. (2020) which concluded that potential slack showed a significantly inverted U-shaped nexus with innovation performance.

Table (8)

GLS Regression Results for the U-shaped Nexus of Firm Slack on Future Profitability

	Model1		Model2		Model3	
	Lower	Upper	Lower	Upper	Lower	Upper
β of X^2	0.117**		-0.051***		-0.010***	
P-value of X^2	0.016		0.000		0.000	
Interval	-0.482	0.852	-1.438	1.892	-4.957	1.803
Slope	-0.186***	0.127**	0.244***	-0.099***	0.054***	-0.087***
P-value of Slope	0.002	0.045	0.000	0.006	0.004	0.000
Turning point	0.3114497		0.9411498		-2.364812	
T-test for U-test	1.61		2.25***		2.64***	
P-value of U-test	0.054		0.005***		0.004***	
Nexus shape	U-shaped		Inverted U-shaped		Inverted U-shaped	

4.3.2 Corporate Life Cycle, Firm Slack, and Future Profitability

4.3.2.1 Introduction and Growth Phases, Firm Slack, and Future Profitability

4.3.2.1.1 Linear Impact Analysis

Table (9) shows the results of GLS regression for the moderating role of the introduction and growth phases. Model (4) indicates that the introduction and growth phases strengthen the linear negative impact of absorbed slack on future profitability as (*β of X_1=-0.045**). Accordingly, the *H4a* **hypothesis** which indicates that "***The introduction and growth phases play a significant***

moderator role in the negative impact of absorbed slack on future profitability" can be accepted.

About unabsorbed slack, Model (5) shows that the introduction and growth phases strengthen the linear positive impact of unabsorbed slack on future profitability as (*β of X_2=0.102****). Consequently, the *H_{4c}* **hypothesis** which indicates that "*The introduction and growth phases play a significant moderator role in the positive impact of unabsorbed slack on future profitability"* is verified. In the same context, Model (6) illustrates that the introduction and growth phases slightly strengthen the linear positive impact of potential slack on future profitability as (*β of X_3=0.048****). Therefore, the introduction and growth phases have no impact on the inverted U-shaped nexus of potential slack with future profitability. So, the *H_{4e}* **hypothesis** which indicates that "*The introduction and growth phases play a significant moderator role in the positive impact of potential slack on future profitability"* cannot be rejected.

4.3.2.1.2 U-shaped Analysis

According to Table (9), Model (4) indicates that the introduction and growth phases have an insignificant impact on the U-shaped nexus between absorbed slack and future profitability as (*β of X_1^2 * M_1=0.135*); in other words, the introduction and growth phases do not have any impact on the U-shaped nexus of absorbed slack with future profitability. Thus, the *H_{4b}* **hypothesis** which indicates that **"*The introduction and growth phases play a significant moderator role in the U-shaped nexus between absorbed slack and future profitability"*** cannot be accepted. Also, Model (5) shows that the introduction and growth phases have no significant impact on the inverted U-shaped nexus between unabsorbed slack and future profitability as (*β of X_2^2 * M_1=0.017*). Accordingly, the introduction and growth phases have no impact on the inverted U-shaped nexus of unabsorbed slack with future profitability. Hence, the *H_{4d}* **hypothesis** which indicates that **"*The introduction and growth phases play a significant moderator role in the inverted U-shaped nexus between unabsorbed slack and future profitability"*** is not verified. In the same vein, Model (6) denotes that the introduction and growth phases do not have any significant impact on the inverted U-shaped nexus between potential slack and future profitability as (*β of X_3^2 * M_1=0.001*). Therefore, the *H_{4f}* **hypothesis**

which indicates that **"*The introduction and growth phases play a significant moderator role in the positive impact of potential slack on future profitability*"** can be rejected.

In conclusion, the introduction and growth phases significantly strengthen the linear impact of firm slack (absorbed, unabsorbed, and potential) on future profitability; however, they do not influence the U-shaped nexus among these variables. This distinction arises due to the considerable role of duration as this impact differs across the short, medium, and long term. This interpretation aligns with Agusti-Perez et al. (2020), who proved that, for example, unabsorbed slack had a positive effect on profitability in the short run, but there was an insignificant impact during the medium and long run.

Table (9)
GLS Regression Results for the Moderating Role of the Introduction and Growth Phases

Variables	Model$_4$				Model$_5$				Model$_6$			
	β	P-v	VIF	Tol.	β	P-v	VIF	Tol.	B	P-v	VIF	Tol.
X_1	-0.045*	0.086	2.104	.475								
X_1^2	0.077	0.194	2.000	.500								
$X_1 * M_1$	-0.099**	0.030	2.111	.474								
$X_1^2 * M_1$	0.135	0.166	1.988	.503								
X_2					0.102***	0.000	3.735	.268				
X_2^2					-0.056****	0.000	2.932	.341				
$X_2 * M_1$					-0.028	0.374	2.871	.348				
$X_2^2 * M_1$					0.017	0.718	2.551	.392				
X_3									0.048***	0.000	5.510	.182
X_3^2									-0.011***	0.001	5.508	.182
$X_3 * M_1$									-0.005	0.730	3.796	.263
$X_3^2 * M_1$									0.001	0.867	3.962	.252
Z_1	.003	0.141	1.299	.770	0.005**	0.035	1.533	.652	0.004**	0.044	1.266	.790
Z_2	-.042***	0.005	1.200	.833	-0.008	0.656	1.623	.616	-0.046***	0.002	1.145	.873
Z_3	.024***	0.000	1.260	.794	0.031***	0.000	1.249	.801	0.035***	0.000	1.226	.816
Z_4	.020***	0.002	1.050	.952	0.014**	0.023	1.083	.924	0.019***	0.002	1.047	.955
Z_5	.010	0.202	1.259	.794	0.012	0.126	1.264	.791	0.019**	0.015	1.313	.761
Z_6	.020**	0.017	1.097	.912	0.011	0.173	1.100	.909	0.018**	0.026	1.086	.921
Z_7	.252***	0.000	1.143	.875	0.208***	0.000	1.143	.875	0.199***	0.000	1.145	.873
Constant	-.119**	0.018			-0.159***	0.005			-0.160***	.001		
Wald chi2	122.187				144.591				160.680			
Prob > chi2	0.000				0.000				0.000			

4.3.2.2 Mature Phase, Firm Slack, and Future Profitability
4.3.2.2.1 Linear Impact Analysis

Table (10) displays the results of GLS regression for the moderating role of the maturity phase. Model (7) indicates that the maturity phase weakens the linear negative impact of absorbed slack on future profitability as (*β of X_1=-0.187****). Accordingly, the *H_{5a}* **hypothesis** which indicates that "***The maturity phase plays a moderator role in the negative impact of absorbed slack on future profitability***" can be accepted. Concerning unabsorbed slack, Model (8) shows that the maturity phase weakens the linear positive impact of unabsorbed slack on future profitability as (*β of X_2=0.079****). Thus, the *H_{5c}* **hypothesis** which indicates that "***The maturity phase plays a moderator role in the positive impact of unabsorbed slack on future profitability***" is verified. Regarding potential slack, Model (9) demonstrates that the maturity phase weakens the linear positive impact of potential slack on future profitability as (*β of X_3=0.047****). Therefore, the *H_{5e}* **hypothesis** which indicates that "***The maturity phase plays a significant moderator role in the positive impact of potential slack on future profitability***" can be accepted.

4.3.2.2.2 U-shaped Analysis

Concerning Table (10), Model (7) reveals that the maturity phase causes flattening in the U-shaped nexus between absorbed slack and future profitability as (*β of X_1^2 * M_2=-0.142***); i.e., the maturity phase weakens the U-shaped nexus of absorbed slack with future profitability. In other words, the U-shaped nexus of absorbed slack with future profitability still exists but it tends to be slightly linear. Accordingly, the *H_{5b}* **hypothesis** which indicates that "***The maturity phase plays a moderator role in the U-shaped nexus between absorbed slack and future profitability***" can be accepted. Turning to Model (8), the maturity phase increases the steepening degree in the inverted U-shaped nexus between unabsorbed slack and future profitability as (*β of X_2^2 * M_2=-0.022***); viz., the maturity phase strengthens the inverted U-shaped nexus of unabsorbed slack with future profitability, meaning that any minor change in the level of unabsorbed slack leads to a rapid large change in future profitability. Thus, the *H_{5d}* **hypothesis** which indicates that "***The maturity phase plays a moderator role in the inverted U-shaped nexus between***

unabsorbed slack and future profitability" is verified. Also, Model (9) shows that the maturity phase rises the steepening degree in the inverted U-shaped nexus between potential slack and future profitability as (**β of X_3^2 * M_2=-0.002**[**]); namely, the maturity phase strengthens the inverted U-shaped nexus of potential slack with future profitability, indicating that any slight change in the level of potential slack leads to a rapid large change in future profitability. So, the H_{5f} **hypothesis** which indicates that "***The maturity phase plays a moderator role in the inverted U-shaped nexus between potential slack and future profitability"*** can be accepted.

To conclude, the maturity phase has a moderator role not only for the linear impact but also for the U-shaped nexus. The significant moderating role of the maturity phase on the nexus between absorbed slack and future profitability occurs because in the maturity phase firms have stable sales growth, persistent net income, and a stable increase in sales demand (Yang and Shyu, 2019; Michalkova et al., 2022). As a result, firms in the maturity phase are more able to control and exploit their resources effectively, increasing future profitability. Also, the significant moderating role of the maturity phase on the nexus between unabsorbed slack and future profitability happens because in the maturity phase firms display positive operating cash flows as a result of the stable increase in sales (Chireka, 2020; Irawan and Afif, 2020), leading to a rise in cash level. When the cash level reaches a certain threshold (a high level of cash slack), it will negatively affect future profitability. In the same context, the moderating role of the maturity phase on the nexus between potential slack and future profitability arises as in the maturity phase firms display negative financing cash flows as a result of the existence of a cash surplus to pay their debts (Chireka, 2020; Irawan and Afif, 2020). As a consequence, firms in this phase depend more on internal financing than external financing because of financial stability which affects future profitability.

Table (10)
GLS Regression Results for the Moderating Role of the Maturity Phase

Variables	Model7				Model8				Model9			
	β	P-v	VIF	Tol.	β	P-v	VIF	Tol.	β	P-v	VIF	Tol.
X_1	-	0.00	2.279	.439								

	.187***	0										
X_1^2	.148***	0.002	1.891	.529								
$X_1 * M_2$	.158***	0.000	1.892	.528								
$X_1^2 * M_2$	-.142**	0.016	1.555	.643								
X_2					.079***	0.000	3.979	.251				
X_2^2					-.047***	0.001	3.404	.294				
$X_2 * M_2$					.051**	0.046	4.742	.211				
$X_2^2 * M_2$					-.022**	0.021	4.932	.203				
X_3									.047***	0.000	6.677	.150
X_3^2									-.012***	0.003	8.314	.120
$X_3 * M_2$									.007**	0.049	6.765	.148
$X_3^2 * M_2$									-.002**	0.048	8.710	.115
Z_1	.003	0.161	1.283	.779	.005**	0.039	1.525	.656	.004**	0.045	1.270	.787
Z_2	-.058***	0.000	1.197	.836	-.006	0.706	1.604	.623	-.048***	0.001	1.153	.867
Z_3	.019***	0.005	1.252	.799	.031***	0.000	1.250	.800	.035***	0.000	1.227	.815
Z_4	.017***	0.006	1.057	.946	.014**	0.024	1.090	.917	.018***	0.003	1.044	.957
Z_5	.015**	0.037	1.261	.793	.012	0.114	1.261	.793	.019**	0.014	1.313	.762
Z_6	.017**	0.045	1.094	.914	.011	0.179	1.100	.909	.017**	0.031	1.088	.920
Z_7	.229***	0.000	1.147	.871	.192***	0.000	1.172	.853	.193***	0.000	1.150	.870
Constant	-.116**	0.021			-.156**	0.006			-.154***	0.002		
Wald chi2	117.947				149.907				163.513			
Prob > chi2	0.000				0.000				0.000			

4.3.2.3 Shake-out and Decline phases, Firm Slack, and Future Profitability
4.3.2.3.1 Linear Impact Analysis

Table (11) shows the results of GLS regression for the moderating role of the shake-out and decline phases. Model (10) denotes that the shake-out and decline phases weaken the linear negative impact of absorbed slack on future profitability as (**β of X_1=-0.104*****). Consequently, the **H_{6a} hypothesis** which indicates that "***The shake-out and decline phases play a moderator role in the negative impact of absorbed slack on future profitability***" can be accepted. Regarding unabsorbed slack, Model (11) displays that the shake-out and decline phases strengthen the linear positive impact of unabsorbed slack on future profitability as (**β of X_2=0.105*****). Hence, the **H_{6c} hypothesis** that "***The shake-out and decline phases play a moderator role in the positive impact of unabsorbed slack on future profitability***" is verified. About potential slack, Model (12) demonstrates that the shake-out and decline phases strengthen the linear positive impact of potential slack on future profitability as (**β of X_3=0.054*****). Therefore, the **H_{6e} hypothesis** which indicates that "***The shake-out and decline phases play a moderator role in the positive impact of potential slack on future profitability***" cannot be rejected.

4.3.2.3.2 U-shaped Analysis

Regarding Table (10), Model (7) indicates that the shake-out and decline phases increase the steepening degree in the U-shaped nexus between absorbed slack and future profitability as (**β of $X_1^2 * M_3$=0.181****); that is to say, the shake-out and decline phases strengthen the U-shaped nexus of absorbed slack with future profitability, meaning that any slight change in the level of absorbed slack leads to a rapid large change in future profitability. Thus, the **H_{6b} hypothesis** which indicates that "***The shake-out and decline phases play a moderator role in the U-shaped nexus between absorbed slack and future profitability***" cannot be rejected. On the contrary, the shake-out and decline phases cause a flattening in the inverted U-shaped nexus between unabsorbed slack and future profitability as (**β of $X_2^2 * M_3$=0.003****); i.e., the shake-out and decline phases weaken the inverted U-shaped nexus of unabsorbed slack with future profitability. In other words, the inverted U-shaped nexus of unabsorbed slack with future profitability still exists but tends to be slightly linear. Therefore, the **H_{6d} hypothesis** which indicates that "***The shake-out and decline***

phases play a moderator role in the inverted U-shaped nexus between unabsorbed slack and future profitability" is verified. Also, the shake-out and decline phases cause a flattening in the inverted U-shaped nexus between potential slack and future profitability as (*β of $X_3^2 * M_3$=0.006***); namely, the shake-out and decline phases weaken the inverted U-shaped nexus of potential slack with future profitability. In other words, the inverted U-shaped nexus of potential slack with future profitability still exists but tends to be slightly linear. Hence, the *H_{6f}* **hypothesis** which indicates that *"The shake-out and decline phases play a moderator role in the inverted U-shaped nexus between potential slack and future"* cannot be rejected.

      To summarize, the shake-out and decline phases play a moderator role in the linear impact and the U-shaped nexus. The significant moderating role of the shake-out and decline phases on the nexus between absorbed slack and future profitability happens because, in the shake-out and decline phases, firms suffer from an increase in costs with a great decrease in revenues, earnings, and net income (Fodor et al. 2024). Thus, any small increase in absorbed slack causes a rapid decline in future profitability. Similarly, the significant moderating role of the shake-out and decline phases on the nexus between unabsorbed slack and future profitability occurs because in the decline phase firms meet negative operating cash flows as a result of the decline in revenues, earnings, and net income (Michalkova et al. 2022). Therefore, firms in the decline phase face a considerable decrease in unabsorbed slack, affecting future profitability. In the same sense, the significant moderating role of the shake-out and decline phases on the nexus between potential slack and future profitability appears because firms in the shake-out and decline phases show negative financing cash flows due to the incapability to pay debts (Irawan and Afif 2020; Abuhommous, 2023). Consequently, the shake-out and decline phases strengthen the positive impact of potential slack on future profitability and weaken the inverted U-shaped nexus if firms can access additional resources.

Table (11)
GLS Regression Results for the Moderating Role of the Shake-out and Decline Phases

Variables	Model10 β	P-v	VIF	Tol.	Model11 β	P-v	VIF	Tol.	Model12 β	P-v	VIF	Tol.
X_1	-.104***	0.000	2.35	.426								
X_1^2	.190***	0.003	2.376	.421								
$X_1 * M_3$	-.084**	0.045	2.136	.468								
$X_1^2 * M_3$	.181**	0.038	2.269	.441								
X_2					.105***	0.000	5.403	.185				
X_2^2					-.050**	0.013	6.449	.155				
$X_2 * M_3$					-.025**	0·37	4.687	.213				
$X_2^2 * M_3$					.003**	0·13	6.601	.151				
X_3									.054***	0.000	4.752	.21
X_3^2									-.010***	0.000	4.389	.228
$X_3 * M_3$									-.005**	0.044	9.349	.107
$X_3^2 * M_3$									.006**	0.042	9.355	.107
Z_1	.003	0.162	1.299	.770	.005**	0.026	1.52	.658	.004**	0.049	1.272	.786
Z_2	-.042***	0.005	1.204	.831	-.007	0.700	1.625	.615	-.050***	0.001	1.16	.862
Z_3	.024***	0.000	1.259	.794	.031***	0.000	1.249	.801	.035***	0.000	1.227	.815
Z_4	.021***	0.001	1.055	.948	.015**	0.018	1.092	.915	.019***	0.002	1.047	.955
Z_5	.009*	0.064	1.259	.794	.012	0.123	1.261	.793	.019***	0.015	1.313	.762
Z_6	.020**	0.018	1.094	.914	.011	0.170	1.097	.912	.017***	0.036	1.087	.92
Z_7	.239***	0.000	1.141	.876	.199***	0.000	1.179	.848	.189***	0.000	1.157	.864
Constant	-.120**	0.018			-.166***	0.003			-.156***	0.002		
Wald chi2	122.594				146.005				168.430			
Prob > chi2	0.000				0.000				0.000			

5. Conclusion

This study mainly sought to examine the linear impact of firm slack on future profitability and the U-shaped nexus between firm slack and future profitability. Additionally, the current study aimed to investigate the moderator role of corporate lifecycle among these variables. To achieve this, the present study depended on a sample consisting of (104) firms of Egyptian-listed firms from 2015 to 2021.The results revealed that, firstly, firm slack had a significant linear impact on future profitability. Absorbed slack had a significant negative impact on future profitability, while unabsorbed and potential slack had a significant positive impact on future profitability. Further, the results showed that there was a U-shaped nexus between firm slack and future profitability. Absorbed slack had a significant U-shaped nexus with future profitability, whereas unabsorbed and potential slack had a significant inverted U-shaped nexus with future profitability. Moreover, the maturity, shake-out, and decline phases of the corporate life cycle moderated not only the linear impact of firm slack (absorbed, unabsorbed, and potential) on future profitability but also the U-shaped nexus among these variables. On the other hand, the introduction and growth phases of the corporate life cycle moderated the linear impact of firm slack (absorbed, unabsorbed, and potential) on future profitability; but they did not have a moderator role in the U-shaped nexus among these variables.

Despite the aforementioned results, there are some limitations. First, the current study excluded banks and non-bank financial services. Therefore, this study can be reexamined using banks and non-bank financial services. Secondly, the current study classified the corporate life cycle into three phases: growth, maturity, and decline because of the nature of Egyptian data as the number of observations in the introduction and shake-out phases were small. Thus, further research can be conducted in other environments and compare results with the Egyptian environment. Also, future research can examine the impact of peer firms on determining the levels of firm slack.

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