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A Study to Examine the Relationship Between CEO Characteristics and Organizational Performance in the US Pharmaceutical and Biopharmaceutical Industries

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A STUDY TO EXAMINE THE RELATIONSHIP BETWEEN CEO CHARACTERISTICS AND ORGANIZATIONAL PERFORMANCE IN THE U.S. PHARMACEUTICAL AND BIOPHARMACEUTICAL INDUSTRIES

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ABSTRACT

This study examined the relationship between CEO tenure, sex, level of education, and organizational performance across 229 U.S. publicly traded pharmaceutical and biopharmaceutical companies. The Upper Echelons Theory was used to guide this research on how CEO characteristics could impact organizational performance. Fifteen hypotheses were developed and tested to evaluate the statistically significant relationship between CEO tenure, sex, level of education, and the organizational performance demonstrated in the abnormal stock return valuation and the number of FDA-approved drug products in clinical trial phases (phases 1, 2, and 3) for each company.

This quantitative, non-experimental, and cross-sectional study was completed by conducting Multiple Linear Regression analysis and Negative Binomial Regression analysis to quantitative secondary data representing CEOs' characteristics and their organizations.

Study findings suggest that the length of CEO tenure had a positive statistically significant relationship with organizational performance. Our results showed that as a CEO's tenure increases by one year, the abnormal stock return increases by 0.92%, and the number of drug products in the pipeline in phase 3 increases by a factor of 1.03 (3%).

CEO sex and level of education did not indicate any statistically significant relationship with the abnormal stock return or the number of FDA-approved drug products in clinical trial phases (phases 1, 2, and 3).

Keywords: CEO tenure, CEO sex, CEO education, organizational performance

DEDICATION

This study is dedicated to CEOs and non-executive employees working in the pharmaceutical and biopharmaceutical industries in the United States and worldwide. They work tirelessly in the most regulated industry to develop and manufacture innovative drug products critical for improving the health of our population. Thank you for your dedication and continued efforts in improving the quality of life for humans all over the world.

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I would like to acknowledge the efforts of my parents, Khairy and Aziza, for instilling in me the love of pursing education, particularly my mom, Aziza, and her crucial role in raising three highly educated children after my dad passed away too early. I would not have been in this program or achieved many other goals without your sacrifices. And for that, I am forever grateful. Thank you, Mom.

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CHAPTER 1

INTRODUCTION

In recent years, the characteristics of Chief Executive Officers (CEOs) have been studied extensively to understand and identify the traits of a leader that may result in positive or negative organizational performance (Hitt & Smith, 2005; Miner, 1971; Yukl & Gardner, 2020; Zaccaro et al., 2001). This is due to the significant impact that a CEO has on employees' values, behaviors, commitment, attitude, goals, and productivity, as well as on how organizational cultures are formed (Hitt & Smith, 2005; Li & Yang, 2019; van Diggele et al., 2020).

Many studies have examined the influential role of CEOs and their impact on organizational outcomes in various industries and different countries (Li & Yang, 2019; Li et al., 2021; van Diggele et al., 2020; Wang et al., 2011). Scholars reported that for an organization to achieve desirable outcomes, specific leadership skills and characteristics must exist in its CEO (He et al., 2021; van Diggele et al., 2020). Scholars also concluded through statistical analysis and empirical evidence that if there is no effective leadership in place, there will not be a clear organizational vision, mission, or goal to work towards (Dausey, 2020; He et al., 2021; Northhouse, 2018; van Diggele et al., 2020). Additionally, scholars found a definitive connection between CEOs' characteristics (i.e., age, tenure, sex, level of education) and organizational performance (i.e., stock price,

profitability, innovation, organizational assets) (Ali et al., 2022; Dausey, 2020; He et al., 2021; Nguyen et al., 2018).

Published studies on CEO characteristics agreed that CEO traits are influential factors that should be considered when evaluating an organization and the reasons for its success (Ali et al., 2022; Saidu, 2019; Urquhart & Zhang, 2022; Yimin et al., 2022). However, there is no clear answer as to which specific characteristics may affect the overall performance of an organization (Cao et al., 2021; Dausey, 2020; Neifar & Ajili, 2019; Northhouse, 2018; Wang et al., 2011).

The literature indicates that CEOs are not only the face of their organizations but also a major factor in their organization's failure or success (Dausey, 2020; Northhouse, 2018; Tran & Adomako, 2021; Wang et al., 2011). This can be attributed to the CEO's ultimate responsibility to ensure the successful fulfillment of the organization's mission, vision, and goals, as well as to survive the aggressive competition in their market (Mulyati et al., 2021; Tran & Adomako, 2021; Wang et al., 2011). A CEO is also responsible for preventing their organizations from violating any rules, policies, procedures, or regulations (Dausey, 2020; Sun & Zou, 2021). Moreover, a CEO is responsible for allocating the funds and resources needed for daily operations and is held accountable for ensuring a high rate of financial profitability for the organization's stakeholders (Dausey, 2020; Li & Yang, 2019; Meyers et al., 2022).

Given the major responsibilities of the CEO role, studying the impact of CEOs' characteristics on organizational performance became a hot topic for research (Mukherjee & Sen, 2022; Sun & Zou, 2021; Ullah et al., 2021). Scholars examined the impact of

CEOs' characteristics on organizational outcomes in various industries, such as the automotive, food, healthcare, education, manufacturing, insurance, and banking industries (He et al., 2021; Jadiyappa et al., 2019; Mun et al., 2020). However, limited research has been conducted to examine the impact of CEOs' characteristics on organizational performance in the pharmaceutical and biopharmaceutical industries, considering how critical these industries are (Meyers et al., 2022). The pharmaceutical and biopharmaceutical industries produce a continuous stream of drug products that save lives and improve the quality of life for patients worldwide (Scherer, 2000). Therefore, the lack of research on CEO characteristics and organizational performance in the pharmaceutical and biopharmaceutical industries represented a critical gap in the literature that this study aims to fill (Scherer, 2000)

Various studies measured the success of a CEO based on the organization's stock price, market capitalization (market cap), assets acquired or developed, and organizational profitability (Dausey, 2020; Jardon & Martínez-Cobas, 2019; Meliá-Martí et al., 2020; Meyers et al., 2022; Northhouse, 2018). For instance, a CEO's success at a pharmaceutical or biopharmaceutical company is measured by the value of the company's stock price, market cap valuation, and the abnormal stock returns for the company (Chiyachantana et al., 2021; Meyers et al., 2022). All draw a picture of how well an organization is performing from a financial standpoint and, therefore, how attractive the organization is to investors and financial institutions (Dausey, 2020; Meyers et al., 2022; Mulyati et al., 2021; Scherer, 2000). An additional factor of a pharmaceutical or biopharmaceutical company's success is its portfolio, which summarizes the number

of drug products in its pipeline and approved by the United States Food and Drug Administration (FDA) for clinical trial development (Meyers et al., 2022; Scherer, 2000). The organization's pipeline reflects the research and development (R&D) capabilities of an organization (Li & Yang, 2019; Li et al., 2021; Meyers et al., 2022). This, in turn, gives investors an idea of the organization's potential future revenue sources should the drug products in the pipeline be approved by the FDA for commercial marketing (FDA, 2022; Li et al., 2021; Meyers et al., 2022; Scherer, 2000). Once a drug receives final FDA approval, it becomes a commercial product that generates revenue for the company (He et al., 2021; Li & Yang, 2019; Meyers et al., 2022). Therefore, this study examined if an association exists between the organizational abnormal stock return (ASR) and the number of drug products developed in the pipeline, as measures of organizational performance and specific CEO characteristics (i.e., CEO tenure, sex, level of education) (Scherer, 2000).

Background

Given that executives play a critical part in the success of their organizations and that performance is influenced by their innate characteristics, many studies have examined the relationship between CEOs' characteristics and organizational performance (He et al., 2021; Neifar & Ajili, 2019; Northhouse, 2018; Wang et al., 2011). For instance, studies examined the link between CEO charisma and organizational performance (Hitt & Smith, 2005; Wang et al., 2011). Others studied the relationship between CEO age, tenure, education, and their effect on organizational performance

(Dausey, 2020; Hitt & Smith, 2005; Tran & Adomako, 2021; Wang et al., 2011). All studies reported mixed results, but all agreed that there is a relationship between CEO characteristics and organizational outcomes (Dausey, 2020; Northhouse, 2018; Tran & Adomako, 2021).

Researchers have examined the impact of CEO characteristics on the organizational outcomes in various industries—retail, service, healthcare, manufacturing, and education (Dausey, 2020; Mulyati et al., 2021; Northhouse, 2018; van Diggele et al., 2020; Wang et al., 2011). They concluded that CEO characteristics influence organizational performance as well as the behavior and commitment of employees toward the organization (Miller & Xu, 2017; Saidu, 2019; Shao et al., 2020). These characteristics may translate to the success or failure of an organization (van Diggele et al., 2020; Wang et al., 2011). Additionally, studies have shown that CEO characteristics influence market reaction toward an organization which impacts the organization's stock price, market cap, and ability to raise capital if needed (Dausey, 2020; Khan et al., 2020; Mulyati et al., 2021).

However, there is limited literature that examines the relationship between CEO characteristics and organizational performance in the U.S. pharmaceutical and biopharmaceutical industries (Meyers et al., 2022; Scherer, 2000; Wang et al., 2011). This is an important sector of the economy that is responsible for the research and manufacture of drugs and medicine critical for improving the health of our population (Meyers et al., 2022; Scherer, 2000). Therefore, initiating this quantitative, non-experimental, cross-sectional study will fill the gap discovered in the literature by

providing a research-based perspective on the relationship between CEO tenure, sex, level of education, and organizational performance among the U.S. publicly traded pharmaceutical and biopharmaceutical companies.

Problem Statement

Empirical evidence demonstrates that CEOs play a critical role in an organization's success or failure (Almutairi & Alenezi, 2020; Blase & Blase, 2000; Jardon & Martínez-Cobas, 2019; Mukherjee & Sen, 2022). CEOs are not only responsible for their organization's compliance with rules and regulations but also for financial sustainability (Almutairi & Alenezi, 2020; Meyers et al., 2022). They are also responsible for creating a work environment where all employees feel included, empowered, respected, heard, and valued (Bass et al., 2008; Goleman, 2000; Wang et al., 2011; Yukl & Gardner, 2020).

The macro consensus among scholars is that a relationship exists between CEOs' characteristics and the performance of their organization (Dausey, 2020; He et al., 2021; Neifar & Ajili, 2019; Wang et al., 2011). Therefore, the role of executives in organizational performance outcomes has been a topic of interest for research across various industries, including healthcare, manufacturing, finance, and education (Almutairi & Alenezi, 2020; Chaturvedi et al., 2019; Expósito et al., 2021; Wang et al., 2011; Yukl & Gardner, 2020). However, there is no consensus as to how a CEO's individual characteristics of tenure, sex, and level of education specifically impact the

organizational success (Dausey, 2020; Naseem et al., 2020; Northhouse, 2018; Prabowo & Setiawan, 2021).

Most importantly, there is a gap in the literature that provides evidence of the impact of CEO characteristics on the organizational performance of U.S. publicly traded pharmaceutical and biopharmaceutical companies (Meyers et al., 2022; Scherer, 2000; Wang et al., 2011). This gap in the literature creates a need that should be addressed by further research (Meyers et al., 2022).

From the literature reviewed, it was evident that the Upper Echelons Theory (UET) provided clear guidance to researchers in examining the relationship between CEO characteristics and organizational performance (Ali et al., 2022; Bassyouny et al., 2020; Díaz-Fernández et al., 2020; Hitt & Smith, 2005; Ma et al., 2021; Miles, 2021; Northhouse, 2018; Smith & Hitt, 2009; White & Borgholthaus, 2022). However, little research utilizing the UET has been conducted in the U.S. pharmaceutical and biopharmaceutical industries (Meyers et al., 2022). Therefore, this quantitative, non-experimental, cross-sectional study seeks to fill this void by examining the relationship between CEO characteristics and organizational performance in the U.S. pharmaceutical and biopharmaceutical industries guided by the UET.

Theory

The theoretical framework designed for this study was governed by one of the most popular and influential management theories in the management literature, the Upper Echelons Theory (UET) (Hambrick, 2007). Hambrick and Mason's (1984) UET

focuses on executives' characteristics and the impact of these characteristics on employees and organizational outcomes (Dausey, 2020; Hambrick, 2007; Hitt & Smith, 2005; Smith & Hitt, 2009; Wang et al., 2011). According to the UET, executives' characteristics are expressed in their behavior and performance (Hambrick, 2007; Hitt & Smith, 2005; Smith & Hitt, 2009). Therefore, the beliefs, characteristics, and values of senior executives translate into the success or failure of their organizations (Dausey, 2020; Hitt & Smith, 2005; Northhouse, 2018; Wang et al., 2016).

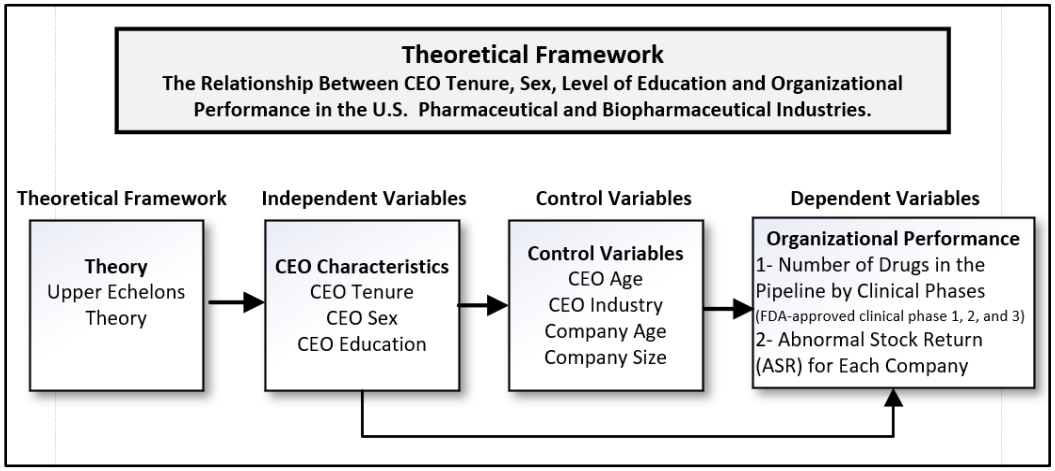
The UET indicates that an individual executive is able to affect the outcome of an organization because organizational performance mirrors an executive's values, education, experience, goals, and cognitions (Dausey, 2020; He et al., 2021; Hitt & Smith, 2005; Neely et al., 2020; Ting, 2021). The characteristics introduced and examined in the UET are the executive's age, tenure, type of experience, and level of education (Altuwaijri & Kalyanaraman, 2020; Dausey, 2020; Li et al., 2021). Additionally, the UET indicates that organizational success could be measured through various criteria, such as the financial performance and milestones achieved during an executive's tenure (Cao et al., 2021; Dausey, 2020; Khan et al., 2020; Neifar & Ajili, 2019).

Previous studies have examined the influence of individual CEO characteristics on their organizational performance across various industries in accordance with the UET, and it is proven to be an effective theoretical framework (Altuwaijri & Kalyanaraman, 2020; Bassyouny et al., 2020; Dausey, 2020; Hitt & Smith, 2005; Urquhart & Zhang, 2022; Wang et al., 2016; White & Borgholthaus, 2022). Therefore,

the UET was selected for this study as a theoretical framework to examine the relationship between CEO tenure, CEO sex, CEO level of education, and their impact on organizational performance in the U.S. pharmaceutical and biopharmaceutical industries (Scherer, 2000). Figure 1 below illustrates the examined variables in this study in accordance with the UET that CEO characteristics influence organizational performance.

Figure 1

Theoretical Framework



Note. In accordance with the Upper Echelons Theory, CEO characteristics may influence organizational performance. Figure developed by author, W. Mohamed.

Importance of the Study

The current body of literature presents studies that examined CEO characteristics and their impact on organizational performance (Altuwaijri & Kalyanaraman, 2020; Miller & Xu, 2017; Nakavachara, 2020). However, contradictory results were observed in the literature (Phuong, 2020; Saidu, 2019; Urquhart & Zhang, 2022).

Multiple studies indicated that there is a relationship between CEO tenure and organizational outcome (Dausey, 2020; Hitt & Smith, 2005; Sumunar et al., 2019; Yimin et al., 2022). However, the conclusions of these studies are contradictory; some reported a positive relationship (Garcia-Blandon et al., 2019) while others reported a negative relationship (Neifar & Ajili, 2019).

Similarly, studies have indicated a relationship between CEO sex and organizational performance (Baselga-Pascual & Vähämaa, 2021; Expósito et al., 2021; Jardon & Martínez-Cobas, 2019; Klein et al., 2021; Wang et al., 2011). Of these works, some studies indicated a positive relationship between the two variables (Tuo et al., 2021) while others indicated a negative relationship (Gupta & Mahakud, 2020).

Other studies examined executives' level of education and its impact on their decision-making process and organizational performance (Altuwaijri & Kalyanaraman, 2020; Hitt & Smith, 2005; Miles, 2021; Miller & Xu, 2017; Nakavachara, 2020). Education level is considered an indicator of an executive's goals, motivations, and risk-taking capabilities (Dausey, 2020; Wang et al., 2011). While some researchers indicated a positive association between both variables (Noura et al., 2021), others indicated a negative relationship between CEO education and organizational performance (Nawaz, 2021).

All studies examined one or two CEO characteristics with organizational outcomes in healthcare, retail, service, food, manufacturing, and education industries, but no quantitative, cross-sectional, and non-experimental studies were performed in the U.S. pharmaceutical or biopharmaceutical industries (Meyers et al., 2022). Therefore, this

study was conducted to fill this gap and examine the relationship between CEO tenure, sex, level of education, and organizational performance in the U.S. pharmaceutical and biopharmaceutical industries. This study will add value to our knowledge and UET-related studies since there is a lack of research that examines the impact of CEO tenure, sex, and level of education on organizational performance among U.S. pharmaceutical and biopharmaceutical industries in accordance to the UET (Meyers et al., 2022).

Research questions were developed and answered based on scientific and empirical evidence, statistical data analysis, and a theoretical framework. Therefore, the results of this research could be beneficial as a foundation for future research that aims to explore different angles of this research topic. Additionally, pharmaceutical and biopharmaceutical executives could benefit from the in-depth analysis of the overall leadership landscape of the U.S. pharmaceutical and biopharmaceutical industries from an executive standpoint.

Critical characteristics of CEOs were examined in this study such as tenure, sex, and level of education and their impact on organizational performance. This could benefit the various board of directors of the U.S. pharmaceutical and biopharmaceutical organizations during the hiring process of a new CEO or other non-CEO senior executives.

Moreover, policymakers focused on the development and reformation of drug policies and regulations for the pharmaceutical and biopharmaceutical industries could benefit from this research by gaining a holistic understanding of CEOs' characteristics and their impact on organizational performance in U.S. companies. This understanding

could enhance communications with these executives during the process of drug policy discussions (Scherer, 2000).

This study may also serve as a guidance document for those who aspire to hold an executive position in the future. Observing the characteristics of successful individuals at the pinnacle of the pharmaceutical and biopharmaceutical industry, such as CEOs, and studying their achievements and their correlation with certain characteristics will provide a roadmap, list of skills, and educational requirements that may help an individual become an effective executive in the future.

Research Questions

This study examined whether CEO characteristics (tenure, sex, and level of education) could positively or negatively impact the organizational outcomes (the abnormal stock return valuation and the number of drug products developed in their pipeline per FDA-approved one-to-three clinical trial phases) (Scherer, 2000). Therefore, specific research questions were crafted in a way that allows in-depth analysis. The research questions considered in this study are as follows:

RQ 1. Is there a relationship between CEO tenure and organizational performance in the U.S. pharmaceutical and biopharmaceutical industries?

RQ 2. Is there a relationship between CEO sex and organizational performance in the U.S. pharmaceutical and biopharmaceutical industries?

RQ 3. Is there a relationship between CEO level of education and organizational performance in the U.S. pharmaceutical and biopharmaceutical industries?

To answer the research questions listed above based on theoretical and scientific bases, the UET was used as the guiding theoretical framework (Hitt & Smith, 2005; Miles, 2021; Northhouse, 2018; Wang et al., 2011). The research questions were answered by conducting a statistical analysis of quantitative, cross-sectional secondary data from 229 U.S. publicly traded pharmaceutical and biopharmaceutical companies. The statistical analysis of the collected data was conducted using Stata software to perform Multiple Linear Regression analysis (MLR) and Negative Binomial Regression analysis (NBR) to understand the relationship between all variables (Cox et al., 2021; Hilbe, 2011; Nimon & Oswald, 2013). Reviewing the mean, standard deviation (SD), p-values, and confidence intervals resulting from the data analysis determined the statistical significance and relationship between CEO characteristics and their organizational performance in U.S. pharmaceutical and biopharmaceutical companies (Nimon & Oswald, 2013).

Conclusion

CEO characteristics have been extensively studied to understand which traits of a leader could result in positive organizational performance. Multiple studies were published on CEO characteristics and the impact of these characteristics on the organizational outcomes in various industries, such as the automotive, food, healthcare, education, manufacturing, insurance, and banking industries. However, limited research has been conducted to examine the impact of CEOs' characteristics on organizational performance in the U.S. pharmaceutical and biopharmaceutical industries. This is an

important sector of the economy that is responsible for the research and manufacture of drugs critical for improving the health of our population. Therefore, initiating this quantitative, non-experimental, cross-sectional study to fill the gap discovered in the literature is important by providing a research-based perspective on the relationship between CEO tenure, sex, level of education, and organizational performance among the U.S. publicly traded pharmaceutical and biopharmaceutical companies.

Definitions

For a better understanding of the study, the following terms are defined in the context of this research:

Abnormal Stock Return (ASR): Known as the *excess stock return* is calculated by subtracting the actual stock return of an organization from the benchmark return such as S&P 500 [$ASR = SR_{aCt} - SR_{ben}$] (Chiyachantana et al., 2021).

Average Stock Price: The average closing price of a specific common stock share of an organization (Chiyachantana et al., 2021; Tran & Adomako, 2021).

Biopharmaceutical companies: Companies that apply knowledge of biology to duplicate or change the function of a living cell so it will work in a more predictable and controllable way. The biotechnology industry uses advances in genetics research to develop products for human diseases and conditions and derive their products from the extraction or manipulation of living organisms (FDA, 2022; Scherer, 2000).

Chief Executive Officer (CEO): A CEO is a top decision-maker and highest in the rank executive at any organization (Dausey, 2020; Northhouse, 2018).

Chief Executive Officer age: The age of a CEO. A control variable that influences the CEO's decision, risk tolerance, and expertise (Dausey, 2020; Northhouse, 2018).

Chief Executive Officer tenure: The total number of years the CEOs served as CEOs in their organization. An independent variable that influences organizational performance (Dausey, 2020; Khan et al., 2020; Northhouse, 2018).

FDA: The United States Food and Drug Administration is a federal agency responsible for protecting public health and safety through the control and supervision of food products, tobacco products, medical devices, and drug products (FDA, 2022; Scherer, 2000).

Market Capitalization (MC): Also known as the *Market Cap* is a representation of the total value of a company's shares of stock. The MC is calculated by multiplying the stock price of an organization by its total number of outstanding shares [MC = Stock price x number of outstanding shares] (Chiyachantana et al., 2021).

Incidence Rate Ratio (IRR): It is an interpretation of the negative binomial regression analysis considering the ratio of incident rate and is achieved by adding the command (,irr) at the end of the regression command (Hilbe, 2011).

Pharmaceutical companies: Companies that discover, develop, produce, and market pharmaceutical drugs for use as medications to be administered to patients, to cure them, vaccinate them, or alleviate symptoms. Pharmaceutical companies create medicines from chemicals and synthetic processes (FDA, 2022; Scherer, 2000).

Phase one (1) clinical trial: The first clinical trial is conducted on human subjects with a population ranging from 20 to 50 normal healthy volunteers or patients in other cases to evaluate the safety of a drug product (FDA, 2022; Scherer, 2000).

Phase Two (2) clinical trial: The second clinical trial after completing the phase 1 trial and is conducted on a population ranging from 100 to 300 patients with a specific disease to evaluate the efficacy of a drug product (FDA, 2022; Scherer, 2000).

Phase Three (3) clinical trial: The third clinical trial is conducted after the successful completion of phase 2 trials and is conducted on a population ranging from 300 to 3,000 patients with a specific disease in other cases to evaluate the effectiveness of a drug product (FDA, 2022; Scherer, 2000).

Pipeline: Also known as the company's portfolio describes the number and indication of drug products owned by the company that is undergoing FDA-approved one-to-three clinical trial phases (FDA, 2022; Meyers et al., 2022; Scherer, 2000).

S&P 500: Also known as the *Standard and Poor's 500 index* is a stock market index that provides an overview of the performance of the stock market (Chiyachantana et al., 2021).

CHAPTER 2

LITERATURE REVIEW

Introduction

The literature review is the methodology to review, understand, and conduct the synthesis of prior similar research that could contribute to this research from a theoretical framework, thoughtful literature evaluation, identifying research gaps, and extending the research database perspective (Dausey, 2020; Li et al., 2021). The literature review for this study aimed to evaluate similar research and identify gaps in the database related to this topic (Hitt & Smith, 2005; White & Borgholthaus, 2022). Various theories have examined the relevance of executive characteristics that may affect organizational performance, among them being the Upper Echelons Theory (UET) (Díaz-Fernández et al., 2020; Hitt & Smith, 2005; Wang et al., 2011).

The UET states that specific characteristics of an executive could impact the outcome and performance of an organization (Ali et al., 2022; Bassyouny et al., 2020; Hitt & Smith, 2005; Wang et al., 2011). These characteristics include executive tenure, sex, level of education, age, and professional experience (Expósito et al., 2021; Hitt & Smith, 2005; Ma et al., 2021; Naseem et al., 2020; Wang et al., 2011).

This research study was conducted to examine the relationship between CEO tenure, sex, education, and the influence, if any, of these factors on organizational performance in the U.S. pharmaceutical and biopharmaceutical industries (Scherer,

2000). Therefore, the UET was selected as a theoretical framework in this study to answer the following research questions:

RQ 1. Is there a relationship between CEO tenure and organizational performance in the U.S. pharmaceutical and biopharmaceutical industries?

RQ 2. Is there a relationship between CEO sex and organizational performance in the U.S. pharmaceutical and biopharmaceutical industries?

RQ 3. Is there a relationship between CEO level of education and organizational performance in the U.S. pharmaceutical and biopharmaceutical industries?

To answer these research questions listed above, it was essential to conduct a comprehensive literature review in order to understand previous research conducted on this topic and to be aware of their conclusions. The literature review served to identify gaps in the literature that could be addressed by this study and to provide insights into what methodologies and theoretical frameworks have been used and how research limitations were addressed (Urquhart & Zhang, 2022; van Diggele et al., 2020).

Review of the Literature

The study variables of CEO tenure, sex, level of education, and their impact on organizational performance were the main foundation of establishing the literature review chapter of this study. Various studies that evaluated similar topics were reviewed and synthesized to establish the empirical and scientific foundation of this study based on

study variables, theoretical frameworks, methodologies, research gaps, and findings gathered from the literature review. The literature reviewed is listed below.

Leadership

Although individuals may drive a process or lead a team in their personal lives or professional careers, not every leader is a good leader or effective at leading (Northhouse, 2018). This observation resulted in scholars, leaders, and regular individuals asking the question: What makes a leader a good leader? What makes a leader a bad leader? And what makes a leader an ineffective leader? (Northhouse, 2018).

The drive to understand the phenomenon of *not every leader can lead* has resulted in an extensive study of behaviors and characteristics of executives and the definition of leadership. What is the responsibility of a leader? What makes one a high-performing leader? (Northhouse, 2018; van Diggele et al., 2020; Wang et al., 2011). As a result, the research database on leadership and management theories has grown rapidly and become an essential subject of education in textbooks, university courses, work-related training, and a subject of coaching provided by private learning and training institutions (Benzel, 2021; Northhouse, 2018; Wang et al., 2011).

Various studies found that researchers either defined leadership as possessing certain traits or understood leadership as a relationship between executives and followers (Benzel, 2021; Hall, 2022; Northhouse, 2018; Spain, 2019). These studies examined leaders and their level of effectiveness from a quantitative and qualitative perspective in various environments, such as different industries, organizations of different sizes, and

different geographic locations (Hall, 2022; Harris, 2020; Northhouse, 2018; Spain, 2019). Collectively, all studies agreed that leadership is not as simple as many had thought. Effective leadership that achieves successful organizational performance requires a combination of certain traits, skills, education, charisma, and effective communication and listening skills (Adair, 2011; Asadi & Stefanescu, 2019; Benzel, 2021; Chaturvedi et al., 2019; Northhouse, 2018; Yukl & Gardner, 2020).

The definition of leadership has changed over the years due to macro- and micro-environmental factors that impacted the economy, culture, leadership boundaries, responsibilities, and employees' and customers' expectations of a leader (Johnson, 2021; Northhouse, 2018; Yukl & Gardner, 2020). Examples of these macro- and micro-environmental factors include rapid changes in the environment, regulations, policies, technology, human rights, gender rights, sexual-orientation equality, and the rapidly changing demands of consumers and investors (Cepiku & Mastrodascio, 2020; Hall, 2022; Harris, 2020; Northhouse, 2018).

In the 1900s, leadership was defined as power and authority (Northhouse, 2018). In the 1930s, scholars focused on traits to define leadership (Northouse, 2018). These traits included communication, inclusion, empowerment of others, listening skills, vision, and goals (Benzel, 2021; Northhouse, 2018; Sihombing et al., 2018; Yukl & Gardner, 2020). In the 1940s, scholars defined leadership as behavior and the ability to influence and lead others (Northhouse, 2018). Between the 1950s and 1970s, leadership was understood as the ability to develop organizational goals and lead an organization through the successful execution of these goals (Chaturvedi et al., 2019; Northhouse, 2018).

Similarly, in the 1980s, leadership was understood as the ability to dominate an organization and aid in executing organizational goals by influencing others (Chaturvedi et al., 2019; Northhouse, 2018). In the 1990s and into the 21st century is when types of leadership started to emerge and more in-depth knowledge about these different types started to develop. It was recognized that each type is influenced by specific characteristics (DePree, 2011; Johnson, 2021; Northhouse, 2018).

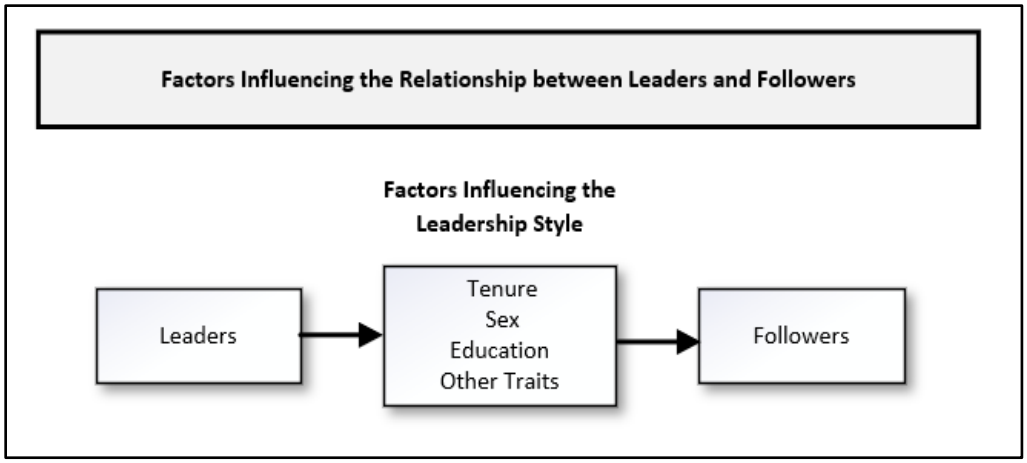
Scholars have identified several types of leadership styles: authentic leadership, where the authenticity of a leader is emphasized (Northhouse, 2018; Rogers, 2020; Spain, 2019); spiritual leadership, where a leader depends on values and membership to motivate others (Northhouse, 2018; Rogers, 2020; Spain, 2019; Wang et al., 2011); and servant leadership when a leader plays a servant role of helping, empowering, and encouraging followers to reach their potential and achieve their goals (Chaturvedi et al., 2019; Northhouse, 2018).

Additionally, adaptive leadership describes leaders who can adapt and encourage others to adapt to changes and solve problems and confront challenges (Rogers, 2020; Spain, 2019). Followership is also a type of leadership where a leader presents followers to the front line and emphasizes their achievements (Benzel, 2021; Northhouse, 2018). Finally, there is discursive leadership in which a leader depends on communication skills in negotiation and influencing others (Harris, 2020; Northhouse, 2018).

Scholars agreed that despite the type of leadership, leaders exert influence on their followers which is heavily driven by their characteristics and traits as indicated in Figure 2 below (Benzel, 2021; Hall, 2022; Northhouse, 2018; Rogers, 2020; Spain, 2019).

Figure 2

Factors Impacting the Leadership Style



Note. Figure developed by author, W. Mohamed.

Based on Figure 2 above, executive characteristics such as tenure, sex, and level of education influence their leadership style and lead to impacts on organizational performance (Benzel, 2021; Hall, 2022; Northhouse, 2018; Rogers, 2020; Spain, 2019). It was important to conduct an in-depth review of the existing literature related to CEO tenure, CEO sex, and CEO level of education and the impact of these factors on the organizational performance individually and as follows:

CEO Tenure

Tenure is defined as the total number of years a CEO has held the CEO position in an organization in which they were authorized to make capital and strategic decisions (Khan et al., 2020; Mulyati et al., 2021). Scholars studied the impact of CEO tenure on

organizational performance and reported inconsistent results (Dausey, 2020; He et al., 2021; Li & Yang, 2019; Li et al., 2021; Naseem et al., 2020). This study was interested in whether a longer CEO tenure positively impacted the organizational performance as demonstrated by the abnormal stock return valuation and the number of drug products in the company's development pipeline.

CEO Tenure and Stock Prices

Researchers have been interested in understanding the relationship between executives' tenure and the resulting impact on their organization's valuation and market cap, assuming that stock price is an accurate benchmark for financial success (Khan et al., 2021; Neifar & Ajili, 2019; Xu et al., 2020). Mixed results were found during the literature review.

Scholars understand that one of a CEO's primary duties is to ensure a continuous increase in the organization's stock price, market cap, and profitability (Garcia-Blandon et al., 2019; Neifar & Ajili, 2019; Xu et al., 2020). They develop the company's financial profile by engaging investors who, in turn, invest cash into the company, increasing the stock price value of an organization (Mulyati et al., 2021; Xu et al., 2020). This could be achieved by developing more products in the pipeline and increasing organizational market valuation to assure a profitable future for the organization for investors and stockholders (Mulyati et al., 2021). There is a positive feedback loop that improves a CEO's success – an increased stock price leads to a higher market value for an

organization. The higher a company is valued, the more successful its CEO is perceived to be (Meyers et al., 2022; Mulyati et al., 2021; Xu et al., 2020).

Scholars found that CEO traits such as tenure are strongly associated with the increase or crash of the stock price and market cap of an organization (Garcia-Blandon et al., 2019; Khan et al., 2021; Mulyati et al., 2021). Investors believe that CEOs hold the highest rank in an organization and therefore can make critical business decisions and execute strategic plans. Their actions may result in a positive or a negative outcome for the organization and its stock price (Mulyati et al., 2021; Xu et al., 2020). This was confirmed in a study conducted by Mulyati et al. (2021) in which it was found that there was a positive relationship between CEO tenure and the stock price and market cap valuation of an organization. The theory was that the longer a CEO's tenure at a company, the more time they were availed to make tangible impacts on the organization like increasing its market value through strategic decisions, plans, and product or service development (Mulyati et al., 2021).

In a study conducted by Xu et al. (2020), a positive relationship was found between internal collusion among CEOs, directors, and top non-CEO executives to protect the stock price from crashing. In this study, examples of collusion were hiding negative information from investors or the public to prevent the fall of their stock price and market cap (Xu et al., 2020). This mostly happened to CEOs with less experience, less tenure, and less guidance on the impact of manipulating stock prices (Mulyati et al., 2021; Xu et al., 2020).

Similarly, studies demonstrated a relationship between tenure and corporate social and environmental performance, both of which positively impacted organizational market value and stock prices (Khan et al., 2020). Moreover, Tran and Adomako (2021) suggested that the longer a CEO's tenure, the stronger the social capital they developed. The organization benefited from the increased perceived legitimacy and long-term vision, reflected by an increased stock price value. Social capital is a major contributing factor to the success of an organization – a broad network of strong connections is critical for an organization to raise capital, acquire resources, and perform its duty effectively and efficiently (Tran & Adomako, 2021). CEOs with longer tenure were better able to strengthen their organization's social capital ties with internal and external stakeholders, resulting in an overall higher stock price and market cap valuation (Tran & Adomako, 2021).

Moreover, in a study conducted by Garcia et al. (2019), CEOs with longer tenure reported higher annual financial performance than their counterparts with less tenure (Garcia-Blandon et al., 2019). Similarly, another study determined that financial institutions in Pakistan achieved better annual financial performance when led by CEOs with a longer tenure than CEOs with less tenure (Khan et al., 2021). There is also supporting evidence that longer CEO tenure had a positive relationship with financial performance during an organization's recovery from financial difficulties or economic downturns (Yao, 2021).

In conclusion, various studies in different countries and industries found that the longer the CEO's tenure, the more the financial incentives were given to the CEO (e.g.,

stocks, cash compensation, salary, retirement plan); and the longer the CEO's tenure, the better the overall organizational financial performance and stock price valuation (Ali et al., 2022; Cao et al., 2021).

In direct contrast, other research posited a negative or insignificant relationship between CEO tenure and stock prices, market valuation, and financial organizational performance (Neifar & Ajili, 2019; Nguyen et al., 2018). For instance, a study that was conducted by Nguyen et al. (2018) examining the impact of CEO characteristics on companies' stock prices found that CEO tenure was associated with lower firm valuation. The study found that the longer the CEO's tenure, the more likely the company was to take a conservative approach to making changes that could improve the organizational stock price and market cap valuation (Nguyen et al., 2018).

Similarly, Dausey (2020) found no significant association between CEO tenure and financial reporting among the U.S. publicly traded companies when considering the stock price, earnings, and market cap valuation (Dausey, 2020). This finding by Dausey (2020) contradicted the results of a study conducted by Neifar and Ajili (2019) on nonfinancial publicly held German companies. The latter found a significant positive association between CEO tenure and financial reporting as CEO tenure impacted the stock price synchronicity (SPS) which measures the stock price volatility (Neifar & Ajili, 2019).

In another study conducted in Pakistan by Naseem et al. (2020) to examine CEOs' characteristics and their impact on the financial performance in developed countries, the study concluded a negative relationship between CEO tenure and organizational financial

performance and stock price valuation. The study indicated that CEOs were mainly figureheads who were largely interchangeable and that hiring a new CEO or firing an existing one had no impact on the overall financial performance of an organization (Naseem et al., 2020).

Additionally, Ahn (2020) studied a sample of 358 Fortune 500 companies and 100 additional, random companies to examine the impact of CEOs' social ties and tenure on a firm's sustainability demonstrated by financial performance. The study concluded that between the two variables, social connections were more influential on financial performance and sustainability than tenure (Ahn, 2020). In conclusion, various studies empirically proved a negative association between CEO tenure, stock prices, market cap valuation, and organizational financial performance.

The overall conclusion is that there are mixed results reported on the impact of CEO tenure on the financial well-being of an organization. Additionally, the literature lacked similar studies to examine the impact of CEO tenure on the financial performance of U.S. pharmaceutical and biopharmaceutical companies. Therefore, this study examined the following hypothesis:

H1. Longer CEO tenure is positively related to the abnormal stock return of U.S. pharmaceutical and biopharmaceutical companies.

CEO Tenure and Products Development

Investments in Research and Development (R&D) are essential for any organization to increase its value, capabilities, and competitiveness in the market (Barker

& Mueller, 2002; Hsu et al., 2020; Zheng et al., 2020). An organizational pipeline or portfolio consists of development projects that have the potential to turn into continuous sources of revenue for the organization (Kao & Chen, 2020; Li et al., 2021).

In the case of this study, the pipeline of pharmaceutical and biopharmaceutical companies consists of drug products that are undergoing clinical trials in various FDA-approved clinical phases (i.e., clinical phases one, two, and three) to demonstrate the safety, efficacy, and stability of the drug product to earn FDA approval for marketing products to patients and healthcare organizations (FDA, 2022; Scherer, 2000). The initiation of every new clinical trial poses significant financial risk since new products have unknown clinical outcomes (Scherer, 2000). The decision to obtain or develop a specific product in the organizational pipeline is primarily made by the CEO after the evaluation of the product's scientific data (Kao & Chen, 2020; Scherer, 2000).

Scholars examined the relationship between CEO tenure and the level of commitment to developing an organization's pipeline and/or portfolio via R&D investments, and mixed results were noted (He et al., 2021; Kao & Chen, 2020; Mukherjee & Sen, 2022). A study conducted by Kao and Chen (2020) examined the effect of CEO tenure on R&D advancement in Initial Public Offering (IPO) high-tech companies. It was found that during the IPO process, in which a privately held organization becomes a publicly traded company on the stock market, CEOs with longer tenure invest aggressively in their organizational R&D capabilities (Kao & Chen, 2020). This strategy increases the potential market value of an organization in the pre-IPO

period, resulting in an increased stock price and organizational market value (Kao & Chen, 2020).

A study conducted on publicly traded companies in Saudi Arabia concluded that CEO tenure has a positive impact on the organization's pipeline and annual financial results. The longer the tenure, the broader the research, and the greater the number of innovative projects that will be strategically planned by the CEO (Tran & Adomako, 2021). Similarly, a study conducted by Zheng et al. (2020) on Chinese publicly held manufacturing companies concluded that the longer the CEO's tenure, the stronger an organization's product innovation.

The study attributed this outcome to the CEO's experience with increasing organizational market valuation through funding R&D projects, advancing and establishing a strong portfolio, and conducting innovative projects (Zheng et al., 2020). Additionally, a similar study of 8,830 Chinese firms validated the idea that longer CEO tenure would positively influence the degree of a firm's investment in brand equity and R&D investments (He et al., 2021). In conclusion, multiple studies providing empirical evidence were found during the literature review that indicated a positive relationship between CEO tenure and the advancement of the organizational portfolio.

Contradicting results were also observed during the literature review on CEO tenure and its impact on innovation. For instance, in a study conducted by Li et al. (2021), it was concluded that CEO age played a more significant role in comparison to CEO tenure when viewing investment ideas in R&D products, projects, and innovation. The study suggested the age of a CEO was a more critical factor than tenure. The older

the CEO, the less risk-averse they are to invest in corporate R&D, while younger CEOs, despite having longer tenure, tended to shy away from risk-taking behaviors as demonstrated in R&D investments and projects (Li et al., 2021). Interestingly, this finding contradicts the results concluded in another study which affirmed that CEO's age had a negative influence on corporate innovative investment decisions—the older the CEO, the less committed they were to long-term R&D projects (He et al., 2021).

Moreover, Hsu et al. (2021), confirmed in their study that CEO tenure had a negative influence on R&D investment. Their findings suggested that as CEO tenure increased, the CEO became less interested in long-term R&D investments (Hsu et al., 2020). These findings were also confirmed in the study conducted by Li and Yang (2019) on U.S. publicly traded pharmaceutical companies. They discovered that as a CEO's tenure increased, they became less associated with product development or innovation initiatives, as they require extensive resources, funds, and time (Li & Yang, 2019).

In conclusion, there was no definitive conclusion in the research database that could confirm if CEO tenure positively impacted corporate R&D and innovation decisions. Therefore, this study aimed to address the following hypotheses:

- *H2. Longer CEO tenure is positively related to the number of drug products developed in the pipeline of U.S. pharmaceutical and biopharmaceutical companies.*

- *H2. a. Longer CEO tenure is positively related to the number of drug products developed in the pipeline in phase 1.*
- *H2. b. Longer CEO tenure is positively related to the number of drug products developed in the pipeline in phase 2.*
- *H2. c. Longer CEO tenure is positively related to the number of drug products developed in the pipeline in phase 3.*

The Overall Conclusion of CEO Tenure and Organizational Performance

It was evident from the literature reviewed that there were mixed results related to CEO tenure and its impact on the organizational valuation and the organization's R&D and pipeline capabilities (Ahn, 2020; Li & Yang, 2019; Naseem et al., 2020). Additionally, current studies failed to present cross-sectional and non-experimental evidence that could examine the impact of CEO tenure on the organizational stock price valuation and R&D investments in the U.S. pharmaceutical and biopharmaceutical industries (Scherer, 2000). This represents a critical gap in the literature that this study aimed to fill.

CEO Sex

Gender orientation, gender equality, and performance based on sexual orientation have been sensitive topics of discussion and research—particularly at the C-suite level (Baker et al., 2021; Farmanesh et al., 2020; Ritter-Hayashi et al., 2019). This is due to the lack of diversity and inclusion among the various board of directors, CEOs, and non-CEO executives (Hossain et al., 2020; Meliá-Martí et al., 2020; Mosley, 2020; Olzmann, 2020). However, in recent years, more females have broken this glass ceiling and claimed

their rights to hold executive positions, such as CEO positions (Terrance et al., 2013). This study sought to explore if CEO gender positively impacted the stock price valuation and the number of drug products developed in the pipeline in U.S. publicly held pharmaceutical and biopharmaceutical companies (Scherer, 2000).

CEO Sex and the Stock Prices

Scholars studied the impact of CEO gender on the organizational financial performance and reported inconsistent results (Dausey, 2020; Khan et al., 2020; Mulyati et al., 2021; Neifar & Ajili, 2019; Nguyen et al., 2018). Many studies identified a significant positive relationship between the sex of a CEO and positive financial performance (Terrance et al., 2013). For instance, Terrance et al. (2013) examined 6,305 U.S. firms and discovered that CEO gender had a significant influence on the Return on Investment (ROI) and the stock price of the organizations. Of the 6,305 examined firms, only 77 firms were led by female CEOs, which is a low number to statistically draw a conclusion on female CEOs' performance (Terrance et al., 2013).

However, although the results were exploratory due to the small sample size of female CEOs, the data indicated that female CEOs were perceived differently by the stock market and investors, but they achieved higher Return on Investment (ROI) and produced higher sales growth, which positively impacted the stock price and market cap valuation of their organizations (Terrance et al., 2013). Similarly, a study conducted by Tuo et al. (2021) examined 109 West African public companies and found that female CEOs had a more positive effect on the organization's financial performance than male

CEOs (Tuo et al., 2021). Furthermore, it was discovered that female CEOs generated and held more cash for their organizations than their male CEOs counterparts (Sah, 2021). It was also found that female CEOs generated greater Returns on Assets (ROA), which led to a higher chance of paying debts and better chances of increasing corporate investments (Sah, 2021). These conditions positively impacted their organizations' stock price valuation.

When looking at the influence of CEO gender on banking systems, there were mixed results. Baselga and Vahamaa (2021) examined 91 publicly traded banks in 10 different Latin American countries and concluded that financial institutions led by female CEOs were less risky and more profitable than those led by male CEOs. The study suggested that female executives tended to have a more positive impact on the overall financial performance than their male CEO counterparts (Baselga-Pascual & Vähämaa, 2021).

These results were validated in another study that examined the performance of female CEOs in the Chinese banking system between 2000 and 2011, which concluded that Chinese banking systems led by female CEOs resulted in better financial performance than those led by male CEOs (Ting, 2021). Additionally, the study suggested that female CEOs had a greater drive to succeed than their male counterparts due to the hardships they faced to achieve such a critical leadership position (Ting, 2021). Another study of 138 non-financial institutions in India found that female CEOs were positively associated with higher stock prices, market cap valuation, and financial performance (Mukherjee & Sen, 2022).

On the other hand, Gupta and Mahakud (2020) conducted a study on the banking system in India and concluded that female CEOs reported poorer financial performance than male CEOs. They attributed this difference to the cultural lack of trust in female leadership—particularly, in managing complex processes, challenging teams, and solving complicated issues (Gupta & Mahakud, 2020). A similar study conducted in India by Jadiyappa et al. (2019) on 100 public firms led by female CEOs between 1999 and 2013 found that female CEOs had a negative impact on the overall financial performance and financial growth of these organizations (Jadiyappa et al., 2019).

These results were also confirmed in a study conducted by Naseem et al. (2020) on 179 publicly traded companies in Pakistan. The study confirmed that male CEOs had a positive impact on their organizational financial performance and stock price valuation as compared to their female counterparts (Naseem et al., 2020). Moreover, it was found that there was a strong relationship between female CEOs and being impacted by macroenvironmental factors, such as a high level of corruption leading to adverse financial events (Hanousek et al., 2019). This striking conclusion was made by Hanousek et al. (2019) by examining data of private firms in Europe between 2000 and 2013. The study found that corruption was more likely to impact firms led by female CEOs (Hanousek et al., 2019).

Interestingly, other studies argued that sex had no impact on organizational stock price, market cap valuation, or financial performance. For instance, He et al. (2021) concluded that CEO gender did not influence the corporate investment decisions that impacted the overall organizational financial performance and stock price valuation. The

study indicated that sex did not play a role in risk-taking financial decisions or financial performance (He et al., 2021). Similarly, Sun and Zou (2021) examined Chinese public companies from 2002 to 2018 and found that there was no significant industry difference between male and female CEOs regarding their financial performance (Sun & Zou, 2021). Additionally, Li and Zeng (2019) examined U.S. public firms during the time of 2006 to 2015 and discovered that female CEOs had no statistical significance or impact on crashing the stock price or market cap valuation of their firms. The study indicated that the Chief Financial Officer (CFO) of the company played a more critical role in preventing or causing the stock to crash than female CEOs do (Li & Zeng, 2019).

This finding was also confirmed in another study (Schopohl et al., 2021). Both studies concluded that female CEOs had a negative association with future stock price crashes due to them being cautious in making financial decisions and communicating financial news to the public (Li & Zeng, 2019; Schopohl et al., 2021). Moreover, when 78,000 quarterly earning conference calls for U.S. public companies in the period 2004-2018 were studied and analyzed, it was discovered that female CEOs were less vague and more optimistic than male CEOs (De Amicis et al., 2021). However, being a female CEO had no positive or negative impact on the stock price, market cap valuation, or financial performance since the stock market reacted to these calls based on the context of the call and not the sex of the executive (De Amicis et al., 2021).

In conclusion, there was no definitive answer to whether CEO gender had a positive or negative impact on the stock price valuation of an organization. Therefore, this study aimed to explore the answer to the following hypothesis:

H3. U.S. pharmaceutical and biopharmaceutical companies led by Male CEOs have higher abnormal stock return than those led by female CEOs.

CEO Sex and Products Development

Pipeline, portfolio, investment, research and development (R&D), and innovation are terms used in the literature to capture the same concept: the creation of new products and services, advancing the pipeline, and building organizational assets that could increase the organizational stock price, market value, capability, competitiveness, and market presence (Hsu et al., 2020; Kao & Chen, 2020; Li et al., 2021; Meyers et al., 2022). The question arises if gender has an impact on the establishment of an organizational portfolio or pipeline?

To answer the question presented above, a literature review of the impact of CEO gender on R&D and innovative investments was essential. However, the literature presented mixed results. For instance, Mahhinone and Sacco (2021) examined the impact of CEO gender on the innovation growth of their organizations in traditionally male-dominated sectors like science-related companies. The study concluded that in science-related workplaces, such as laboratories, both male and female CEOs had similar investment characteristics to advance the organizations' pipelines and their footprints in the market (Macchione & Sacco, 2021).

On the other hand, a study was conducted to evaluate the impact of CEO gender on product innovation in the scientific research and technology development (SRTD)

industry in Vietnam. The study concluded that female CEOs outperformed their male counterparts in innovation and new product strategic initiatives (Jardine & Duong, 2021).

Another study examined 1,405 small and mid-sized Spanish enterprises to examine the impact of CEO gender on organizational innovation and concluded that there was no significant difference between male and female CEOs regarding the organizational product pipelines and innovations (Expósito et al., 2021). Moreover, Liberda (2018) investigated the impact of CEO gender on product innovation in 265 firms in Poland and concluded that there was not a significant difference in performance between male-led and female-led firms. The study concluded also that both male and female CEOs produced equal innovative results when working under similar business conditions and resources (Liberda, 2018).

On the other hand, multiple studies do indicate a difference in performance in product innovation based on the CEO's gender. For instance, Mahhinone and Sacco (2021) examined the impact of CEO gender on innovation in traditional female workplaces, such as daycare, and discovered that female CEOs presented more favorable attribution to investments and innovation growth than male CEOs. Additionally, they concluded that female CEOs became more innovative when surrounded by a female workforce than male CEOs (Macchione & Sacco, 2021).

Similar to the results identified in the Machhione and Sacco (2021) study, another study conducted by Ullah et al. (2021) on publicly held Chinese companies from 2000 to 2017 found that female CEOs presented more favorable attribution and characteristics toward innovative and investment projects than male CEO. Female CEOs were found to

not overspend in order to preserve cash that could be utilized to expand their pipeline through executing investment or improvement projects (Ullah et al., 2021). Additionally, Prabowo and Setiawan (2021) discovered that female CEO-led firms were more innovative than those led by male CEOs. The study utilized the World Bank Indonesia Enterprise Survey in 2015 to examine the impact of CEO gender on innovation and R&D (Prabowo & Setiawan, 2021).

Interestingly, the study also discovered that as the firm size grew, female CEOs became more innovative and focused on R&D and investment projects than their male counterparts (Prabowo & Setiawan, 2021). Moreover, Saggese et al. (2020) affirmed that female CEO-led firms positively moderated the impact of CEO gender on organizational R&D and innovations. It was also indicated in this study and others that female CEOs and members of the board of directors positively impacted the decision-making process of innovations that resulted in an increase in the number of new products and innovative initiatives (NPIs) (Dadanlar, 2021; Saggese et al., 2020). Moreover, it was found in another study that female-owned firms had 3.5% higher product innovation than male-owned firms (Iman et al., 2022).

All evidence listed above was contradicted by other studies that suggested an opposite proposal: male-led firms were more innovative than female-led firms. For instance, Chen et al. (2021) found that Chinese family-owned firms were more innovative when there was a male heir. Additionally, the study indicated that with more experience or education, the male CEO's performance toward product innovation increased compared to the female CEO (Chen et al., 2021). When examining 17,000 newsletters

about appointing female CEOs in U.S. public firms between 2000 and 2016, it was found that just the news of the appointment of a female CEO could instantly impact the overall organizational performance and market valuation (Smith et al., 2021). This was due to the predetermined perception that female CEOs are less innovative and more risk-averse than male CEOs (Klein et al., 2021; Smith et al., 2021). This perception was also confirmed in another study which asserted that female CEOs more often than not took less risky strategic and innovative decisions, particularly during economic downturns (Shropshire et al., 2021).

In conclusion, the literature reviewed presented mixed results regarding the impact of CEO gender on the organizational pipeline and innovative initiatives. Therefore, this study aimed to address the following hypotheses:

- *H4. U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have a higher number of drug products in the pipeline than those led by female CEOs.*
    - *H4. a. U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have a higher number of drug products in phase 1 than those led by female CEOs.*
    - *H4. b. U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have a higher number of drug products in phase 2 than those led by female CEOs.*
    - *H4. c. U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have a higher number of drug products in phase 3 than those led by female CEOs.*

The Overall Conclusion of CEO Sex and Organizational Performance

It was evident from the literature reviewed that there were mixed results related to the impact of CEO gender on the organizational stock price, market cap valuation, and the R&D and product innovations (Baselga-Pascual & Vähämaa, 2021; Iman et al., 2022; Jadiyappa et al., 2019; Liberda, 2018; Naseem et al., 2020). Additionally, it was noticeable that the literature lacked cross-sectional and non-experimental studies that could examine the impact of CEO sex on the stock price valuation and the R&D capabilities of the U.S. pharmaceutical and biopharmaceutical industries (Scherer, 2000). This represents a critical gap in the literature that this study aims to address.

CEO Education

Scholars observed empirical evidence indicating the level and quality of education had an impact on executives' decision-making processes, risk tolerance, and commitment to innovation and R&D investments (Garcia-Blandon et al., 2019; García-Pérez-de-Lema et al., 2021; Jiang & Liu, 2020; Moores et al., 2021; Nakavachara, 2020). However, it was evident in the literature reviewed that there was no consensus on whether higher education positively impacted CEOs' performance (Ali et al., 2022; Boubaker et al., 2020; García-Pérez-de-Lema et al., 2021; Gounopoulos et al., 2021; Sumunar et al., 2019; Urquhart & Zhang, 2022; Yimin et al., 2022).

In this study, there was an interest to understand whether a higher level of CEO education (i.e., CEOs with a doctoral degree versus a non-doctoral degree) would

positively impact the stock price valuation of a company and its innovation demonstrated in the number of drug products developed in the organizational pipeline (Scherer, 2000).

CEO Education and the Stock Price

Scholars studied the impact of a CEO's level of education on the organizational financial performance extensively, as they believed that the level of education impacted critical thinking, strategic planning, and the overall performance of a CEO (Garcia-Blandon et al., 2019; Saidu, 2019). Therefore, it was an important variable for scholars interested in organizational performance to examine (Shao et al., 2020). However, studies reported inconsistent results (Dausey, 2020; Garcia-Blandon et al., 2019; Noura et al., 2021; Phuong, 2020).

In a study conducted by Wafa (2022), it was found that a CEO with an MBA or engineering and science degrees had higher financial performance compared to CEOs with lower degrees. The theory was that CEOs with an MBA or engineering and science degrees were more likely to engage in further R&D projects, process improvement initiatives, social and environmental activities, and commit to continuously enhancing organizational performance (Garcia-Blandon et al., 2019; Tran & Adomako, 2021; Wafa, 2022). All of these actions resulted in a positive impact on the stock price, market cap valuation, and financial performance of an organization (Wafa, 2022). Similarly, Barker and Mueller (2002) found that CEOs with advanced science degrees were more likely to invest in R&D projects. This was due to their scientific mindset and critical thinking style

that drove them to explore, invent, and advance their pipeline capability which increased their organizations' stock price (Barker & Mueller, 2002).

Nassem et al. (2020) examined CEOs' characteristics and their impact on the financial performance of publicly traded companies in Pakistan and confirmed that CEOs with higher education had better financial performance than those with less education. Khan et al. (2021) confirmed these findings in another study conducted in Pakistan for privately held financial organizations. It was discovered in this study and other studies that the higher the education of a CEO, the better the financial performance and the better the stock price of their organizations (Ali et al., 2022; Khan et al., 2021).

Another similar study was conducted on 56 financial institutions publicly listed on the Nigerian stock exchange which confirmed that CEO education had a positive relationship with organizational financial performance, stock prices, and market cap valuation (Saidu, 2019). The study indicated that CEOs' education was a contributing factor in improving organizational profitability (Saidu, 2019). This conclusion was also confirmed in another study conducted on 85 nonfinancial organizations (Altuwaijri & Kalyanaraman, 2020). The study confirmed that CEOs with a graduate degree or higher had better financial performance than those with less education (Altuwaijri & Kalyanaraman, 2020).

Building on this fact, the higher level of education the CEO achieved, the better the financial performance. CEOs of 350 firms from 1999 to 2017 were studied from an educational and financial performance perspective, and it was discovered that CEOs with doctorate-level degrees achieved higher financial performance than their non-PhD peers

(Urquhart & Zhang, 2022). It was found that the advanced educational degree had a positive impact on organizational financial performance, which was demonstrated in the organizational profitability and reflected in the stock price of the organization (Ali et al., 2022; Altuwaijri & Kalyanaraman, 2020; Gupta & Mahakud, 2020; Khan et al., 2021; Saidu, 2019; Wafa, 2022).

When examining CEOs' educational backgrounds and their effect on organizational financial performance in faith-based organizations, similar results were concluded (Nawaz, 2021). It was found that there was a positive relationship between CEOs' higher education, profitability, and stock price valuation (Nawaz, 2021).

Similarly, when examining the CEOs' educational background and its influence on the stock price of an organization in the initial public offering (IPO) phases, it was found that a CEO's education significantly influenced the price setting of the organization's stock price (Gounopoulos et al., 2021). Particularly, when a CEO held a doctoral degree from a highly-ranked educational institution, the organization's financial performance tended to improve (Gounopoulos et al., 2021; Urquhart & Zhang, 2022). This was found to be a result of the CEO's credibility needed to convince investors of the organization's mission and ability to raise capital if needed based on the CEO's credentials and academic achievements. All of these conditions resulted in investment institutions believing in the company, which positively impacted the stock price, profitability, and market cap valuation of the organization (Gounopoulos et al., 2021).

Interestingly, the literature also presented contradicting findings regarding the CEO's educational background and its impact on the organization's stock price and

financial performance. For instance, a study conducted by Garcia et al. (2019) on the best-performing CEOs in 2016, found that CEOs with MBA degrees reported unfavorable financial performance while CEOs with engineering degrees reported higher financial performance (Garcia-Blandon et al., 2019).

A similar study concluded that CEOs with MBA degrees did not financially perform better than other CEOs with no MBA degree or CEOs with other advanced degrees (Nakavachara, 2020). These findings contradicted the results of another study that found that CEOs with MBA degrees had better financial performance and stock price valuation than those with non-MBA degrees (Nawaz, 2021). More interestingly, a study conducted on publicly traded companies in Saudi Arabia discovered that CEOs with degrees focused on management reported poor financial performance (Altuwaijri & Kalyanaraman, 2020).

On the other hand, a study that examined 250 French public firms indicated that neither the level of education nor the field of education impacted the financial performance or the stock price valuation of an organization. Rather, the quality of the educational institution where the CEO obtained their education impacted the financial performance of an organization (Boubaker et al., 2020). The theory was that the better the quality of education, the better the performance of a CEO (Boubaker et al., 2020).

More interesting findings were concluded by Yao (2021) when examining 316 non-financial institutions in China. It was found that a CEO's educational background had no impact on financial performance, particularly during the process of recovering financially or during a financial downturn situation (Yao, 2021). Even in the healthcare

sector, it was found that there was no significant association between CEO education and financial performance as represented in stock prices, profitability, or market cap valuation of U.S. acute care hospitals (Moores et al., 2021).

The literature also presented an interesting point of view regarding the comparison between the financial performance of CEOs with high confidence and less education versus CEOs with less confidence and higher education (Sumunar et al., 2019). Examining 305 companies in Indonesia from 2013 to 2017, it was found that CEOs with a high level of confidence had a positive effect on tax avoidance through creating policies or other tax avoidance initiatives. This resulted in a positive cash flow that positively impacted the overall stock price valuation and financial performance of the organization (Sumunar et al., 2019).

On the other hand, it was found that CEOs with higher education and less confidence had a negative effect on tax avoidance, which resulted in paying the full annual amount of taxes due. This resulted in a negative financial performance and less market cap valuation due to the lack of cash available for the organization after paying the full amount of taxes (Sumunar et al., 2019).

In conclusion, there were mixed results as to whether CEO education impacted the overall stock price and financial performance of an organization. Therefore, it was critical to develop and examine the following hypothesis:

H5. CEOs with doctorate degrees have a higher abnormal stock return than those with non-doctorate degrees in U.S. pharmaceutical and biopharmaceutical companies.

CEO Education and Products Development

It was evident from the literature reviewed that the CEOs' level of education had an implication on financial performance and could influence the stock prices of an organization (Altuwaijri & Kalyanaraman, 2020; Gounopoulos et al., 2021). The question that arose was whether the educational background impacted the organization's level of innovation. Therefore, it was crucial to collect research-based evidence to answer this question.

The literature provided mixed answers to the question presented above. For instance, in a study that was conducted on 310 firms in Spain to evaluate CEOs' educational background against the level of innovation and product research initiatives in their respective organizations, it was found that CEOs with financial literacy or knowledge performed higher in product innovations than CEOs with no financial literacy (García-Pérez-de-Lema et al., 2021). This was due to the importance of acquiring financial knowledge to obtain credits or raise the capital needed for R&D purposes (García-Pérez-de-Lema et al., 2021). Another study examined the R&D initiatives in publicly traded Chinese firms from 2008 to 2016. Researchers discovered that CEOs with higher education were associated with higher expenses for R&D projects (Jiang & Liu, 2020).

It is also worth explaining that in some studies, the R&D and product innovation capabilities were related to the amount of cash available at each organization, which was impacted by the CEO's educational background (Mun et al., 2020). It was found that CEOs with business education showed higher cash reserves than those with science or

engineering backgrounds (Mun et al., 2020). The study discovered that when a CEO had a science or engineering educational background, more spending on R&D projects occurred, and less available cash was reported (Mun et al., 2020). Moreover, the literature indicated that when a CEO had an academic background or was associated with an academic or research institution, their R&D rate of spending increased (Shao et al., 2020). This was also confirmed in another study that examined the product development and innovation of 105 Chinese firms. The study concluded that CEOs with higher education positively impacted the product innovation performance of an organization due to their interest in innovation and discovery projects (Yimin et al., 2022)

On the other hand, other studies argued the lack of a statistical relationship between the CEO's level of education and organizational innovation. For instance, Miller and Xu (2017) discovered that CEOs with MBA degrees were associated with a lower rate of innovation or R&D initiatives. This was due to the fact that CEOs with MBA degrees were most likely to be associated with short-term senior management positions (Miller & Xu, 2017). Additionally, when the performance of a random sample of U.S. acute hospitals led by physicians carrying not only experience but also advanced education was examined, no association was found between CEO education and the advancement of the clinical or innovative capabilities of these hospitals (Moores et al., 2021).

In conclusion, the literature reviewed presented mixed results on how the educational background, level of education, and quality of education impacted

innovation, R&D initiatives, and research investments in an organization. Therefore, this study addressed the following hypotheses:

- *H6. CEOs with doctorate degrees have a higher number of drug products developed in the pipeline than those with non-doctorate degrees in U.S. pharmaceutical and biopharmaceutical companies.*
    - *H6. a. CEOs with doctorate degrees have a higher number of drug products developed in phase 1 than those with non-doctorate degrees.*
    - *H6. b. CEOs with doctorate degrees have a higher number of drug products developed in phase 2 than those with non-doctorate degrees.*
    - *H6. c. CEOs with doctorate degrees have a higher number of drug products developed in phase 3 than those with non-doctorate degrees.*

The Overall Conclusion of CEO Education and the Organizational Performance

The literature reviewed confirmed the notion that there are mixed results related to CEO education and its impact on stock price, organizational market cap valuation, organizational R&D, and product innovation capability (Boubaker et al., 2020; Miller & Xu, 2017; Nakavachara, 2020; Noura et al., 2021; Urquhart & Zhang, 2022). Additionally, the literature failed to present any cross-sectional and non-experimental studies that could examine the impact of CEO education on the stock price valuation and R&D capabilities in the U.S. pharmaceutical and biopharmaceutical industries (Scherer, 2000). This represents a critical gap in the literature that this study aimed to fill.

Overall Literature Review Conclusion

The literature reviewed provided a depth of knowledge in understanding CEO characteristics, particularly tenure, sex, and level of education, and the impact of these

characteristics on the organizational performance demonstrated in the organizational stock price valuation and R&D initiatives (He et al., 2021; Jadiyappa et al., 2019; Meyers et al., 2022; Neifar & Ajili, 2019; Saidu, 2019). It was evident from the literature that there were inconsistent results and disagreement on how CEO characteristics impacted the overall outcome of an organization (Klein et al., 2021; Naseem et al., 2020).

Additionally, while there was an extensive amount of research done on these characteristics and their impact on the organizational performance in various industries (i.e., education, service, healthcare, banking, manufacturing), no quantitative, cross-sectional, and non-experimental studies were found to evaluate the impact of CEO characteristics on organizational performance in the U.S. pharmaceutical and biopharmaceutical industries (Scherer, 2000). This represents a critical gap in the literature that this study aimed to fill.

Theory

Hambrick and Mason's (1984) Upper Echelons Theory (UET) was initially created to process executives' information (values, personality, sex, age, tenure, education, and experience) systematically in order to explain how executives act and react under certain organizational and environmental conditions (Bassyouny et al., 2020; Hambrick, 2007; Hitt & Smith, 2005; Neely et al., 2020). The UET indicates that organizational performance is a reflection of the executive characteristics leading these organizations (Hambrick, 2007). This could be measured through various ways of evaluation, such as the organizational financial performance and achievements that were

achieved by the executives leading these organizations (Hitt & Smith, 2005). Therefore, various studies over the past three decades utilized the UET as a theoretical framework in their research to examine executives' characteristics against organizational performance in various industries (Bassyouny et al., 2020; Neely et al., 2020; Wang et al., 2016). Industries represented include automotive, healthcare, education, food, banking, and insurance industries (Cao et al., 2021; Dausey, 2020; Hitt & Smith, 2005; Khan et al., 2020; Neifar & Ajili, 2019). Moreover, in a study conducted in 2016 on how effective the UET is in the research database, 306 studies were analyzed, and analyses confirmed the UET predictions that CEO characteristics (tenure, sex, education, and age) were associated with the strategic decisions and significantly influenced the organizational performance and outcome (Wang et al., 2016).

Given that previous studies have examined the influence of individual CEO characteristics on their organizational performance in accordance with UET (Altuwaijri & Kalyanaraman, 2020; Dausey, 2020; Hitt & Smith, 2005; Urquhart & Zhang, 2022), and that no research has been done to evaluate the characteristics of the U.S. pharmaceutical and biopharmaceutical CEOs against their organizational performance according to the UET (Scherer, 2000), it was evident that there was a critical gap in the literature and research database that this research aimed to address. Therefore, the UET was selected as the theoretical framework to guide this study through the process of evaluating CEOs' characteristics of the U.S. pharmaceutical and biopharmaceutical industries against their organizational performance.

Research Hypothesis

Based on the study variables identified in this study in Chapter 1 and the empirical findings gathered from the literature reviewed in this chapter, this study addressed the following research questions:

RQ 1. Is there a relationship between CEO tenure and organizational performance in the U.S. pharmaceutical and biopharmaceutical industries?

RQ 2. Is there a relationship between CEO sex and organizational performance in the U.S. pharmaceutical and biopharmaceutical industries?

RQ 3. Is there a relationship between CEO level of education and organizational performance in the U.S. pharmaceutical and biopharmaceutical industries?

The study examined the answer to the research questions presented above by studying the following research hypotheses:

Null Hypothesis

There is no relationship between CEO tenure, sex, level of education, and organizational performance in the pharmaceutical and biopharmaceutical industries.

Research Hypothesis

The research question presented above was addressed by examining the following research hypotheses developed for this study:

- **H1**. Longer CEO tenure is positively related to the abnormal stock return of U.S. pharmaceutical and biopharmaceutical companies.

- **H2**. Longer CEO tenure is positively related to the number of drug products developed in the pipeline of U.S. pharmaceutical and biopharmaceutical companies.
    - **H2. a**. Longer CEO tenure is positively related to the number of drug products developed in the pipeline in phase 1.
    - **H2. b.** Longer CEO tenure is positively related to the number of drug products developed in the pipeline in phase 2.
    - **H2. c**. Longer CEO tenure is positively related to the number of drug products developed in the pipeline in phase 3.

- **H3**. U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have higher abnormal stock return than those led by female CEOs.
- **H4.** U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have a higher number of drug products in the pipeline than those led by female CEOs.
    - **H4. a**. U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have a higher number of drug products in phase 1 than those led by female CEOs.
    - **H4. b.** U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have a higher number of drug products in phase 2 than those led by female CEOs.
    - **H4. c**. U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have a higher number of drug products in phase 3 than those led by female CEOs.

- **H5.** CEOs with doctorate degrees have a higher abnormal stock return than those with non-doctorate degrees in U.S. pharmaceutical and biopharmaceutical companies.

- **H6.** CEOs with doctorate degrees have a higher number of drug products developed in the pipeline than those with non-doctorate degrees in U.S. pharmaceutical and biopharmaceutical companies.
    - **H6. a**. CEOs with doctorate degrees have a higher number of drug products developed in phase 1 than those with non-doctorate degrees.
    - **H6. b.** CEOs with doctorate degrees have a higher number of drug products developed in phase 2 than those with non-doctorate degrees.
    - **H6. c.** CEOs with doctorate degrees have a higher number of drug products developed in phase 3 than those with non-doctorate degrees.

The study hypotheses presented above were examined by conducting a statistical analysis of quantitative, cross-sectional secondary data gathered for this study.

CHAPTER 3

METHODOLOGY

This chapter aims to introduce an overview of the methodology used in this study, consisting of four main sections. The first section, Study Design, describes how the study was designed and explains the rationale behind selecting a specific study design. The second section, Study Population, and Data Sources describes the data and the data collecting strategy for this study, the inclusion and exclusion criteria used for data selection, and the formulas used to calculate the dependent variable (abnormal stock return). The third section, Operationalization of the Study Variables, explains each variable type (i.e., continuous or categorical) and how these variables were organized and coded to facilitate the statistical analysis of the data. The fourth and final section in this chapter is the Statistical Model, which describes the statistical methods used in this study to analyze these data. It explains the software and tools used to organize and perform statistical data analysis.

Study Design

The study design selected for this research was a cross-sectional design that examined the characteristics of 229 CEOs across the U.S. pharmaceutical and biopharmaceutical industries. The total sample population consisted of 229 U.S. publicly traded pharmaceutical and biopharmaceutical organizations: 89 are

pharmaceutical companies and the remaining 140 companies are biopharmaceutical companies. The impact of CEO characteristics (tenure, sex, and level of education) of the 229 CEOs leading these organizations was measured against the organizational performance of their respective companies by evaluating two outcomes: the number of phase 1 to 3 drug products developed in each organization's pipeline, and the abnormal stock return valuation for each company (Scherer, 2000).

Study Population

The study population consisted of 229 publicly traded U.S. pharmaceutical and biopharmaceutical companies that met specific criteria designed for this study in 2019. More recent data from 2020, 2021, and 2022 were not used in this study given the impact of the economic downturn resulting from the impacts of the COVID-19 pandemic and the Russian-Ukrainian war.

For a company to be included in the research population, it first must be a publicly held U.S. company as recognized by the United States Securities and Exchange Commission (Tran & Adomako, 2021; Xu et al., 2020). Second, the CEOs of these companies must have held the position of CEO for three or more years (He et al., 2021; Li & Yang, 2019). Data for almost 65 privately held and non-United States-based pharmaceutical and biopharmaceutical companies were excluded from this study. Similarly, medical device companies (those that manufacture medical devices or medical supplies) or pharmaceutical supplies companies (those that sell pharmaceutical supplies to pharmaceutical and biopharmaceutical companies) were excluded from this study

because they are different in nature and governing regulations (FDA, 2022; Scherer, 2000).

The 229 companies that were examined in this study consisted of 89 pharmaceutical companies (representing 38.9 % of the population) and 140 biopharmaceutical companies (representing 61.1% of the population). The study population consisted of 209 male CEOs (representing 91.3% of the population) and 20 female CEOs (representing 8.7% of the population). The small size of the female CEO population presents a limiting factor in this study, which was discussed in the *Study Limitation* section in Chapters 1 and 5 of this study.

Data Sources

After identifying the study variables, a list of U.S. publicly traded pharmaceutical and biopharmaceutical companies was created in an Excel sheet named *Dissertation Data* to gather all the data required for statistical analysis needed to examine the hypotheses developed in this study. Information about CEOs and their organizations was retrieved using the University of Alabama's (UAB) subscription to the website MergentOnline.com, a source of secondary quantitative data that is considered the most comprehensive company research tool (*MergentOnline*, 2023). The website is a user-friendly platform that offers extensive search capabilities and an abundance of information about an organization's history, location, subsidiaries, leadership team, size, capital, debit, stock history, annual financial reports, and CEO's information including sex, education, tenure, and salary (*MergentOnline*, 2023).

Information about the company's CEO, such as age, type of industry (i.e., pharmaceutical versus biopharmaceutical), tenure, sex, and level of education was retrieved from MergentOnline.com. This data was collected by searching each company by name and retrieving the data from the *Executive* section. Similarly, data on a company's age and the number of employees (i.e., company's size) were collected from MergentOnline.com from the *Company Details* and *Financial* sections (*MergentOnline*, 2023).

The number of products in a company's pipeline was collected from each company's public website by selecting the *Pipeline* or *Portfolio* section. The data collected consisted of the CEO's age and type of industry (pharmaceutical versus biopharmaceutical), company age, and company size were collected as control variables. Dependent variables were the abnormal stock return and the number of drug products in the pipeline per each FDA-approved clinical trial phase (i.e., FDA-approved drug products in the phases of the clinical trial 1, 2, and 3) (*MergentOnline*, 2023; Scherer, 2000).

Table 3 in the proceeding section summarizes the study variables, operationalization of the study variables, and the sources from which data were gathered for statistical analysis to examine the hypotheses developed in this study (see Appendix B).

Operationalization of the Study Variables

Table 1 below summarizes the study variables, operationalization of the study variables (i.e., coded variable), and sources of data.

Table 1

Data Sources and Operationalization of the Study Variables

Study Variables	Variables	Code	Number	Source of Data
Dependent variables	Number of drug products in the pipeline in each clinical phase (1→3 FDA-approved clinical trial phases)	A count variable that represented the number of FDA-approved drug products in the pipeline for each clinical phase (phases 1, 2, and 3). The variables did not require coding and were analyzed as is.	N/A	Company website
	Abnormal stock return	A continuous variable representing the abnormal stock return value of each company. The variable did not require coding and was analyzed as is.	N/A	Mergentonline.com
Independent variables	CEO tenure	A continuous variable represents the number of years of experience a CEO obtains in an organization. This variable did not require coding and was analyzed as is.	N/A	Mergentonline.com
	CEO sex	A categorical variable that was coded to the following: Male → 0 Female → 1	209 Male CEOs (91.3 % of the study population). 20 Female CEOs (8.7 % of the study population).	Mergentonline.com
	CEO education	A Categorical variable that was coded to the following: CEO with a Doctorate degree → 0 CEO with a bachelor's or master's degree → 1	119 CEOs held a non-doctorate degree (52 % of the study population) 110 CEOs held a doctorate degree (48 % of the study population)	Mergentonline.com

	CEO age	A continuous variable representing the CEO's age in years. This variable did not require coding and was analyzed as is.	N/A	Mergentonline.com
Control variables	CEO industry	A categorical variable that was coded to the following: Pharmaceutical → 0 Biopharmaceutical → 1	89 CEOs lead pharmaceutical companies (38.9 % of the study population) 140 CEOs lead biopharmaceutical companies (61.1 % of the study population)	Mergentonline.com
	Company age	A continuous variable representing the company's age in years. This variable did not require coding and was analyzed as is.	N/A	Mergentonline.com
	Number of employees (company's size)	A categorical variable that was coded to the following: Small size (<50 employees) → 1 Mid-size (=<250 employees) → 2 Large size (>250 employees)→ 3	106 small size companies (46.3 % of the study population) 65 midsize companies (28.4 % of the study population) 58 large size companies (25.3 % of the study population)	Mergentonline.com

Note. Developed by the author, W. Mohamed.

Dependent Variables

The dependent variables in this study consisted of the abnormal stock return, a continuous variable representing the abnormal stock return value for each company, and the number of FDA-approved drug products in the pipeline. To calculate the abnormal stock return for each company, their average stock price for 2018 and 2019 was retrieved from MergentOnline.com from the *equity pricing* section.

After gathering the average stock price for each company in 2018 and 2019, the percentage growth of the stock price for each company was calculated using the following formula:

$$\%\ Growth\ of\ the\ stock\ price = (\frac{Average\ Stock\ price\ in\ 2019 - \ Average\ Stock\ price\ in\ 2018}{Average\ Stock\ price\ in\ 2018})$$

Given that the abnormal stock return is calculated by subtracting the actual return from the benchmarked return, the S&P 500 was selected as a benchmarked return in this study, and its percentage growth was calculated as follows:

$$\%\ Growth\ of\ the\ S\&P\ 500 = (\frac{Average\ price\ of\ the\ S\&P\ 500\ in\ 2019 - Average\ price\ of\ the\ S\&P\ 500\ in\ 2018}{Average\ price\ of\ the\ S\&P\ 500\ in\ 2018})$$

The abnormal stock return also known as the *excess stock return* for each company was calculated by subtracting the percentage growth of the S&P 500 from the percentage growth of the stock price of each company (Chiyachantana et al., 2021). The formula used for calculating the abnormal stock return for each company is as follows:

$$Abnormal\ stock\ return = \%growth\ of\ the\ stock\ price\ for\ each\ company - \%\ growth\ of\ the\ S\&P\ 500$$

The number of FDA-approved drug products in the pipeline was a count variable representing the number of FDA-approved drugs in clinical trials in phases 1,2 and 3 for each company. Phase 1 clinical trial is the first step in the drug development lifecycle and is intended to test the safety of a new treatment in humans. Phase 2 clinical trial is the second step in developing a new drug and aims to test the efficacy of the new treatment in humans. Phase 3 clinical trial is the third and final step in testing a new treatment and is intended to test the drug's safety, effectiveness, and stability. None of the dependent variables required coding and were used *as-is*.

Independent Variables

The independent variables consisted of the CEO's tenure, sex, and level of education. CEO tenure was a continuous variable that represented CEO's experience in years. The variable did not require coding and was statistically analyzed *as-is*. The CEO's sex was a categorical variable representing the gender of each CEO. Data were collected as male or female and then coded as 0 for males and 1 for females to facilitate the statistical analysis process. CEO education was a categorical variable representing the level of education that each CEO obtained. The data collected were categorized as 0 for CEOs with a non-doctorate degree and 1 for CEOs with a doctorate degree.

Control Variables

The control variables in this study consisted of each CEO age, type of industry, company age, and the number of employees at each organization (company size). CEO age was a continuous variable representing the age of a CEO in years. The company age was a continuous variable representing the age of a company in years. Both variables did not require coding and were analyzed *as-is*. The CEO type of industry was a categorical value representing the type of experience a CEO had. The data were collected as *pharmaceutical* or *biopharmaceutical* and therefore were coded as 0 for pharmaceutical and 1 for biopharmaceutical to facilitate the statistical analysis process.

Similarly, the number of employees (size of the organization) was a continuous category representing the count of employees in numbers for each organization. The data

collected were consolidated into three main categories: small-size companies comprising 50 or fewer employees; mid-size companies comprising between 50 and 250 employees; and large-size companies comprising more than 250 employees. The statistical analysis considered for this study was explained in the proceeding section of this chapter, *Statistical Model*.

It is worth mentioning that companies' Market Capitalization valuation (Market Cap) was considered for inclusion in this study as a control variable. However, after conducting a correlation test between all study variables, it was observed that the Market Cap is highly correlated (R-Squared above 0.80) with the number of employees (company's size) variable and contained multiple outliers. Therefore, the Market Cap was not considered as a control variable and was removed from this study.

Statistical Model

This quantitative, non-experimental, and cross-sectional study aimed to examine the relationship between CEO tenure, sex, level of education, and the impact of these variables on organizational performance in the U.S. pharmaceutical and biopharmaceutical industries (Scherer, 2000). Table 2 below summarizes the study variables.

Table 2

Study Variables

Dependent variables	Independent Variables	Control Variables
1. Number of drug products in the pipeline in each clinical phase (FDA-approved clinical trial phases 1, 2, and 3)	1. CEO tenure	1. CEO age
2. Abnormal stock return	2. CEO sex	2. CEO industry
	3. CEO education	3. Company age
		4. Number of employees (company's size)

Note. Developed by the author, W. Mohamed.

Given that the dependent variables consisted of continuous, count, and categorical variables, Multiple Linear Regression Analysis (MLRA) and Negative Binomial Regression Analysis (NBRA) were considered for this study to examine the relationship between the study variables and to determine the level of statistical significance between the dependent and independent variables (Aiken et al., 2003; Cox et al., 2021; Hilbe, 2011). This decision was determined based on the following statistical and empirical evidence:

Multiple Linear Regression Analysis (MLRA)

Multiple Linear Regression Analysis (MLRA) is a statistical methodology that examines the relationship and degree of significance of multiple predictors (independent variables) to a single criterion (dependent variable) (Aiken et al., 2003). Researchers use MLRA to understand the correlation and variation between the dependent variables and the various continuous or categorical independent variables in their research (Cox et al., 2021; Nimon & Oswald, 2013). Additionally, researchers use MLRA to understand the

degree of significance that each independent variable has on the dependent variables by evaluating the confidence intervals, t-statistics, and the p-value resulting from their analysis (Cox et al., 2021). A probability value (p-value) is a critical value used to determine the statistical significance of the study variables (Cox et al., 2021; Nimon & Oswald, 2013). A p-value of less than 0.05 indicates a statistically significant relationship between the study variables, and therefore the null hypothesis established in the study can be rejected while the alternative hypothesis can be accepted (Nimon & Oswald, 2013).

Given that the dependent variable *abnormal stock return* was a continuous variable, a multiple linear regression analysis was selected to understand the significance level of the CEO's characteristics (independent variables) and their impact on the dependent variable.

Negative Binomial Regression Analysis (NBRA)

The Negative Binomial Regression Analysis (NBRA) is a model based on the underlying probability distribution function (PDF). Researchers use this statistical model to analyze count variables and predict count-based research data (Hilbe, 2011; Iqbal et al., 2021; Oztig & Askin, 2020). Given that this study included the count of FDA-approved drug products in the pipeline for clinical trials as a second dependent variable (which is a count variable), an NBRA was conducted to understand the degree of significance between CEO characteristics (independent variables) and the dependent variable represented in the number of drug products in the pipeline for each approved

clinical phase (FDA-approved drug products for clinical phase 1, 2, and 3) at each company.

In conclusion, an MLRA was selected to statistically explain the relationship between CEOs' characteristics (independent variables) and the abnormal stock return of each company (dependent variable). Additionally, an NBRA was selected to statistically explain the relationship between CEOs' characteristics (independent variables) and the count of drug products in each company's pipeline (dependent variable) (Aiken et al., 2003; Cox et al., 2021; Hilbe, 2011).

CHAPTER 4

RESULTS

This chapter aims to summarize the data analysis resulting from the secondary quantitative data collection portion of this study. The purpose of this study was to determine the statistical association between CEO characteristics—particularly, tenure, sex, and level of education of an organization's CEO on organizational performance as demonstrated in the valuation of the abnormal stock return, and the number of drug products in the pipeline per each FDA-approved clinical trial phase.

Descriptive Statistics

Table 3 and Table 4 below summarize the descriptive statistics for the continuous and categorical variables examined in this study.

Table 3

Descriptive Statistics: Continuous Variables

Variable Type	Variable Name	N	Mean	SD	Min	Max
	Abnormal stock return	229	-35.03	40.34	-106.09	149.6122
Dependent Variable	Drugs in phase 1	229	2.64	5.48	0	52
	Drugs in phase 2	229	2.93	7.25	0	71
	Drugs in phase 3	229	2.15	5.07	0	49
Independent Variable	CEO tenure	229	10.69	6.78	3	34
Control Variable	CEO age	229	58.52	7.30	32	78
	Company age	229	24.93	21.27	5	147

Note. Developed by the author, W Mohamed.

Table 4

Descriptive Statistics: Categorical Variables

Variable Type	Variable Name	Code	N	Percentage
Independent Variable	CEO sex	Male (0)	209	91.27 %
		Female (1)	20	8.73 %
		Total	229	100 %
	CEO education	Non-doctorate (0)	119	51.97 %
		Doctorate (1)	110	48.03 %
		Total	229	100 %
Control Variable	Company size	Small size =1	106	46.29 %
		Midsize = 2	65	28.38 %
		Large size =3	58	25.33 %
		Total	229	100 %
	CEO type of industry	Pharmaceutical (0)		38.86 %
		Bio-Pharmaceutical (1)	140	61.14 %
		Total	229	100 %

Note. Developed by the author, W. Mohamed.

Additionally, Table 5 below summarizes the frequency (count) of FDA-approved drug products in each clinical phase (phases 1, 2, and 3) for the population examined in this study.

Table 5

Frequency Table: Number of Drug Products in Each Clinical Phase (Phases 1, 2, and 3)

Number of Drugs (Phases 1, 2, and 3)			Frequency (Number of companies)			Percentage		
P I	P II	P III	P I	P II	P III	P I	P II	P III
0	0	0	66	80	107	28.82	34.93	46.72
1	1	1	66	48	49	28.82	20.96	68.12
2	2	2	45	34	22	19.65	14.85	9.61
3	3	3	16	20	19	6.99	8.73	8.30
4	4	4	5	16	8	2.18	6.99	3.49
5	5	5	10	9	6	4.37	3.93	2.62
6	7	6	2	6	4	0.87	2.62	1.75
7	8	7	5	3	1	2.18	1.31	0.44
10	10	9	2	1	2	0.87	0.44	0.87
12	11	11	2	3	2	0.87	1.31	0.87
13	14	12	1	1	2	0.44	0.44	0.87
15	17	17	1	1	1	0.44	0.44	0.44
16	20	18	1	2	1	0.44	0.87	0.44
17	22	20	1	1	3	0.44	0.44	1.31
18	25	25	1	2	1	0.44	0.87	0.44
22	64	27	1	1	1	0.44	0.44	0.44
27	71	49	1	1	1	0.44	0.44	0.44
28			1			0.44		
31			1			0.44		
52			1			0.44		
T= 229	229	229	229	229	229	100%	100%	100%

Note. Developed by the author, W. Mohamed.

Regression Analysis (Without Control Variables)

A regression analysis was conducted for the study data by omitting the control variables (CEO age, CEO type of industry, company's age, and company's size) from the Multiple Linear Regression and the Negative Binomial Regression models. This decreased the variation introduced to the regression model and increased the significance of each independent variable. The aim of conducting this analysis was to fully understand the impact of each CEO characteristic (i.e., tenure, sex, and level of education) individually on organizational performance while not accounting for the control variables. Below is a summary of the data analysis resulting from conducting the MLR and NBR analysis, without control variables.

Multiple Linear Regression Analysis

When excluding the control variables (CEO age, CEO type of industry, company's age, and company's size) from the MLR model, only the CEO tenure variable indicated a positive statistically significant relationship with the abnormal stock return (dependent variable) with P-value = 0.01 and coefficient value of 1.09. This indicated that as CEO tenure increases by one yes, the Abnormal Stock Return increases by 1.09%. On the other hand, CEO sex and level of education did not indicate any statistically significant relationship with the Abnormal Stock Return.

Negative Binomial Regression Analysis

When excluding the control variables (CEO age, CEO type of industry, company's age, and company's size) from the NBR model, the following results were observed:

CEO Tenure

CEO tenure indicated a positive statistically significant relationship with the number of drug products in phase 1 (P=0.01 and IRR= 1.03). This meant as the CEO tenure increased by one year, the number of drug products in phase 1 increased by a factor of 1.03 (3%). Additionally, CEO tenure indicated a highly positive statistically significant relationship with the number of drug products in phase 2 at the 99% confidence interval (P=0.001 and IRR= 1.06). This meant as the CEO tenure increased by one year, the number of drug products in phase 2 increased by a factor of 1.06 (6%). Moreover, CEO tenure indicated a highly positive statistically significant relationship with the number of drug products in phase 3 at the 99% confidence interval (P=0.01 and IRR= 1.07). This meant as the CEO tenure increased by one year, the number of drug products in phase 3 increased by a factor of 1.07 (7%).

CEO Sex

CEO sex indicated a negative statistically significant relationship with the number of drug products in phase 2 at the 95% confidence interval (P=0.02 and IRR= 0.40). This meant that compared to male CEOs, female CEOs had a 60% lower number of drug products in phase 2.

CEO Education

CEO level of education indicated a positive statistically significant relationship with the number of drug products in phase 2 at the 99% confidence interval (P=0.01 and IRR= 1.06). This meant CEOs with doctorate degrees were associated with a 6% higher number of drug products in phase 2 than those CEOs with less education.

These results provided an understanding of how CEO characteristics (tenure, sex, and level of education) impact the Abnormal Stock Return (ASR) and the number of drug products developed in the pipeline in each FDA-approved clinical trial phases 1, 2, and 3 when not accounting for the control variables considered in this study. The question arises, will this result be replicated if the control variables are added to the regression model?

The following analysis will answer the question noted above by including the control variables in the regression models.

Regression Analysis (Including Control Variables)

A multiple liner regression analysis (MLRA) was conducted to examine the impact of CEO characteristics (tenure, sex, and level of education) on the organizational performance demonstrated in the abnormal stock return. Additionally, a negative binomial regression analysis (RBRA) was conducted to evaluate the impact of CEO characteristics (tenure, sex, and level of education) on the number of FDA-approved drug products in the pipeline for clinical trial phases 1, 2, and 3. Below is a summary of the data analysis resulting from conducting the MLR and NBR analysis.

Multiple Linear Regression Analysis

Multiple linear regression analysis was conducted to identify the statistically significant relationship between the dependent variable (abnormal stock return), independent, and control variables. Table 6 below summarizes the findings of the MLR analysis.

Table 6

Multiple Linear Regression Analysis Results

Variable	Coefficient	P-Value	95% Confidence Interval	
			Min	Max
Tenure	0.92	0.03	0.10	1.74
Sex	-1.67	0.85	-18.83	15.49
Level of education	4.57	0.38	-5.69	14.83
CEO age	-0.55	0.11	-1.24	0.13
Company age	-0.13	0.37	-0.42	0.15
CEO industry	1.60	0.75	-8.66	11.87
Company size				
Mid-size	11.50	0.05	0.06	22.95
Large size	20.34	0.002	7.64	33.05

Note. Developed by the author, W. Mohamed.

Data analysis indicated a positive statistically significant relationship at the 95% confidence interval between CEO tenure and the abnormal stock return (P=0.03). The coefficient value (0.92) indicated that as for the magnitude of this relationship, with the increase of CEO tenure by one year, the abnormal stock return increased by 0.92%.

Similarly, company size (control variable) indicated a positive statistically significant relationship with the abnormal stock return at the 95% confidence interval (P=0.05 for midsize companies, and P=0.002 for large-size companies). The coefficient value (11.50 for midsize and 20.34 for large-size companies) indicated that compared to small-size companies (less than 50 employees), mid-size companies (between 50 and 250 employees) and large-size companies (greater than 250 employees) had a higher abnormal stock return of 11.5% and 20.3%, respectively. The Negative Binomial Regression Analysis (NBR) results are explained in the proceeding section of this chapter.

Negative Binomial Regression Analysis

A negative binomial regression analysis was conducted to study the impact of CEO characteristics (tenure, sex, and level of education) on the number of FDA-approved drug products in the pipeline for clinical trial phases 1, 2, and 3. A summary of the NBR analysis is described below.

Number of Drug Products in Phase 1

Phase 1 clinical trial is the first step in testing the safety of a new treatment in humans. During the period of this trial, the drug's safety, side effects, and dosage are determined based on the results generated from testing the drug on a small population of 20 to 50 healthy volunteers (Scherer, 2000). Table 7 below summarizes the findings of the NBR analysis for the number of drug products in phase 1.

Table 7

NBR Analysis Results for Phase 1

Variable	IRR	P-Value	95% Confidence Intervale	
			Min	Max
Tenure	1.01	0.71	0.98	1.03
Sex	0.96	0.90	0.51	1.80
Level of education	0.88	0.49	0.61	1.27
CEO age	1.00	0.80	0.98	1.03
Company age	1.01	0.02	1.00	1.02
CEO industry	1.20	0.34	0.83	1.73
Company size				
Mid-size	1.57	0.03	1.04	2.39
Large size	3.11	<0.001	1.97	4.92

Note. Developed by the author, W. Mohamed.

The results indicated that the company age (control variable) had a positive statistically significant relationship with the number of drug products in phase 1 (P=0.02) at the 95% confidence interval. Additionally, the incident rate ratio (IRR) value = 1.01 meant that as the company age increased by one year, the number of drug products in phase one increased by 1%. The 1% value was calculated by the following formula (IRR value – 1) x 100 = (1.01-1) x 100 = 1%.

Similarly, the company size (control variable) indicated a positive statistically significant relationship with the number of drug products in phase 1 (P=0.03 for midsize companies, and P<0.001 for large-size companies) at the 95% and 99% confidence intervals, respectively. Their incident rate ratio (IRR) value = 1.57 for midsize and 3.11 for large-size companies meant that in comparison to small-size companies, midsize companies (50-250 employees) increased their number of drug products in phase one by

a factor of 1.57 (57%). Additionally, in comparison to small-size companies, large-size companies (250 employees or more) had 3.11 times the number of drug products in phase one.

Number of Drug Products in Phase 2

Phase 2 clinical trial is the second step in developing a new drug and aims to test the efficacy of the new treatment in humans. The purpose of Phase 2 trial is to determine the drug's effectiveness based on the results generated from testing the drug on a larger population, 50 to 300 volunteers (Scherer, 2000). Table 8 below summarizes the findings of the NBR analysis for Phase 2.

Table 8

NBR Analysis Results for Phase 2

Variable	IRR	P-Value	95% Confidence Intervale	
			Min	Max
Tenure	1.02	0.14	0.99	1.05
Sex	0.74	0.40	0.37	1.49
Level of Education	1.21	0.32	0.83	1.77
CEO age	0.10	0.80	0.97	1.02
Company age	1.01	0.001	1.01	1.02
CEO industry	1.02	0.92	0.69	1.50
Company size				
Mid-size	1.37	0.15	0.90	2.10
Large size	2.56	<0.001	1.62	4.60

Note. Developed by the author, W. Mohamed.

The NB regression analysis indicated that the company age (control variable) had a positive statistically significant relationship with the number of drug products in phase 2 at the 99% confidence interval (P=0.001 and IRR-value = 1.01). The IRR value of 1.01

meant that with the increase of the company's age by one year, the number of drug products in phase 2 increased by a factor of 1.01 (1%).

Similarly, the company size (control variable) indicated a positive statistically significant relationship between large-sized companies and the number of drug products in phase 2 at the 99% confidence interval (P=0.000 and IRR-value = 2.56). The IRR value of 2.56 meant that in comparison to small-size companies, large-size companies had 2.56 times more drug products in the pipeline in phase 2 than small-size companies.

Number of Drug Products in Phase 3

Phase 3 clinical trial is the third and final step in testing a new treatment in humans before it is approved by the FDA. During the period of this trial, the drug's safety, effectiveness, and stability are tested in a large population of 500 to 3,000 patients (Scherer, 2000). Table 9 below summarizes the findings of the NBR analysis for the number of drug products in Phase 3.

Table 9

NBR Analysis Results for Phase 3

Variable	IRR	P-Value	95% Confidence Intervale	
			Min	Max
Tenure	1.03	0.08	0.10	1.06
Sex	1.20	0.63	0.58	2.48
Level of Education	0.86	0.49	0.57	1.31
CEO age	1.02	0.30	0.99	1.05
Company age	1.01	0.001	1.01	1.02
CEO industry	1.24	0.31	0.82	1.89
Company size				
Mid-size	2.08	0.003	1.28	3.38
Large size	4.35	<0.001	2.60	7.29

Note. Developed by the author, W. Mohamed.

The NB regression analysis concluded that CEO tenure had a positive statistically significant relationship with the number of drug products in phase 3 at the 90% confidence interval (P=0.08 and IRR-value= 1.03). This meant that as the CEO tenure increased by one year, the number of drug products in the pipeline for phase 3 increased by a factor of 1.03 (3%).

Additionally, the company age (control variable) indicated a positive statistically significant relationship with the number of drug products in phase 3 at the 99% confidence interval (P=0.01 and IRR-value = 1.01). This meant that as the company age increased by 1 year, the number of drug products in phase 3 increased by a factor of 1.01 (1%).

Moreover, the company size (control variable) indicated a positive statistically significant relationship between mid-size and large-sized companies and the number of drug products in phase 3. For midsize companies, there was a positive statistically

significant relationship at the 95% confidence interval (P-value=0.01, and IRR-value= 2.08) indicating that in comparison to small-size companies, midsize companies had 2.08 times the number of phase 3 drug products than small size companies. Similarly, large-size companies indicated a highly positive statistically significant relationship with the number of drug products in phase 3 at the 99% confidence interval (P-value<0.001, and IRR-value= 4.35). This meant that in comparison to small-size companies, large-size companies had 4.35 times the number of drug products in phase 3 than small-size companies.

Statistical Analysis Summary

Fifteen hypotheses were developed and examined in this study by conducting a Multiple Linear Regression Analysis (MLRA) and a Negative Binomial Regression Analysis (NBRA) to quantitative secondary data gathered for this study. The statistical analysis conducted in this study provided a great level of understanding of the impact of CEO characteristics (CEO tenure, sex, and level of education) on the organizational performance demonstrated in the value of the abnormal stock return, and number of drug products in the clinical pipeline for 229 U.S. publicly traded pharmaceutical and biopharmaceutical companies. Below is an executive summary of the data analysis conducted for this study:

Multiple Linear Regression Analysis

Table 10 below summarizes the finding of multiple linear regression analysis (MLRA) conducted in this study to evaluate the impact of CEO characteristics (CEO tenure, sex, and level of education) on the organizational performance demonstrated in the value of the abnormal stock return of 229 U.S. publicly traded pharmaceutical and biopharmaceutical companies.

Table 10

Multiple Linear Regression Analysis Summary

Multiple Linear Regression Analysis CEO tenure, sex, and level of education positively associated with the abnormal stock return				
Study Variables	Variables	Significance	P-Value	Study Hypotheses
Independent variables	CEO tenure	Statistically significant	0.03	Supported
	CEO sex	Not statistically significant	0.85	Not Supported
	CEO education	Not statistically significant	0.38	Not Supported
Control variables	CEO age	Not statistically significant	0.11	N/A
	CEO industry	Not statistically significant	0.76	N/A
	Company age	Not statistically significant	0.37	N/A
	Number of employees (size)	Statistically significant	0.05(*) .002(**)	N/A

Note. Developed by the author, W. Mohamed.
(*): Mid-size companies
(**): Large-size companies

Hypotheses Summary

- *H1. Longer CEO tenure is positively related to the abnormal stock return of U.S. pharmaceutical and biopharmaceutical companies.* (Supported)
- *H3. U.S. pharmaceutical and biopharmaceutical companies led by Male CEOs have higher abnormal stock return than those led by female CEOs.* (Not Supported)
- *H5. CEOs with doctorate degrees have a higher abnormal stock return than those with non-doctorate degrees in U.S. pharmaceutical and biopharmaceutical companies*. (Not Supported)

Negative Binomial Regression Analysis

Table 11 below summarizes the findings of the negative binomial regression analysis (NBRA) conducted in this study to evaluate the impact of CEO characteristics (CEO tenure, sex, and level of education) on the organizational performance of 229 U.S. publicly traded pharmaceutical and biopharmaceutical companies demonstrated in the number of FDA-approved drug products in the pipeline in phases 1, 2, and 3.

Table 11

Negative Binomial Regression Analysis Summary

Study Variables	Variables	P-Value	Hypotheses	P-Value	Hypotheses	P-Value	Hypotheses
		Phase I		**Phase II**		**Phase III**	
Independent variables	CEO tenure	0.71	Not Supported	0.14	Not Supported	0.08	Supported
	CEO sex	0.90	Not Supported	0.40	Not Supported	0.63	Not Supported
	CEO education	0.49	Not Supported	0.32	Not Supported	0.49	Not Supported
Control variables	CEO age	0.80	N/A	0.80	N/A	0.30	N/A
	CEO industry	0.34	N/A	0.92	N/A	0.31	N/A
	Company age	0.02	N/A	0.001	N/A	0.001	N/A
	Number of employees (size)	0.03(*) <0.001(**)	N/A N/A	0.15(*) <0.001(**)	N/A	0.003(*) <0.001(**)	N/A

Note. Developed by the author, W. Mohamed.
(*): Mid-size companies
(**): Large-size companies

Hypotheses Summary

- **H2**. Longer CEO tenure is positively related to the number of drug products

developed in the pipeline of U.S. pharmaceutical and biopharmaceutical companies.

  - **H2. a**. Longer CEO tenure is positively related to the number of drug products developed in the pipeline in phase 1. (Not Supported)
  - **H2. b.** Longer CEO tenure is positively related to the number of drug products developed in the pipeline in phase 2. (Not Supported)
  - **H2. c**. Longer CEO tenure is positively related to the number of drug products developed in the pipeline in phase 3. (Supported)

- **H4.** U.S. pharmaceutical and biopharmaceutical companies led by male CEOs

have a higher number of drug products in the pipeline than those led by female CEOs.

  - **H4. a**. U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have a higher number of drug products in phase. (Not Supported)
  - **H4. b.** U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have a higher number of drug products in phase 2. (Not Supported)
  - **H4. c**. U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have a higher number of drug products in phase 3. (Not Supported)
  -

- **H6.** CEOs with doctorate degrees have a higher number of drug products

developed in the pipeline than those with non-doctorate degrees in U.S. pharmaceutical

and biopharmaceutical companies.

  - **H6. a**. CEOs with doctorate degrees have a higher number of drug products developed in phase 1 than those with non-doctorate degrees. (Not Supported)
  - **H6. b.** CEOs with doctorate degrees have a higher number of drug products developed in phase 2 than those with non-doctorate degrees. (Not Supported)
  - **H6. c.** CEOs with doctorate degrees have a higher number of drug products developed in phase 3 than those with non-doctorate degrees. (Not Supported)

Overall Study Hypotheses Results

Table 12 below summarizes the overall study hypotheses.

Table 12

Study Hypotheses Results

Overall Summary of the Examined Study Hypotheses				
	MLRA	NBRA		
	CEO tenure, sex, and level of education are positively associated with abnormal stock return (ASR)	CEO tenure, sex, and level of education are positively associated with the number of drug products in phases 1, 2, and 3		
	ASR	Phase 1	Phase 2	Phase 3
CEO tenure	Supported	No	No	Supported
CEO sex	No	No	No	No
CEO education	No	No	No	No

Note. Developed by the author, W. Mohamed.

Hypotheses 1 and 2

It was concluded through the statistical analysis conducted in this study that CEO tenure had a positive statistically significant relationship with the abnormal stock return and the number of the FDA-approved drug product in the pipeline for clinical trial Phase 3. Therefore, hypotheses H1 and H2. c were supported.

H1. Longer CEO tenure is positively related to the abnormal stock return of U.S. pharmaceutical and biopharmaceutical companies. (Supported)

H2. Longer CEO tenure is positively related to the number of drug products developed in the pipeline in phase 3. (Supported)

Hypotheses 3 and 4

CEO sex did not demonstrate any statistically significant relationship with the abnormal stock return or the number of FDA-approved drug products in the pipeline. Therefore, study hypotheses H3 and H4 were not supported.

H3. U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have higher abnormal stock return than those led by female CEOs. (Not Supported)

H4. U.S. pharmaceutical and biopharmaceutical companies led by male CEOs have a higher number of drug products in the pipeline than those led by female CEOs. (Not Supported)

Hypotheses 5 and 6

CEOs' level of education did not indicate any statistical significance relationship with the abnormal stock return valuation or the number of FDA-approved drug products in the pipeline. Therefore, study hypotheses number H5 and H6 were not supported.

H5. CEOs with doctorate degrees have a higher abnormal stock return than those with non-doctorate degrees in U.S. pharmaceutical and biopharmaceutical companies. (Not Supported)

H6. CEOs with doctorate degrees have a higher number of drug products developed in the pipeline than those with non-doctorate degrees in U.S. pharmaceutical and biopharmaceutical companies. (Not Supported)

CHAPTER 5

DISCUSSION AND CONCLUSION

Further Discussion

The purpose of this quantitative, non-experimental, and cross-sectional study was to examine CEO characteristics (i.e., CEO tenure, sex, and level of education) and their impact on the organizational performance of 229 U.S. publicly traded pharmaceutical and biopharmaceutical companies. To understand the impact of CEO characteristics on organizational performance, this study examined the impact of CEO tenure, sex, and education on the organizational outcome as measured by the abnormal stock return valuation and the number of FDA-approved drug products in the pipeline for clinical trial phases 1, 2, and 3 of each company considered.

This study intended to extend the research literature conducted on leadership in accordance with the Upper Echelons Theory and to fill the gap identified in the literature reviewed for this study. This gap is caused by the lack of research conducted on examining the impact of CEO characteristics on the organizational performance in the U.S. pharmaceutical and biopharmaceutical industries.

The results shared in this study will inform researchers on how CEOs in the U.S. pharmaceutical and biopharmaceutical industries influence the performance of their

organizations and how these industries could improve by paying close attention to the statistical data surrounding the executives leading these organizations.

The purpose of this chapter is to summarize the findings of this study, explain the managerial implications, and document the limitations of this study. Additionally, this chapter will outline future research ideas to expand the literature examining CEO characteristics in the U.S. pharmaceutical and biopharmaceutical industries.

Findings

CEO Tenure

Our results suggest that the length of CEO tenure had a positive statistically significant relationship with organizational performance. The results suggest that as the CEO tenure increased, the abnormal stock return and the number of FDA-approved drug products in phase 3 increased. This aligns with previous studies which concluded that with the increase in tenure, CEOs become more experienced and well-invested in collaborations, strategic projects, and products acquisitions that could add meaningful value to their pipelines, competitiveness, market presence, and stock prices (Hsu et al., 2020; Mukherjee & Sen, 2022).

Study Limitations

Limitations are factors of the study that a researcher cannot control or influence (Dausey, 2020; Meyers et al., 2022; Prabowo & Setiawan, 2021). These factors could influence the outcome of a study and could prevent the generalizability of a study's results or conclusions (Dausey, 2020; van Diggele et al., 2020).

Like other studies, this study included a limiting factor: the number of companies led by female CEOs. This study examined 229 publicly traded U.S. pharmaceutical and biopharmaceutical companies. Of these 229 companies, there were 209 companies led by male CEOs (91.3% of the population), and 20 companies led by female CEOs (8.7% of the population). Given that 91.3% of the study population was male, it can be said that the U.S. pharmaceutical and biopharmaceutical industries are dominated by male CEOs. Additionally, this represents the limiting factor of the number of female CEOs in the study population, which results in a significant skew in sex representation that does not reflect the general population.

Therefore, the research data highlighted a critical fact that the U.S. pharmaceutical and biopharmaceutical industries lack diversity and inclusion. This fact must be acknowledged, researched, and addressed by further studies and reforms in corporate and industry policies.

Practical Applications

The practical applications portion of this study aims to address three main topics. First, the importance of CEO tenure and education; second, the importance of gender equality among the C-suit and top-level managers; and finally, appreciation for the working employees who contribute to the success of their organizations.

CEO Tenure

This study proved through the statistical analysis conducted in the study that CEO tenure indicated a positive statistically significant relationship with the performance of an

organization. Therefore, it is crucial for boards of directors to consider experienced candidates with longer tenure when hiring a new CEO and to allow sufficient years (a minimum of three) for a newly hired CEO to improve the performance of an organization.

Additionally, given the critical impact of CEO tenure on organizational performance, this study encourages CEOs with less tenure and experience to connect with CEOs with longer tenures to learn from their experiences, achievements, and inadvertent mistakes that they made throughout their career. This will result in a new generation of CEOs who are well-trained and mentored.

Gender Equality

Gender equality was a critical finding that was uncovered during the data collection process of this study. It was evident looking at the research data gathered for this study that the U.S. pharmaceutical and biopharmaceutical industries are dominated by male CEOs, and an extremely small number of companies (20 out of 229 companies) were led by female CEOs.

Regardless of the statistical results concluded in this study between CEO sex and organizational performance, this study calls upon the board of directors of each organization, and the personnel responsible for hiring executives (both CEOs and non-CEO roles), to consider female leaders when an executive position is available. This way, the unequal gender demography currently existing in the U.S. pharmaceutical and biopharmaceutical industries can be changed.

Employees

Employees represented in the entry-level and mid-level individual contributors, supervisors, and entry-level managers are the upcoming generation of leadership. The statistical analysis conducted in this study demonstrated that there was a positive statistically significant relationship between the size of an organization (i.e., the number of employees) and organizational performance. Therefore, this study encourages CEOs and non-CEO executives to recognize the work being executed behind the scenes by employees by supporting them with a healthy work environment, proper healthcare insurance, equitable pay and benefits, required tools and training to successfully perform their daily tasks to the best of their ability.

Additionally, this study encourages all leaders to provide mentorship and leadership training to all employees. Doing so will result in creating leading organizations—where all employees are treated as leaders and have the opportunity to act in a leadership capacity. This will increase the quality of the product and services provided by these organizations which, by proxy, will benefit patients, stakeholders, and the economy in general.

Future Research

This study aimed to examine important CEO characteristics (tenure, sex, and education) and their impact on organizational performance in a crucial sector of the U.S. economy—the pharmaceutical and biopharmaceutical industries. The results shared in

this study will benefit researchers and leaders who are interested in studying the leadership landscape of the U.S. pharmaceutical and biopharmaceutical industries. However, more research is needed to address the lack of research being conducted on examining CEO characteristics on the organizational performance in the U.S. pharmaceutical and biopharmaceutical industries.

This study recommends studying other CEO characteristics, such as CEO age, quality of education, and ethnicity, and examining if they have any impact on organizational performance. Additionally, this study encourages researchers to explore the limitation factors presented in this study, such as the small female CEO population. This limitation could be used as a starting point for new research focused on exploring the reasons behind the lack of diversity and inclusion within the C-suite and board of directors in the U.S. pharmaceutical and biopharmaceutical industries.

Moreover, this study examined 229 U.S. publicly traded companies and the impact of CEOs' characteristics on their organizational performance. This study recommends exploring the U.S. privately held pharmaceutical and biopharmaceutical companies. Examining the characteristics of CEOs leading these organizations and their impact on organizational performance would establish the foundation in the research database that could encourage the expansion of privately held companies.

Last, the Upper Echelon Theory was a useful governing theory for this study. However, to enrich the research database, this study encourages researchers to examine CEO characteristics in the U.S. pharmaceutical and biopharmaceutical industries through the lens of a management theory other than the Upper Echelons Theory, such as the

resource-based theory, structural contingency theory, institutional theory, or goal-setting theory. This way, a broad range of research may be made available to new researchers that could broaden their scope of knowledge and utilization of various management theories.

Conclusion

The pharmaceutical and biopharmaceutical industries are important sectors of the U.S. economy that generate billions of dollars in revenue by developing and marketing lifesaving drug products. Additionally, they return billions of dollars to the U.S. economy through taxes, paid wages, and healthcare benefits offered to their employees. This enriches the overall stock market and economy both in the United States and worldwide.

The pharmaceutical and biopharmaceutical industries provide a continuous stream of product development and FDA-approved drug products to the market that can treat or enhance the life of millions of patients across the world. This results in quality of life for humans all over the world.

Despite the criticality of these industries, little research has been conducted to examine the impact of CEO characteristics on organizational performance in the U.S. pharmaceutical and biopharmaceutical industries. This was identified as a critical gap in the literature reviewed, and this study aimed to fill this gap through the analysis presented within.

Leadership and CEO characteristics have been studied by researchers across various other industries (education, hotels, finance, entertainment, healthcare, insurance,

and manufacturing) to examine the impact of CEO characteristics (CEO tenure, sex, and level of education) on organizational performance. The literature provided contradicting results as some researchers indicated a statistically positive relationship between CEO characteristics and organizational performance, while others disagreed and statistically demonstrated the existence of a negative association between specific CEO characteristics and organizational performance. These contradictory results were identified as an additional gap in the literature. Therefore, this study was initiated to settle the debate around the association between CEO characteristics and organizational performance in the U.S. pharmaceutical and biopharmaceutical industries.

In conclusion, this study confirmed through statistical analysis that CEO tenure had a positive statistically significant relationship with the overall performance of an organization. Additionally, the study discovered through statistical analysis that an organization's age and the number of employees indicated a statistically significant relationship with the organizational outcome.

REFERENCES

Adair, J. (2011). *The John Adair lexicon of leadership: The definitive guide to leadership skills and knowledge.* Kogan Page.

Ahn, Y. (2020). A socio-cognitive model of sustainability performance: Linking CEO career experience, social ties, and attention breadth. *Journal of Business Ethics, 175*(2), 303-321. https://doi.org/10.1007/s10551-020-04651-w

Aiken, L. S., West, S. G., & Pitts, S. C. (2003). Multiple linear regression. *Handbook of Psychology*, 481-507.

Ali, R., Rehman, R. U., Suleman, S., & Ntim, C. G. (2022). CEO attributes, investment decisions, and firm performance: New insights from upper echelons theory. *Managerial and Decision Economics, 43*(2), 398-417. https://doi.org/10.1002/mde.3389

Almutairi, Y. M., & Alenezi, A. K. (2020). The impact of organization culture and environment on leadership effectiveness applied study on some governmental organizations in the state of Kuwait. *Journal of Public Affairs*, 10-20. https://doi.org/10.1002/pa.2198

Altuwaijri, B. M., & Kalyanaraman, L. (2020). CEO education-performance relationship: Evidence from Saudi Arabia. *The Journal of Asian Finance, Economics, and Business, 7*(8), 259-268. https://doi.org/10.13106/JAFEB.2020.VOL7.NO8.259

Asadi, R., & Stefanescu, D. (2019). The sustainable links of development between leadership and organizational cultures. *Journal of Economic Development, Environment and People, 8(2),* 45-55. http://jedep.spiruharet.ro

Baker, M., French, E., & Ali, M. (2021). Insights into ineffectiveness of gender equality and diversity initiatives in project-based organizations. *Journal of Management in Engineering, 37*(3), 1-17. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000893

Barker, V. L., & Mueller, G. C. (2002). CEO characteristics and firm R&D spending. *Management Science, 48*(6), 782-801. https://doi.org/10.1287/mnsc.48.6.782.187

Baselga-Pascual, L., & Vähämaa, E. (2021). Female leadership and bank performance in Latin America. *Emerging Markets Review, 48*, 100807. https://doi.org/10.1016/j.ememar.2021.100807

Bass, B. M., Stogdill, R. M., & Bass, R. R. (2008). *Stogdill's handbook of leadership: A survey of theory and research*. Free Press.

Bassyouny, H., Abdelfattah, T., & Tao, L. (2020). Beyond narrative disclosure tone: The Upper Echelons Theory perspective. *International Review of Financial Analysis, 70*, 101499.

Benzel, E. (2021). Leadership. *World Neurosurgery, 152*, xvii. https://doi.org/10.1016/j.wneu.2021.06.001

Blase, J., & Blase, J. (2000). Effective instructional leadership. *Journal of Educational Administration, 100*(5).

Boubaker, S., Clark, E., & Mefteh-Wali, S. (2020). Does the CEO elite education affect firm hedging policies? *The Quarterly Review of Economics and Finance, 77*, 340-354. https://doi.org/10.1016/j.qref.2019.11.004

Cao, X., Im, J., & Syed, I. (2021). A meta-analysis of the relationship between Chief Executive Officer tenure and firm financial performance: The moderating effects of Chief Executive Officer pay and board monitoring. *Group & Organization Management, 46*(3), 530-563. https://doi.org/10.1177/1059601121989575

Cepiku, D., & Mastrodascio, M. (2020). Leadership and performance in intermunicipal networks. *Journal of Public Budgeting, Accounting & Financial Management, 32*(2), 177-196. https://doi.org/10.1108/JPBAFM-02-2019-0019

Chaturvedi, S., Rizvi, I. A., & Pasipanodya, E. T. (2019). How can leaders make their followers to commit to the organization? The importance of influence tactics. *Global Business Review, 20*(6), 1462–1474. https://doi.org/10.1177/0972150919846963

Chen, S., Ying, S. X., Wu, H., & You, J. (2021). Carrying on the family's legacy: Male heirs and firm innovation. *Journal of Corporate Fnance, 69*, 101976. https://doi.org/10.1016/j.jcorpfin.2021.101976

Chiyachantana, C. N., Pattanawihok, S., & Prasarnphanich, P. (2021). Board composition, board diversity and stock performance. *International Journal of Business and Economics, 6*(2), 76-87.

Cox, K., Lambert, R., & Hitchcock, J. H. (2021). Multiple linear regression analysis with qualitative data that have been quantitized. In *The Routledge reviewer's guide to mixed methods analysis* (pp. 77-88). Routledge.

Dadanlar, H. H. (2021). *Hawkish or dovish: The effect of female CEO leadership on strategic conformity, organizational innovation and strategic change* ProQuest Dissertations Publishing.

Dausey, J. L. (2020a). *CEO age, CEO tenure, and internal control over financial reporting* ProQuest Dissertations Publishing. https://csudh-primo.hosted.exlibrisgroup.com/openurl/01CALS_UDH/01CALS_UDH_SP?genre=dissertations&atitle=&author=Dausey%2C+Janet+Laurene&volume=&issue=&spage=&date=2020&rft.btitle=&rft.jtitle=&issn=&isbn=9781392452745&sid=ProQuest+Dissertations+%26+Theses+Global%3A+The+Humanities+and+Social+Sciences+Collection_

De Amicis, C., Falconieri, S., & Tastan, M. (2021). Sentiment analysis and gender differences in earnings conference calls. *Journal of Corporate Finance, 71*, 101809. https://doi.org/10.1016/j.jcorpfin.2020.101809

DePree, M. (2011). *Leadership is an art*. Currency.

Díaz-Fernández, M. C., González- Rodríguez, M. R., & Simonetti, B. (2020). Top management team diversity and high performance: An integrative approach based on upper echelons and complexity theory. *European Management Journal, 38*(1), 157-168. https://doi.org/10.1016/j.emj.2019.06.006

Expósito, A., Sanchis-Llopis, A., & Sanchis-Llopis, J. A. (2021). CEO gender and SMEs innovativeness: Evidence for Spanish businesses. *International Entrepreneurship and Management Journal*. https://doi.org/10.1007/s11365-021-00758-2

Farmanesh, P., Vehbi, A., Zargar, P., Sousan, A., & Bhatti, F. (2020). Is there always a positive relationship between workplace diversity and organizational performance, or does diversity fatigue imply a suppressing effect? *South East European Journal of Economics and Business, 15*(1), 14-26.

FDA. (2022). *Drugs*. https://www.fda.gov/drugs

Garcia-Blandon, J., Argilés-Bosch, J. M., & Ravenda, D. (2019). Exploring the relationship between CEO characteristics and performance. *Journal of Business Economics and Management, 20*(6), 1064-1082. https://doi.org/10.3846/jbem.2019.10447

García-Pérez-de-Lema, D., Ruiz-Palomo, D., & Diéguez-Soto, J. (2021). Analysing the roles of CEO's financial literacy and financial constraints on Spanish SMEs technological innovation. *Technology in Society, 64*, 101519. https://doi.org/10.1016/j.techsoc.2020.101519

Goleman, D. (2000). Leadership that gets results. *Harvard Business Review*, *78*(2), 4-17.

Gounopoulos, D., Loukopoulos, G., & Loukopoulos, P. (2021). CEO education and the ability to raise capital. *Corporate Governance: An International Review, 29*(1), 67-99. https://doi.org/10.1111/corg.12338

Gupta, N., & Mahakud, J. (2020). CEO characteristics and bank performance: Evidence from India. *Managerial Auditing Journal, 35*(8), 1057-1093. https://doi.org/10.1108/MAJ-03-2019-2224

Hall, J. G. (2022). Leadership. *ITNow, 64*(1), 27. https://doi.org/10.1093/itnow/bwac014

Hanousek, J., Shamshur, A., & Tresl, J. (2019). Firm efficiency, foreign ownership and CEO gender in corrupt environments. *Journal of Corporate Finance, 59*, 344-360. https://doi.org/10.1016/j.jcorpfin.2017.06.008

Harris, T. (2020). *Successful Supervision and Leadership: Ensuring high-performance outcomes using the pase model*. Productivity Press.

He, Q., Carrilero-Castillo, A., & Gonzalez-Garcia, J. (2021). Do CEO characteristics influence a firm's investment in brand equity? Evidence from Chinese listed firms. *International Entrepreneurship and Management Journal, 18*(1), 73-87. https://doi.org/10.1007/s11365-020-00721-7

Hilbe, J. M. (2011). *Negative binomial regression* (2nd ed.). Cambridge University Press.

Hitt, M. A., & Smith, K. G. (2005). *Great minds in management: The process of theory development*. Oxford University Press.

Hossain, M., Atif, M., Ahmed, A., & Mia, L. (2020). Do LGBT workplace diversity policies create value for firms? *Journal of Business Ethics, 167*(4), 775–791. https://doi.org/10.1007/s10551-019-04158-z

Hsu, W.-T., Chen, H.-L., & Ho, M. H.-C. (2020). CEO tenure and R&D investment: Founders vs. agents and the role of independent directors. *Technology Analysis & Strategic Management, 32*(10), 1209-1222. https://doi.org/10.1080/09537325.2020.1757637

Iman, A., Nazarov, Z., & Obydenkova, A. (2022). Female leadership, democratization, and firm innovation: Social inequalities and gender issues in post-communist economies. *Eastern European Economics, 60*(2), 149-170. https://doi.org/10.1080/00128775.2021.2024440

Iqbal, W., Tang, Y. M., Chau, K. Y., Irfan, M., & Mohsin, M. (2021). Nexus between air pollution and NCOV-2019 in China: Application of negative binomial regression analysis. *Process Safety and Environmental Protection, 150,* 557-565.

Jadiyappa, N., Jyothi, P., Sireesha, B., & Hickman, L. E. (2019). CEO gender, firm performance and agency costs: evidence from India. *Journal of Economic Studies, 46*(2), 482-495. https://doi.org/10.1108/JES-08-2017-0238

Jardine, M., & Duong, T. T. T. (2021). CEO demographic characteristics and firm performance: An empirical study in the scientific research and technology development industry. *Journal of International Economics and Management, 21*(1), 24-49. https://doi.org/10.38203/jiem.021.1.0021

Jardon, C. M., & Martínez-Cobas, X. (2019). Leadership and organizational culture in the sustainability of subsistence small businesses: An intellectual capital based view. *Sustainability, , 11(12), 491*.

Jiang, H., & Liu, C. (2020). Economic policy uncertainty, CEO characteristics and firm R&D expenditure: A Bayesian analysis. *Applied Economics, 52*(34), 3709-3731. https://doi.org/10.1080/00036846.2020.1721422

Johnson, C. E. (2021). *Meeting the ethical challenges of leadership: Casting light or shadow* (7th ed.). SAGE Publications, Inc.

Kao, L., & Chen, A. (2020, Dec 2020). CEO characteristics and R&D expenditure of IPOs in emerging markets: Evidence from Taiwan. *Asia Pacific Management Review, 25*(4), 189-197. https://doi.org/https://doi.org/10.1016/j.apmrv.2020.01.001

Khan, I., Mansi, W., Lin, K.-L., Liu, C.-F., Suanpong, K., & Ruangkanjanases, A. (2021). The effect of CEO on bank efficiency: Evidence from private commercial banks. *Frontiers in Psychology, 12*, 738210-738210. https://doi.org/10.3389/fpsyg.2021.738210

Khan, T. M., Bai, G., Fareed, Z., & Yasmeen, R. (2020, Jun 2020). The impact of CEO tenure on corporate social and environmental performance: An emerging country's analysis. *Environmental Science and Pollution Research International, 27*(16), 19314-19326. https://doi.org/https://doi.org/10.1007/s11356-020-08468-y

Klein, F. B., Chaigneau, P., & Devers, C. E. (2021). CEO gender-based termination concerns: Evidence from initial severance agreements. *Journal of Management, 47*(3), 567-596. https://doi.org/10.1177/0149206319887421

Li, M., & Yang, J. (2019). Effects of CEO duality and tenure on innovation. *Journal of Strategy and Management, 12*(4), 536-552. https://doi.org/10.1108/JSMA-04-2019-0049

Li, Y., Xu, X., Zhu, Y., & Haq, M. (2021). CEO decision horizon and corporate R&D investments: An explanation based on managerial myopia and risk aversion. *Accounting and Finance, 61*(4), 5141-5175. https://doi.org/10.1111/acfi.12752

Li, Y., & Zeng, Y. (2019). The impact of top executive gender on asset prices: Evidence from stock price crash risk. *Journal of Corporate Finance, 58*, 528-550. https://doi.org/10.1016/j.jcorpfin.2019.07.005

Liberda, B. (2018). Performance of male and female-led firms. *International Journal of Contemporary Management, 17*(2), 85-95. https://doi.org/10.4467/24498939IJCM.18.019.8543

Ma, S., Kor, Y. Y., & Seidl, D. (2021). Top management team role structure: A vantage point for advancing upper echelons research. *Strategic Management Journal*. https://doi.org/10.1002/smj.3368

Macchione, A. L., & Sacco, D. F. (2021). The effect of workplace gender composition on investment interest in hypothetical companies. *Psychological Reports*, 332941211009134-332941211009134. https://doi.org/10.1177/00332941211009134

Meliá-Martí, E., Tormo-Carbó, G., & Juliá-Igual, J. F. (2020). Does gender diversity affect performance in agri-food cooperatives? A moderated model. *Sustainability, 12*(16), 6575. https://doi.org/10.3390/su12166575

MergentOnline. (2023). *MergentOnline*. https://www.mergentonline.com/login.php

Meyers, D. E., Meyers, B. S., Chisamore, T. M., Wright, K., Gyawali, B., Prasad, V., Sullivan, R., & Booth, C. M. (2022). Trends in drug revenue among major pharmaceutical companies: A 2010-2019 cohort study. *Cancer, 128*(2), 311-316. https://doi.org/10.1002/cncr.33934

Miles, J. A. (2021). *Management and organization theory* Jossey-Bass.

Miller, D., & Xu, X. (2017). MBA CEOs, short-term management and performance. *Journal of Business Ethics, 154*(2), 285-300. https://doi.org/10.1007/s10551-017-3450-5

Miner, J. B. (1971). *Management theory*. Macmillan.

Moores, L. E., Landry, A., Hernandez, S. R., Szychowski, J. M., & Borkowski, N. (2021). Reported clinical and financial performance of hospitals with physician CEOs compared to those with nonphysician CEOs. *Journal of Healthcare Management, 66*(6), 433-448. https://doi.org/10.1097/JHM-D-20-00157

Mosley, E. (2020). *Making work human: How human-centered companies are changing the future of work and the world* (1st ed.). McGraw-Hill.

Mukherjee, T., & Sen, S. S. (2022). Impact of CEO attributes on corporate reputation, financial performance, and corporate sustainable growth: Evidence from India. *Financial Innovation, 8*(1), 1-50. https://doi.org/10.1186/s40854-022-00344-7

Mulyati, Y., Sukmawati, F., & Mariana, C. (2021). The impact of CEO tenure, capital structure, stock prices on firm value (empirical study on the automotive industry and components listed on the Indonesia Stock Exchange for the 2013-2019 period). *Turkish Journal of Computer and Mathematics Education, 12*(8), 939-944. https://login.ezproxy3.lhl.uab.edu/login?url=https://www.proquest.com/scholarly-journals/impact-ceo-tenure-capital-structure-stock-prices/docview/2623460810/se-2

Mun, S., Han, S. H., & Seo, D. (2020). The impact of CEO educational background on corporate cash holdings and value of excess cash. *Pacific-Basin Finance Journal, 61*, 101339. https://doi.org/10.1016/j.pacfin.2020.101339

Nakavachara, V. (2020). CEOs and graduate business education. *Journal of Education for Business, 95*(2), 73-80. https://doi.org/10.1080/08832323.2019.1606770

Naseem, M. A., Lin, J., Rehman, R. u., Ahmad, M. I., & Ali, R. (2020). Does capital structure mediate the link between CEO characteristics and firm performance? *Management Decision, 58*(1), 164-181. https://doi.org/10.1108/MD-05-2018-0594

Nawaz, T. (2021). What's in an education? Implications of CEO education for financial inclusion. *International Journal of Finance and Economics*. https://doi.org/10.1002/ijfe.2348

Neely B. H., Jr., Lovelace, J. B., Cowen, A. P., & Hiller, N. J. (2020). Metacritiques of Upper Echelons Theory: Verdicts and recommendations for future research. *Journal of Management, 46*(6), 1029-1062.

Neifar, S., & Ajili, H. (2019). CEO characteristics, accounting opacity and stock price synchronicity: Empirical evidence from German listed firms. *The Journal of Corporate Accounting & Finance, 30*(2), 29-43. https://doi.org/10.1002/jcaf.22386

Nguyen, P., Rahman, N., & Zhao, R. (2018). CEO characteristics and firm valuation: A quantile regression analysis. *Journal of Management & Governance, 22*(1), 133-151. https://doi.org/https://doi.org/10.1007/s10997-017-9383-7

Nimon, K. F., & Oswald, F. L. (2013). Understanding the results of multiple linear regression: Beyond standardized regression coefficients. *Organizational Research Methods, 16*(4), 650-674. https://doi.org/10.1177/1094428113493929

Northhouse, P. G. (2018). *Leadership: Theory and Practice* (8th ed.). SAGE Publications Ltd.

Noura, Z., Mohamed Ali, A., & Tarek, S. (2021). CEO financial education and bank performance. *Journal of Entrepreneurship Education, 24*(2), 1-20.

Olzmann, J. A. (2020 Dec). Diversity through equity and inclusion: The responsibility belongs to all of us. *Moleculat Biology of the Cell., 31*(25), 2757-2760. https://doi.org/10.1091/mbc.E20-09-0575.

Oztig, L. I., & Askin, O. E. (2020). Human mobility and coronavirus disease 2019 (COVID-19): A negative binomial regression analysis. *Public Health, 185*, 364-367.

Phuong, T. H. (2020). Impact of organizational characteristics, CEO education, and firm ownership on the adoption and effectiveness of high performance work system in Vietnam. *Organizations and Markets in Emerging Economies, 11*(1), 83-106. https://doi.org/10.15388/omee.2020.11.25

Prabowo, R., & Setiawan, D. (2021). Female CEOs and corporate innovation. *International Journal of Social Economics, 48*(5), 709-723. https://doi.org/10.1108/IJSE-05-2020-0297

Ritter-Hayashi, D., Vermeulen, P., & Knoben, J. (2019). Is this a man's world? The effect of gender diversity and gender equality on firm innovativeness. *PloS One, 14*(9), e0222443–e0222443. https://doi.org/10.1371/journal.pone.0222443

Rogers, M. G. (2020). *Do you care to lead?: A 5 part formula for creating loyal and results focused teams and organizations* (1st ed.). Wiley.

Saggese, S., Sarto, F., & Viganò, R. (2020). Do women directors contribute to R&D? The role of critical mass and expert power. *Journal of Management and Governance, 25*(2), 593-623. https://doi.org/10.1007/s10997-020-09513-1

Sah, N. B. (2021). Cash is queen: Female CEOs' propensity to hoard cash. *Journal of Behavioral and Experimental Finance, 29*, 100412. https://doi.org/10.1016/j.jbef.2020.100412

Saidu, S. (2019). CEO characteristics and firm performance: Focus on origin, education and ownership. *Journal of Global Entrepreneurship Research, 9*(1), 1-15. https://doi.org/10.1186/s40497-019-0153-7

Scherer, F. M. (2000). The pharmaceutical industry. *Handbook of Health Economics, 1*, 1297-1336.

Schopohl, L., Urquhart, A., & Zhang, H. (2021). Female CFOs, leverage and the moderating role of board diversity and CEO power. *Journal of Corporate Finance, 71*, 101858. https://doi.org/10.1016/j.jcorpfin.2020.101858

Shao, D., Zhao, S., Wang, S., & Jiang, H. (2020). Impact of CEOs' academic work experience on firms' innovation output and performance: Evidence from Chinese listed companies. *Sustainability, 12*(18), 7442. https://doi.org/10.3390/SU12187442

Shropshire, C., Peterson, S., Bartels, A. L., Amanatullah, E. T., & Lee, P. M. (2021). Are female CEOs really more risk averse? Examining economic downturn and other-orientation. *Journal of Leadership & Organizational Studies*, *28*(2), 185-206. https://doi.org/10.1177/1548051821997404

Sihombing, S., Astuti, E. S., Al Musadieq, M., Hamied, D., & Rahardjo, K. (2018). The effect of servant leadership on rewards, organizational culture and its implication for employee's performance, *60*(2). https://doi.org/10.1108/ijlma-12-2016-0174

Smith, E. B., Chown, J., & Gaughan, K. (2021). Better in the shadows? Public attention, media coverage, and market reactions to female CEO announcements. *Sociological Science, 8*(7), 119-149. https://doi.org/10.15195/V8.A7

Smith, K. G., & Hitt, M. A. (2009). *Great minds in management: The process of theory development*. Oxford University Press.

Spain, S. M. (2019). *Leadership, work, and the dark side of personality* (1st ed.). Academic Press.

Sumunar, K. I., Jannah, L., & Aulia, D. (2019). CEO overconfidence, tax avoidance, and education foundation. *Jurnal Akuntansi & Auditing Indonesia, 23*(2), 99-105. https://doi.org/10.20885/jaai.vol23.iss2.art4

Sun, R., & Zou, G. (2021). Political connection, CEO gender, and firm performance. *Journal of Corporate Finance, 71*, 101918. https://doi.org/10.1016/j.jcorpfin.2021.101918

Terrance, J., Mercedes, J., & Kimberly, F. (2013). The relationship between CEO gender, financial performance, and financial management. *Journal of Business & Economics Research, 11*(1), 25.

Ting, H.-I. (2021). CEO gender, power and bank performance: Evidence from Chinese banks. *Journal of Enterprising Communities. 15*(1), 155-176. https://doi.org/10.1108/JEC-04-2020-0065

Tran, M. D., & Adomako, S. (2021). How CEO social capital drives corporate social performance: The roles of stakeholders, and CEO tenure. *Corporate Social-Responsibility and Environmental Management, 28*(2), 819-830. https://doi.org/10.1002/csr.2092

Tuo, S. J., Chang, L., Tesfagebreal, M., & Edjoukou, A. J. R. (2021). Gender diversity inclusive board structure and firm performance: Evidence from West Africa. *The Journal of Corporate Accounting & Finance, 32*(4), 118-131. https://doi.org/10.1002/jcaf.22519

Ullah, I., Majeed, M. A., & Fang, H.-X. (2021). Female CEOs and corporate investment efficiency: Evidence from China. *Borsa Istanbul Review, 21*(2), 161-174. https://doi.org/10.1016/j.bir.2020.09.010

Urquhart, A., & Zhang, H. (2022). PhD CEOs and firm performance. *European Financial Management: The Journal of the European Financial Management Association, 28*(2), 433-481. https://doi.org/10.1111/eufm.12316

van Diggele, C., Burgess, A., Roberts, C., & Mellis, C. (2020, Dec 3). Leadership in healthcare education. *BMC Medical Education, 20*(Suppl 2), 456. https://doi.org/10.1186/s12909-020-02288-x

Wafa, G. (2022). Corporate sustainability and firm performance: The moderating role of CEO education and tenure. *Sustainability, 14*(6), 3513. https://doi.org/10.3390/su14063513

Wang, G., Holmes R. M., Jr., Oh, I.-S., & Zhu, W. (2016). Do CEOs matter to firm strategic actions and firm performance? A meta-analytic investigation based on Upper Echelons Theory. *Personnel Psychology, 69*(4), 775-862. https://doi.org/10.1111/peps.12140

Wang, H., Tsui, A. S., & Xin, K. R. (2011). CEO leadership behaviors, organizational performance, and employees' attitudes. *The Leadership Quarterly, 22*(1), 92-105. https://doi.org/10.1016/j.leaqua.2010.12.009

White, J. V., & Borgholthaus, C. J. (2022). Who's in charge here? A bibliometric analysis of Upper Echelons research. *Journal of Business Research, 139*, 1012-1025. https://doi.org/10.1016/j.jbusres.2021.10.028

Xu, L., Rao, Y., Cheng, Y., & Wang, J. (2020). Internal coalition and stock price crash risk. *Journal of Corporate Finance, 64*, 101640. https://doi.org/https://doi.org/10.1016/j.jcorpfin.2020.101640

Yao, S. (2021). "Who should be the next CEO?" Desirable successor characteristics in recovery from financial distress. *Emerging Markets Finance & Trade, 57*(15), 4461-4472. https://doi.org/10.1080/1540496X.2020.1828857

Yimin, W., Qianhong, S., & Wei, S. (2022). CEO relational leadership and product innovation performance: The roles of TMT behavior and characteristics. *Frontiers in Psychology, 13*, 874105-874105. https://doi.org/10.3389/fpsyg.2022.874105

Yukl, G. A., & Gardner, W. L. (2020). *Leadership in organizations* (9th ed.). Pearson Education, Inc.

Zaccaro, S. J., Rittman, A. L., & Marks, M. A. (2001). Team leadership. *The Leadership Quarterly, 12*(4), 451-483.

Zheng, W., Shen, R., Zhong, W., & Lu, J. (2020). CEO values, firm long-term orientation, and firm innovation: Evidence from Chinese manufacturing firms. *Management and Organization Review, 16*(1), 69-106. https://doi.org/10.1017/mor.2019.43

APPENDIX A

INSTITUTIONAL REVIEW BOARD LETTER OF APPROVAL

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM
Office of the Institutional Review Board for Human Use

470 Administration Building
701 20th Street South
Birmingham, AL 35294-0104
205.934.3789 | Fax 205.934.1301 |
irb@uab.edu

NHSR DETERMINATION

TO: MOHAMED, WAFICK Khairy

FROM: University of Alabama at Birmingham Institutional Review Board
Federalwide Assurance # FWA00005960
IORG Registration # IRB00000196 (IRB 01)
IORG Registration # IRB00000726 (IRB 02)
IORG Registration # IRB00012550 (IRB 03)

DATE: 02-Nov-2022

RE: IRB-300010242
A STUDY TO EXAMINE THE RELATIONSHIP BETWEEN CEO CHARACTERISTICS AND ORGANIZATIONAL PERFORMANCE IN THE U.S. PHARMACEUTICAL AND BIOPHARMACEUTICAL INDUSTRIES.

The Office of the IRB has reviewed your Application for Not Human Subjects Research Designation for the above referenced project.

The reviewer has determined this project is not subject to FDA regulations and is not Human Subjects Research. Note that any changes to the project should be resubmitted to the Office of the IRB for determination.

if you have questions or concerns, please contact the Office of the IRB at 205-934-3789.

Additional Comments:

Thesis research project - Publicly available data