A STATISTICAL ANALYSIS OF THE EFFECTS OF DEFENSE SPENDING ON EMPLOYMENT OPPORTUNITIES IN THE COMMONWEALTH OF VIRGINIA

A Dissertation

by

ARTAISHA C. JENKINS

Submitted to the Graduate College of Hampton University in

partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

MAY 2020

This dissertation submitted by Artaisha C. Jenkins in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Hampton University, Hampton, Virginia is hereby approved by the committee under whom the work has been completed.

Gerard Hall, Ph.D.

Committee Chair

Janet Adeyiga, Ph.D.

Vahwere Kavota, D.B.A

Kyndra Middleton, Ph.D.

Michelle Penn-Marshall, Ph.D.
Dean, The Graduate College

Date

ABSTRACT

A Statistical Analysis of The Effects of Defense Spending on Employment Opportunities in The Commonwealth of Virginia (May 2020)

Artaisha C. Jenkins, B.A., George Mason University;

M.B.A, American Military University;

Ph.D., Hampton University

Chair of Advisory Committee: Dr. Gerard Hall

The purpose of the longitudinal correlational study was to investigate the effects of defense spending on both blue-collar and white-collar job opportunities in the Commonwealth of Virginia. The variables of interest were overall economic output, defense spending, blue-collar jobs, and white-collar jobs, all particular to Virginia. The relationships amongst these variables were measured using descriptive statistics and linear regressions, which were conducted on sample data of the above-mentioned variables of interest from 2009-2018. The theoretical framework underpinning this study was Faggio and Overman's (2014) theory of public sector employment's effects on the distribution of private-sector jobs. To further the body of knowledge on this method, the study sought to analyze the effects of government spending, in the form of defense spending, within the private sector. Prior studies theorized government spending efforts cause both crowding out and the creation of new jobs but found that these effects occur in different sectors (Faggio and Overman 2014). This study found that while government spending may lead to crowding out, government expenditure on defense spending alone,

was not a significant predictor of Virginia's GDP, white-collar job opportunities, or blue-collar opportunities.

DEDICATION

It is with genuine gratefulness and warmest regard

that my philosophical doctorate is dedicated

to the many entrepreneurial-minded scholars

who have paved the way

for me to achieve my dreams.

In the honorable words of the late Maya Angelou,

"When you learn, teach. When you get, give."

ACKNOWLEDGMENTS

This has been a very challenging yet rewarding journey that I could not have conquered without the grace and mercy of God.

To my children, Taiyana, Dante Jr., Daniel, and Mikayla, thank you for encouraging me with your abundant love. I pray that you all have been inspired by my perseverance as I have been inspired by your selfless support of my academic endeavors.

To my parents, the love and support that you have provided to me during my studies is beyond appreciated. The time that you have spent with my children and your unmatched enthusiasm will never be forgotten. I pray that I have made you proud and that you know how much I appreciate all that you have done to support me through my studies.

To my Committee Chair, Dr. Hall, your guidance and direction was invaluable, and I genuinely thank you for your willingness to guide and encourage me through my research. You have been selfless in your commitment to advise me on my research, and it has been an honor to work under your guidance.

To my Committee Members Dr. Adeyiga, Dr. Kavota, and Dr. Middleton and my Academic Advisor Dr. Credle, you have also been selfless in your commitment to advise me on my research. Thank you all for the encouragement, advisement, and guidance throughout this journey. I aspire to one day serve a doctoral student, as each of you has done for me.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure Page

CHAPTER I

INTRODUCTION

Government spending can have a significant impact on the private sector. Different theorists (e.g., Mitchell, 2017; Tobin, 2017) offer conflicting views on whether the ultimate effect of this spending is positive or negative for the economy. Defense spending is undeniably essential, given its role in national security and international diplomacy (Stohl, 2015). However, understanding its ultimate effect on the economy is still important to further the knowledge base. Historically, defense spending has boosted the national economy through manufacturing (blue-collar) jobs, such as during World War II (Bicer, Young, & Meyer, 2015), but defense production is increasingly automated today (Noble, 2017).

Traditionally, blue-collar jobs, and manufacturing jobs, in particular, represented the backbone of the US economy. However, over the last several decades, the number of such jobs available in the US has declined sharply and swiftly. Specifically, in more rural states such as Virginia, these blue-collar jobs are below white-collar jobs, to the extent that managers alone almost outnumber factory workers (Bureau of Labor Statistics, 2019). Researchers disagree on the cause of this decline. Some posit that the easing of tariffs on Chinese imports in 2000 saw a swell of both outsourcing by US companies and cheap imports from Chinese companies that eroded the profitability of US factories (Pierce & Schot, 2016). Others posit that the decline in manufacturing was due primarily to structural economic factors that have also affected other developed economies

(Lawrence, 2017). The rise of automation in manufacturing and similar industries likely has also played some role in the fall of manufacturing (Noble, 2017).

Historically, defense spending was a strong driver of manufacturing and economic growth. The militarization of the US economy ultimately lifted the country out of the Great Depression before World War II, for example (Bicer et al., 2017). However, the face of defense spending has shifted in recent years. The increasing sophistication of weaponry means that defense firms often put significantly more resources into research and development (R&D) than into manufacturing capabilities (Lee & Park, 2019). Despite this shift in the nature of the defense industry, however, or perhaps in part because of it, the defense industry has a strong interrelation with other parts of the economy (Acosta, Coronado, Ferrándiz, Marín, & Moreno, 2019). Defense innovation is often spun-off into civilian enterprise, while civilian innovation may also be spun-in to military products. Furthermore, whether or not defense jobs are increasingly white-collar and defense production is increasingly automated (Noble, 2017), defense spending does continue to boost the overall economy.

In Virginia, defense spending represents nearly 10% of the economy (Vergun, 2019). At the same time, blue-collar jobs have sharply decreased in Virginia, the second-highest recipient of defense spending receipts within the US (Bureau of Labor Statistics, 2019), which creates an opportunity to examine the effects of defense spending on the composition of job opportunities within the state. Prior to 2016-2017, Virginia was the state with the highest level of defense spending, and it remains the state in which defense spending represents the highest percentage of the GDP (Vergun, 2019). At the same time, however, blue-collar jobs in Virginia have been on the decline. Today, blue-collar jobs are broadly outnumbered by a growing percentage of white-collar positions in Virginia (Bureau of Labor Statistics, 2019). From 2000 to 2016, the number of manufacturing jobs in Virginia decreased by 135,886, from approximately 380,000 to approximately 250,000 (Khine, 2019); this may be indicative of a national trend despite continued high levels of defense spending.

In many ways, the broad reach of defense and its driving effects on the economy make it parallel to the technology (Tech) industry. Tech, which is more of a paradigm than an industry, has significant integration into the broader economy, and tech firms operate in ways that have broad effects on firms outside the tech sector (Cramer & Krueger, 2016). Prime examples of this are disruptive tech firms like Uber (Cramer & Krueger, 2016) or Airbnb (Zervas, Proserpio, & Byers, 2017). Despite their success, these firms have a minimal effect on the economy in terms of job creation but a much more significant effect in the way they unseat the existing industries like transit and lodgings, shifting the makeup of the job opportunities in those sectors. Some researchers have suggested these effects are not as detrimental as they have commonly been understood to be (e.g., Berger, Chen, & Frey, 2018), but even such results do not contest that these tech firms have had significant effects on the nature and the makeup of non-tech job markets. The theory of “squeezing out” (Faggio & Overman, 2014) suggests that public sector employment can have similar effects within the private sector, driving a shift in the kinds of jobs that are present without necessarily having a significant effect on the total number of jobs available. Given this, in connection with the broad interest in understanding the effects of government spending on the economy, the question of whether the type of defense spending today is driving the shift from blue-collar jobs to white-collar jobs is a natural one to ask. Which based upon Faggio & Overman, (2014) findings may be a probable predictor of this effect.

Answering this question helps to address a research gap. The first aspect of this gap is that the theory of “squeezing out” (Faggio & Overman, 2014) needs to be empirically tested. This theory stakes out ground between the traditional theory of “crowding out” by government spending and Keynes’ contrary claim that government spending boosts the economy by suggesting that such spending has a more neutral effect of shifting the private sector toward different areas. Secondly, there is a need for more research directly aimed at informing and considering public policy as it relates to defense spending from a defense perspective rather than a security or international relations perspective (Archuleta, 2016). Finally, the ongoing debate about the causes of declining blue-collar jobs in the US presents a third point framing the research gap (Lawrence, 2017; Pierce & Schot, 2016).

Problem Statement

The Commonwealth of Virginia has seen a decline in blue-collar jobs in recent years (Bureau of Labor Statistics, 2019), significantly decreasing the job opportunities for blue-collar workers. Prior studies have consistently shown that lost jobs equate to lost economic output (Bivens, 2019), making this a pertinent area for continued research. The specific problem is that it is not known if increasing defense expenditure in Virginia by the federal government may be squeezing out job opportunities. Research indicates that technology industry spending can have detrimental effects on other market sectors, such as automation, hurting manufacturing jobs (Works, 2017). The increasing presence of technology and the tech industry has also been shown to lead to the increasing stratification of labor and increasing inequity between skilled and unskilled workers (Meschi, Taymaz, & Vivarelli, 2016). Furthermore, in some cases, technology spending can lead to a complete disruption to an existing market sector, such as Uber and Lyft disrupting the taxi industry (Cramer & Krueger, 2016). The defense industry shares many characteristics with the technology industry, including a focus on innovation and the application of technology as well as a broad, cross-sector influence (Acosta et al., 2019). However, it also differs in key terms of the technology industry being largely private while the defense industry is wholly public. This “private” in contrast to “public” comparison presents an area for continued research on whether or not increasing defense industry expenditures and presence can have the same effects on other parts of the economy.

According to the theory of squeezing out (Faggio & Overman, 2014), government expenditures can have a significant effect in terms of shifting relative employment by different parts of the private sector. The creation of public sector jobs does not hurt the overall private sector but may significantly shift its composition. Defense spending represents a unique form of public spending because much defense spending goes toward outside contractors, such as weapon manufacturers (Cohee, Barrows, & Handfield, 2019). Therefore, understanding the effects of defense spending on blue-collar and white-collar jobs fill a gap in the research regarding the application of squeezing out theory to defense spending. In addition, to understand resultant economic effects, further research is needed to clarify and expand the understanding of those factors that have caused a loss in blue-collar jobs (Lawrence, 2017; Pierce & Schot, 2016). Research must also examine issues of defense policy and defense spending to inform public policy (Archuleta, 2016).

Purpose of the Study

The purpose of the longitudinal correlational study is to examine the effects of defense spending on blue-collar and white-collar job opportunities in the Commonwealth of Virginia and thereby examine if the theory of squeezing out is applicable in the context of defense spending. The United States (US) boasts the world's largest economy by nominal GDP and second largest by GDP at purchasing power parity. The United States is comprised of 50 states, and it has an estimated total national population of 323.127 million as of 2016. The Commonwealth of Virginia is the 12th largest state of the US by population and the 10th by income, with a GDP of roughly $534,448 billion (Bureau of Labor Statistics, 2019; US Census Bureau, 2019). In 2018, roughly 2% of the national GDP came from defense spending (Bureau of Economic Analysis, 2019). Examining government defense spending could, therefore, allow for an understanding of the function of this sector of the economy as well as the outsized role it plays in Virginia's economy and how it interacts with other sectors, testing the theory of squeezing out. By drawing upon historical data, it was possible to examine how government defense spending, blue-collar jobs, and white-collar jobs have shifted over time relative to one another and if these shifts significantly correlate with one another. The results of this study offer valuable insight into both the overall economic effect of government defense spending, one of the largest sources of US discretionary spending, and the recent decline of blue-collar job opportunities within the Commonwealth of Virginia.

Theoretical Framework

Research on government spending is one of the key pillars of economics, and many theories have emerged that examine such influence in differing ways. Of the various theories in this area, the specific theoretical framework underpinning this study was Faggio and Overman's (2014) theory of public sector employment's effects on the distribution of private-sector jobs. This theory suggests a sort of "crowding out", though not in the traditional economic sense. In traditional economic terms, crowding out refers to the way in which government spending "crowds out" the chance for private investment through increasing interest rates or potentially competing with the private sector. The type of crowding suggested by Faggio and Overman (2014), on the other hand—henceforth instead termed "squeezing out"—refers to a situation in which government investment in an area causes a shift in the composition of the private sector. Unlike traditional crowding out, this squeezing out does not have any effect on *total* private sector employment, only on the *composition* of private-sector employment. In their original study, Faggio and Overman (2014) examined the case of England, where they found that government spending fueled the creation of some private-sector jobs in construction and services (the so-called non-tradable sector) while causing a roughly equal crowding out of jobs in the tradable sector (i.e., manufacturing).

This "squeezing out" effect could serve to explain the effects of government spending on sectors other than those being directly influenced. For example, existing research has shown that spending in the technology sector has the potential to hurt non-tech employment even as it creates technology employment opportunities, or that it can shift the types of job opportunities in other sectors even if it does not decrease them (e.g., Cramer & Krueger, 2016). This secondary effect of government spending, causing a ripple effect through several parts of the private sector, produces a more nuanced view of the effects of government investment. As alluded to in the problem statement, although the effects of government tech spending have been studied, and evidence has broadly supported the squeezing out theory proposed by Faggio and Overman (2014), whether or not the results of government investment in other sectors are similarly consistent with this theory remains a more open, question.

In this regard, the study did not only draw upon Faggio and Overman's (2014) theory but sought to expand it. Faggio and Overman (2014) illustrated the squeezing out effect for English public-sector jobs. Other researchers (Cramer & Krueger, 2016) have shown similar squeezing out effects for spending on technology. Defense spending, however, is one of the most significant categories of federal spending in the US (Walker, 2012). Furthermore, the defense industry is characterized by different types of jobs and products than the technology industry, with a stronger emphasis on production. Therefore, examining whether or not Faggio and Overman's (2014) theory held for the defense industry served to advance the understanding of how government spending can squeeze out private-sector jobs, and whether or not defense spending redistributed private sector employment opportunities in the same way that tech spending does.

Research Questions

The following are the key research questions developed for this correlational study:

RQ$_1$: Does defense spending predict overall economic growth in the Commonwealth of Virginia?

RQ$_2$: Does defense spending predict blue-collar job opportunities in the Commonwealth of Virginia?

RQ$_3$: Does defense spending predict white-collar job opportunities in the Commonwealth of Virginia?

Research Method

The research design for the study was correlational and longitudinal. The study employed quantitative methodology, which is an empirical, numerical paradigm of research (Bernard, 2017). Quantitative studies draw upon closed-ended data and large sample sizes to fuel statistical analyses of data. Quantitative research is also well-suited to testing theory rather than creating it, as it excels at capturing established theoretical constructs while failing to capture new ideas. The strength of quantitative research, therefore, lies in studies where closed-ended, quantitative, or numerical data can be gathered easily from a large sample size (Bernard, 2017). The quantitative approach to research is a good fit for this study because the issues under study are already inherently numerical. Furthermore, the study seeks to test the theory of squeezing out.

Correlational research, which seeks to test the relationships between variables, is broadly classified as being experimental or non-experimental (Bernard, 2017).

Experimental research is preferable because an experiment can create significantly more reliable results, illustrating causal relations between variables. However, experimental research is much harder to conduct as it requires that the researcher be able to manipulate the variable under study and also randomize participants into control and test groups (Bernard, 2017). On the other hand, correlational research cannot establish causation, but in exchange for this, it can use data collected "as is" from the real world (Johnson, 2001). To evaluate methods for data collection, cross-sectional and longitudinal were considered. Cross-sectional research examines data from a point in time, while longitudinal research examines data from the same variables repeatedly over a period of time (Menard, 2002). Further, longitudinal research aims to describe patterns of change while establishing the direction and magnitude of causal relationships (Menard, 2002). Thus, a longitudinal correlational approach was the choice for the study.

The population under the study was all Virginians employed in white-collar or blue-collar jobs within the private sector. In particular, these were quantified by quarter, rather than the overall state level. Data generated between 2009 to 2018 comprised the sampling frame. For the study, a G*Power analysis was carried out using a statistical power of 80%, a significance level of 0.05, and a large effect size. Under these conditions, using the analysis described later within the study, the minimum necessary sample size was 25. Data were collected as secondary data from existing secondary sources such as the Bureau of Labor Statistics and Data.gov. Data were analyzed using descriptive statistics and linear regressions.

Definition of Terms

Defense Spending. The United States Department of Defense is an executive branch department of the federal government comprised of three major departments: The Department of the Army, Navy, and Air Force. The Department of Defense is charged with coordinating and supervising all agencies and functions of the government, which are directly related to national security and all of the United States Armed Forces (USA, 2007). The Department of Defense maintains a $716 billion-dollar budget and is located in more than 160 countries on all seven continents ("United States Department of Defense: Our Story," 2018). Further, the Department of Defense is America’s largest employer, employing 2.87 million people, of which 2.15 million are service members ("United States Department of Defense: Our Story," 2018). “Defense spending” is a term describing the dollar amount obligated to products, services, and personnel related to national security by the Department of Defense.

Blue-collar and white-collar. For the purposes of this study, the North American Industry Classification System (NAICS) which uses a six-digit hierarchical coding system to classify all economic activity into twenty industry sectors, was referenced to develop the definition for both blue-collar and white-collar (Bureau of Labor Statistics, 2019). The NAICS provides five sectors are which are mainly goods-producing sectors, and fifteen are entirely services-providing sectors. From this, the following definitions were produced:

Blue-collar jobs are jobs associated with manual labor and other hands-on activities. For the purposes of this study, the following good-producing sectors are considered blue-collar: “Agriculture, Forestry, Fishing and Hunting (NAICS 11), Mining, Quarrying, and Oil and Gas Extraction (NAICS 21), Construction (NAICS 23), and Manufacturing (NAICS 31-33)” (Bureau of Labor Statistics, 2019).

White-collar jobs are those associated with paperwork, administrative tasks, and formal attire. For the purposes of this study, the following service-providing sectors are considered white-collar: “Wholesale Trade (NAICS 42), Retail Trade (NAICS 44-45), Transportation and Warehousing (NAICS 48-49), Utilities (NAICS 22), Information (NAICS 51), Finance and Insurance (NAICS 52), Real Estate and Rental and Leasing (NAICS 53), Professional, Scientific, and Technical Services (NAICS 54), Management of Companies and Enterprises (NAICS 55), Administrative and Support and Waste Management and Remediation Services (NAICS 56), Educational Services (NAICS 61), Health Care and Social Assistance (NAICS 62), Arts, Entertainment, and Recreation (NAICS 71), Accommodation and Food Services (NAICS 72), Other Services (except Public Administration) (NAICS 81)” (Bureau of Labor Statistics, 2019).

Significance of the Study

The study had both theoretical and academic significance. Theoretically speaking, critical, inferential, and deductive understanding of government spending is essential both in economic and financial management concepts (Blecker, 2016). The defense industry makes up an outsized portion of government discretionary spending, with an annual budget of around $700 billion today (Walter, 2019). However, the face of the defense industry is also changing. Although historically defense spending has uplifted the economy through manufacturing (Bicer, Young, & Meyer, 2015), today’s defense industry is increasingly focused on research and development and technology (Lee & Park, 2019). This means that the type of jobs created by defense spending, and the corresponding effect of defense spending on the economy at large has changed. At the same time, the availability of blue-collar job opportunities in Virginia, home to many defense contractors owing to its proximity to Washington, has seen a significant decrease in recent years (Bureau of Labor Statistics, 2019). Given that a shift from blue-collar to white-collar jobs can significantly impact the ability of a region's population to find gainful employment and also creates increasing economic disparity (Best, 2018), understanding if this shift has been driven by increasing defense spending represents an important practical question and one that could inform both public policy and economic policy in areas where the industrial base for the defense industry has been established.

The study also had a key academic significance, in which it is aimed at testing and expanding the theory of squeezing out (Faggio & Overman, 2014). The conditions on the ground in Virginia, in which blue-collar job opportunities have eroded and white-collar opportunities have grown even as defense spending has shifted, suggests the theory of squeezing out as a potential explanation for these concurrent changes. The theory posits that government spending does not crowd out private enterprise as in traditional economic theory suggests nor have only positive effects as Keynes hypothesizes, but rather that it does both, ultimately having no net effect on employment but rather shifting the type of employment. This study tested this theory in the case of defense spending. Furthermore, the study answered a call for research by Archuleta (2016) for more research to support public policy on defense spending. Understanding the effects of defense spending on private-sector job distribution would help meet that call for research. Finally, existing research is conflicted as to the ultimate causes of blue-collar job declines (Lawrence, 2017; Pierce & Schot, 2016). Although the defense industry is not the only factor playing into this, understanding if it is one such factor may help contribute to that ongoing debate in the literature.

Summary

In summary, the purpose of the longitudinal correlational study was to examine the effect of defense spending on blue-collar and white-collar job opportunities in the Commonwealth of Virginia. This chapter provided an introduction to and overview of the study. The chapter began with a short background of the study, along with the problem statement. From this, the purpose of the study and theoretical framework were derived, followed by the research questions. The research method was then previewed, along with the definitions of key terms and the significance of the study. The chapter concludes with a summary.

The problem identified within the chapter is that the Commonwealth of Virginia has seen a decline in blue-collar jobs in recent years (Bureau of Labor Statistics, 2019), significantly decreasing the job opportunities for blue-collar workers. The specific problem is that it was not known if increasing defense expenditure in Virginia by the federal government may be squeezing out blue-collar jobs. To address this problem, the purpose of the longitudinal correlational study was to examine the effect of defense spending on blue-collar and white-collar job opportunities in the Commonwealth of Virginia. This was guided by three research questions investigating the relationships between defense spending, white-collar jobs, and blue-collar jobs. These research questions were answered through a longitudinal correlational design with data drawn from publicly available datasets. The study is important because of the dearth of research to inform public policy regarding defense spending, and because defense spending makes up such a large part of US government spending and in particular, is a significant portion of Virginia's GDP. This chapter has provided an overview of and introduction to the study. Next, Chapter II, the literature review, offers a deeper look at the academic research and practical context underlying the study.

CHAPTER II

LITERATURE REVIEW

To recall, the purpose of the longitudinal correlational study was to examine the effect of defense spending on blue- and white-collar job opportunities in the Commonwealth of Virginia. Several sources suggest the importance of specific aspects of government spending and expenditure relative to economic growth (Leimbach, Kriegler, Roming, & Schwanitz, 2017). This chapter provided an in-depth analysis and appraisal of different scholarly resources that specifically highlight the study topic and identified problem. Resources examined are from the academic literature and are current, within the past five years. The literature search was carried out using the extensive set of academic databases available through Hampton University libraries as well as additional resources found through local libraries and Google Scholar. The keywords guiding the literature search included *government, spending, crowding out, squeezing out, private sector, public sector, blue-collar, white-collar, defense, defense industry, technology, United States, Virginia*, and appropriate combinations thereof.

The literature review, which presents the results of the literature search, is organized as follows; first, the theoretical framework, the theory of squeezing out, is elaborated upon. Following this, the remainder of the review is divided into a set of themes. These themes are the Commonwealth of Virginia, government spending, and the economy, the role of defense spending, technology's effects on other sectors and employment, and the factors affecting American manufacturing. Following the themes, the chapter concludes with a summary of the review and the results thereof, including a highlight of the research gap which the study seeks to fill.

Theoretical Framework

As discussed in Chapter 1, The theoretical framework underpinning this study was Faggio and Overman's (2014) theory of public sector employment's effects on the distribution of private-sector jobs, herein referred to as the "theory of squeezing out". The theory of squeezing out describes the way in which government spending can impact the private sector in ways that go beyond the traditional idea of crowding out.

The idea of "crowding out" comes from (neo)classical economics and is quite long-established, although controversial. The notion of crowding out posits that increased government spending (and the corresponding increases in government deficit) have a detrimental effect on the private sector (Nikolova, 2015). This traditional notion of crowding out refers in particular to the crowding out of private *investment*s. Because increased spending is tied to increased interest rates, heightened government spending may crowd out private investment by making it less attractive to investors (Nikolova, 2015). Governments can also crowd out private enterprise by spending to provide goods or services that would otherwise be provided only by private enterprise. The notion of "crowding-out" has been criticized by some economists. Keynes, in particular—the originator of Keynesian economics and the subsequent paradigms—postulated that in an economy without full employment, government spending does not hurt overall employment (Tobin, 2017). Instead, in Keynes' view, the introduction of government spending to the economy serves to boost overall economic outcomes by creating new jobs, thus not actually driving up interest rates or hurting investment.

"Squeezing out" falls somewhere between these two extremes. In the view of Faggio and Overman (2014), government spending efforts cause both crowding out and the creation of new jobs, but these effects occur in different sectors. In their original study, Faggio and Overman (2014) found that government spending on public sector jobs created about 0.4 additional private-sector jobs per public sector jobs in construction and services, but also crowded out 0.5 private sector jobs per public sector jobs in manufacturing. As a result, the final number of private-sector jobs was essentially unchanged, but their distribution had been changed. In a sense, this combines both crowding out and Keynes' criticism of it into a single paradigm that suggests the true effect of government spending in an economy without full employment is to shift jobs between sectors. As discussed in a later theme, spending on technology has a similar effect—for example, tech services such as Uber or Airbnb destroy jobs in the formal services sectors but also create jobs as drivers or hosts.

The theory of squeezing out may apply to the defense industry. Defense spending is a form of government spending and a highly significant one. It both creates direct public sector jobs in the military and offers a significant number of private-sector jobs through contracts. However, it is not yet known whether defense spending has a similar squeezing out effect whereby the mostly white-collar jobs that are created directly as a result of increased defense spending serve to crowd out a similar number of private-sector jobs in, for example, blue-collar employment. Filling this gap serves to expand the theory of squeezing out by testing how, and if, it applies in the case of a specific and significant form of government spending on defense spending. At the same time, it is the theory of squeezing out which provides the theoretical framework that serves to underpin this study and direct its exploration of defense spending's effects on blue-collar jobs in the Commonwealth of Virginia.

Given the specificity of this theory's propositions and its relative newness, little research beyond the foundational aspects have directly assessed to squeezing out as a theory. However, the ideas it encapsulates have been defined by other scholars. For example, Kuroki (2016) noted that the increasing sense of job insecurity amongst blue-collar workers in the United States over time, in the same period as white-collar jobs have become more secure. In a broader sense, the economic notion of crowding out also posits that government spending may have detrimental effects on other aspects of the economy, albeit through different mechanisms (Nikolova, 2015). However, the theory of squeezing out somewhat conflicts with the emergent paradigm of Modern Monetary Theory (Hansen, 2018). Although focused on currency more than spending, in particular, modern money theory posits an entirely positive economic effect of increased government spending as a means to boost the economy and thus comes into conflict with the caveats offered by the theory of squeezing out, where such spending may only benefit specific sectors at the expense of others.

Prior Research

Government Spending and the Economy

The national economy is highly dynamic and is dependent primarily on the fiscal input and subsequent expenditure. Expenditure levels of the federal government directly influence the nation's overall economic output (Mitchell, 2017). According to Mitchell (2017), economies that adhere to moderated expenditure experience fewer economic losses and increase economic growth. Economic growth scale is a measure of the entire fiscal and business potency of a nation and can highlight trends in spending rates that have an impact on the value of the overall economic structure (Jorgenson, Gollop, & Fraumeni, 2016). Notably, the net economic value of a country is dependent on inputs into the economy, outputs of the economy, and relative affiliated liabilities that encompass aspects of expenditure (Jorgenson et al., 2016).

According to Mitchell (2017), the spending rates of the government affect the overall output of the economy. When spending or expenditure rates outweigh the financial input, the resultant effect is a lower or reduced economic output (Jorgenson et al., 2016). A reduced and low economic output causes a negative impact on the economy of a nation, which can be detrimental to respective citizens. If a nation's economy experiences low economic output, a negative economic growth factor is assessed (Lederman & Lesniak, 2017). For instance, the U.S has an economic growth factor of 14%, while Brazil has a growth factor of -2.5% (Lederman & Lesniak, 2017). These statistics underscore a critical economic concept, that allows numeric value to represent overall economic productivity (Lederman & Lesniak, 2017). Countries that boast positive growth factors often are experiencing periods of higher economic output than are countries with negative growth factors (Jorgenson et al., 2016)

Ranges of economic deficit are largely ignored when analyzing the impact of a government's expenditure on economic growth (d'Agostino, Dunne & Pieroni, 2016). However, both the size and fiscal demand on the economy become important when considering the impact of government spending on overall economic output (d'Agostino et al., 2016). Often, the federal government finances its expenditure from the constrained inputs available (d'Agostino et al., 2016). When government spending shifts, changes are often made to allocate increased funds to cover increased costs (d'Agostino et al., 2016). Many times, the main driver of increased federal spending is to stimulate a stagnant economy (Stiglitz, 2016). When financial resources are reallocated for increased spending, the financial output of an industry may increase, which stimulates the respective economy (Stiglitz, 2016).

Government spending has a correlative impact on the respective economy (Mitchell, 2017). Mitchell (2017) argues that the federal government may stagnate the economy as they attempt to mitigate costs from state demands. In the U.S., at least 34% of the budget is allocated to address the government's expenditure on a state's needs and thereby results in limited funds necessary for progressive economic growth (Stiglitz, 2016). Mitchell (2017) examined the 2012-2013 budget of the United States; the government's devolved structure and internal expenditure rate increased to a scale factor of 16%, which increased from 4.2% previously.

Leimbach et al. (2017) stated that the expansion of government is a crippling economic undertaking. The general Federal government of the U.S. adheres to a specific budget that is legally allocated to address the expenditures and needs of the government, which is typically an estimated $ 450-500 billion (Auerbach, Gale, & Krupkin, 2018). Leimbach et al. (2017) suggested that a majority of this allocation goes into catering for internal government expenditures such as wages, allowances, and other administrative spending. Suggesting that increasing the size of government translates to increases in government spending, Mitchell (2017) states that government expenditure and economic growth are inversely proportioned to each other. Therefore, as government expenditure increases the economic growth and economy decreases exponentially (Mitchell, 2017). The most effective counteraction to large amounts of government spending would be to reduce the annual budgetary allocation remitted to the Federal government as well as reducing the size of the government (Hankins, 2017).

According to Mitchell (2017), the government is composed of three main branches: Executive, Legislative, and Judiciary. Each branch determines and allocates to its spending relative to the employee capacity and population (Haskins, 2017). As such, in 2006, an internal audit of the U.S. government showed that the employee population was approximately 604,546 people (Mitchell, 2017). The Federal government accounted for 36% of the total employees, while the state government accounted for 64% (Mitchell, 2017). However, when expenditure and the total number of employees were analyzed, the Federal expenditure was 12% higher than that of the State governments (Haskins, 2017). Mitchell (2017) explains that this economic phenomenon is because there is a lack of mediated expenditure, which results in the expenditure amounts of the government exceeding the input. When this occurs, the economy may become stagnated (Haskins, 2017).

Liebman and Mahoney (2017) further elaborated on the synergy between government spending and the impact caused on the economy through using a classical case study approach to analyze the financial trends of the U.S. Federal government comparative to U.S. economic growth in the last decade. The study focuses primarily on the aspects of input allocated in the annual budget of the government against the liabilities accounted for as expenditures (Liebman & Mahoney, 2017). The two classes were compared to the economic output of the U.S. government in terms of revenue and GDP (Liebman & Mahoney, 2017). Liebman and Mahoney (2017) deduced from their study that negative economic growth occurred when; (i) Government size increased (ii) Government expenditure increased and (iii) The number of projects and development programs decreased.

Wu, Tang, and Lin (2010) hypothesized that a reduction in the government expenditure budget positively influences the development and economic growth. Using a model simulation of economics, Wu et al. (2010) used data sets that represent a typical U.S. government. The results from the experiment show that as expenditure allocation increased, the economic performance dropped in response to the increase. Using the simulation experiment, it was shown that economic potency depended on the expenditure levels of the government.

The greater picture derived from the study provides evidence of the poor economic performance of the U.S. over the last decade. With a poor economic output, other sectors are liable to face negative impacts; as such, development rates plunge, unemployment rates increase, and in the long-run inflation is realized in the economic world. Thus, Wu et al.'s (2010) hypothesis was accepted and justified from the case study results with some of the strongest recommendations of the study being; (i) Reduction in government expenditure budget (ii) Introduction of mediated government restructuring to reduce the size to a manageable one and (iii) Allocating more funds towards development projects and investments rather than the Federal government. The recommendations presented conveyed possible solutions when facing the resultant negative impacts of over expenditure by the federal government.

Alesina and Passalacqua (2016) advanced the concept of legislative ratification to repeal the over the expenditure of the government. According to Alesina and Passalacqua (2016), economics forms a central point of reasoning when dealing with the impact of government expenditure relative to economic effects. It is argued that null or zero expenditure results in an absolute or no economic development index (Haskins, 2017). However, as expenditure begins to be affected, a critical point is reached where once exceeded, the cost outweighs the benefits marginally and sub-marginally (Haskins, 2017). If this point is continually exceeded, the results generated are what account as poor economic performance (Haskins, 2017).

The central idealism of cost versus benefits comes to the perspective when dealing with expenditure. Mitchell (2017) explains that all expenditures possess a cost factor relative to a perceived benefit. However, expenditure losses benefit when the extractive costs become greater than the output generated. Furthermore, Haskins (2017) enumerates that deficit in expenditure explains a looming shortage between input and utilization. Ideally, deficits arise when utilization is higher than the input.

Mitchell (2017) uses *The Keynesian Controversy* as an example to justify that deficit in budgetary allocation provides insight to economic constraints. Based on *The Keynesian Controversy*, cost-benefit analysis is not the only measure of the economics of a government with deficit ranges providing further insights and enumeration of the economics of a government. The government expenditure can be articulated to development through *'pump borrowing';* the government justifiably utilizes its entire allocated budget and caters to the deficit by borrowing from the private sector (Mitchell 2017). As a reimbursement, the government provides development programs to the private sector, thereby countering the effects and impacts of high expenditure. In the long run, the government will maintain its size and spending budget and equally provide substantial output through the private sector.

Overall, the existing literature provides a strong background in terms of demonstrating the importance of government spending as a force within the larger economy. This is perhaps unsurprising, given the vast sums the government can invest and its role in many sectors. The results of this theme provide mixed support for the classical notion of federal spending crowding out private spending. Indeed, it would perhaps be most accurate to say that the mixed results in this regard support the more nuanced perspective of squeezing out found in the work of Faggio and Overman (2014).

Yet to more specifically inform the present study, a better understanding of the specific sector of interest, defense spending is necessary.

Defense Spending

The defense industry is one of the largest industries in the United States. Over $700 billion of the government's annual budget today is funneled into defense spending (Walter, 2019). One reason for the continued prevalence and importance of defense—or military—spending in what is apparently a time of peace are the ongoing "forever wars" (Rogers, 2015). Following World War II, military spending continued to run high in the United States because of the Cold War, a protracted period of ideological conflict with the Soviet Union. Although the Soviet Union fell nearly three decades ago, it has been replaced by terrorism as the international threats against which the US military is continuously fighting (Rogers, 2015). Furthermore, defense industry products have become an important export (Stohl, 2015). The role of defense exports is twofold in that it brings a significant amount of money into the US, and the continued technological superiority of the US military allows defense industry exports to strategic allies to serve as a diplomatic tool, yielding political capital while at the same time helping to ensure that US allies are militarily capable (Stohl, 2015). Thus, defense spending is a key part of the national budget in terms of national security, international relations, and as an economic force.

The overall effect of defense spending on the economy as a whole is complicated and necessarily consists of important direct and indirect effects (Bicer, Young, & Meyer, 2015). One important thing to note in this regard is that the public, private, or hybrid nature of the defense industry differs significantly across different national contexts. This means that results from one country do not necessarily generalize well to other countries. The history of the United States, however, bears witness to the particularly potent effect that defense spending can have on the national economy. Although in the year leading up to World War II, the US economy had begun to recover from the Great Depression, it was only the shift toward a militarized economy that came with the US entering the war that truly ended the depression (Bicer et al., 2015). Similarly, the German economy was lifted out of a deep depression by militarization in the years leading up to the same war. Such anecdotes should be taken with caution, given that such a total economic shift toward war production is not the same as increased defense spending in peacetime. Nonetheless, these examples still serve as excellent illustrations of why military spending can potentially have significant benefits to the broader economy.

One of the central aspects of defense spending is research and development (R&D). Research and development efforts constitute a significant percentage of defense expenditures because national defense industries must seek to gain an edge over rivals to be effective in defense (Lee & Park, 2019). Although weapons and systems must be manufactured once they are developed, a significant portion of the jobs created by defense spending is, therefore, necessarily white-collar jobs within the R&D domain, including the conceptualization, development, and testing of weapons systems on a continuous basis (Lee & Park, 2019). This R&D focus is reflected in the way that defense contracting often operates, whereby multiple firms are paid to perform R&D simultaneously, creating different prospective systems or devices to be used for the same ultimate purpose (Lin, 2016). The military then considers the relative merits of the different designs and chooses to finance the creation of one or more fully. This approach further skews defense-driven employment toward R&D white-collar jobs because not every R&D project will necessarily have a manufacturing stage; instead, only those chosen by the military from an often-broad field will.

An additional factor shaping defense industry jobs is the emerging importance of cyberspace. Cyberspace has, in recent years, been designated the fifth combat domain by the US military (Crowther, 2017). This means that software has become a potentially important defense product. Unlike conventional weapons, software products do not include any significant manufacturing components (Crowther, 2017). Therefore, the ascendance of the cyber-domain and the accompanying rise of software as a defense product has further shifted the balance of jobs created by defense spending toward white-collar and away from blue-collar.

That being said, neither of these factors fully encapsulates the interaction between the defense industry and other sectors. Another important factor is the crossover between military and civilian technology (Acosta, Coronado, Ferrándiz, Marín, & Moreno, 2019). Such crossovers can flow in both directions. On the one hand, military technology can be spun-off into civilian designs in cases where the military devises products with clear nonmilitary applications, such as improved vehicular systems. Conversely, civilian technology can, because of the same overlaps, be incorporated or spun-in into military designs. In a study of over 100,000 patents filed by defense firms and nearly 250,000 patents filed by civilian firms, Acosta et al. (2019) examined the incidence of spin-offs and spin-ins from 2002-2011. Their results demonstrated significant knowledge crossover between civilian and military patents and found that factors such as firm size, military technological capability, and firm location. Interestingly, however, firm size did not remain a factor when considering whether civilian technology could be spun into the military, leaving only location and military technological capability as predictors of spin-in crossover effects.

Research also offers support for the idea that the allocation of defense spending has a significant effect on other parts of the national economy. For example, Zullo and Liu (2017) examined firm- and community-levels effects from the withdrawal or reallocation of defense spending from a region. In this regard, their analysis identified 10 firm-level and seven community-level effects or factors that play into the way a region responds to or recovers from the reallocation of defense spending. At the firm level, the effects they identified were product specialization, product technology, industry condition, new market target, civilian market experience, firm size, location and status in the network, workforce skills, operational assets, and personnel policy. Many of these are natural factors to consider as firms seek to retool their efforts to replace lost military spending, but they also speak to the kinds of factors that might come into play in the inverted situation, with firms adjusting to an influx of defense spending. More directly relevant to this study, though, were the community-level effects or factors, which were economic integration, urbanization, economic diversity, health of local economy, local demand for workforce skill, capital asset utilization, and land use policy. The fact that so many foundational elements of a community's economy come into play in adjusting to a loss of defense spending perhaps suggests that similar effects and factors may be influenced by an influx of spending, which could reshape the community.

One factor which has a significant effect on the allocation of defense spending is the degree of fiscal constraint a given administration is willing to impose on the defense industry. In the US, this can be quite variable (Hensel, 2016). Although broad support for the military and some degree of defense spending remains present across administrations, the amount of the government budget allocated to defense spending has become a highly partisan issue in recent years. Thus, there is inherent uncertainty with respect to the flow of defense spending because Republican administrations are prone to high levels of defense spending, whereas Democratic administrations may see defense spending as something to be trimmed to help pay for other types of government expenditure (Hensel, 2016). This inherent instability in the level of defense spending creates a dangerous uncertainty and discontinuity for those firms and communities heavily dependent on defense spending.

As noted by Acosta et al. (2019), the location of a firm has a significant influence on its crossover with defense and the defense industry, suggesting that the defense industry tends to have geopolitical centers. This, in turn, implies that defense spending is channeled into specific areas. Another factor in determining the economic impact of defense spending, however, is the extent to which such spending is domestic. Kim (2018) noted that, unsurprisingly, foreign firms have an innate disadvantage in bidding for US government contracts, especially in defense. Nonetheless, such firms may, at times, be able to win such contracts through acquiring political capital. External lobbying and the hiring of external lobbyists is one tactic such firms may use to draw defense industry business, although domestic firms can, of course, utilize the same tactics (Kim, 2018). In addition to foreign actors, another factor that can disrupt this flow of defense spending into established defense industry centers is so-called disruptive innovation. Bellais and Fiott (2017) argue that, despite the diversity of the global defense industry, the rise of disruptive innovation by the commercial sector affects it at ab international level. Such innovation undermines the importance of existing technological capacity and lowers barriers to entry, thereby diluting the advantage of incumbent firms and blurring the answer to the question of where the economic effects of defense spending are ultimately made manifest (Bellais & Fiott, 2017).

Other scholars, such as Walter (2019), emphasize the potential weaknesses of the existing defense industry's industrial base. In essence, Walter (2019) argues that, despite having a military budget of over $700 billion to spend, the nature and location of the existing industrial base for the defense industry, shaped by historical idiosyncrasies, has left it in some ways vulnerable. In particular, the industrial base of the defense industry may not be any more resilient to floods, droughts, and other natural disasters than is any other industry, despite the key importance of defense to the nation and its security. This vulnerability to climatological factors matches the analysis of the Pentagon, which has named climate change as one of the greatest threats to national security in the current age (Klare, 2019).

Overall, defense spending today stands at a crossroads in many ways. The policy guiding defense and defense spending has significantly shifted because of the ongoing conflict in the form of the war on terror (Archuleta, 2016). These shifts have seen an increased emphasis on security and international relations with a decline in public policy focus. Because of this, Scholars such as Archuleta (2016) have called for further research into the public policy implications of defense policy. More fully understanding the economic ramifications of defense spending would be an important step toward this goal. To say that defense spending merely creates jobs would likely be shortsighted, given that even the most successful economic recoveries through militarization, such as the entry of the US into World War II had significant secondary and indirect effects (Bicer et al., 2015). Furthermore, Zullo and Liu (2017) demonstrated the striking breadth of firm-level and community-level factors involved in an area's economic recovery if defense spending is withdrawn. Many of those same factors likely come into play when determining the economic effects when that spending arrives.

Given the central role of the military and military spending in the federal budget, there is no question of *if* such spending will continue. Instead, the more relevant question to ask is that of *how* such spending should be allotted. Walter (2019) highlighted the weakness of the existing industrial base for the defense industry, and yet the expansion of that base could potentially have significant economic effects. This is likely manifest in the increasingly white-collar nature of the jobs created by military spending. Much of today's defense industry is not centered around manufacturing, but instead around the extensive R&D complex (Lee & Park, 2019). Even where manufacturing continues, many jobs are replaced by automation, which requires white collar technicians and programmers but significantly fewer manual laborers. Furthermore, the advent of cyberwarfare has seen technology and software form a significant segment of the defense industry, further drawing the defense industry away from blue-collar workers. Thus, it can only raise the question of how the defense industry ultimately affects workers from different backgrounds and whether or not increased defense spending in an area facilitates the squeezing out of blue-collar job opportunities similar to how the tech industry has squeezed out certain segments of the job market.

Tech Industry, Employment, and "Squeezing Out"

In recent decades, the ascendency of the technology industry has been undeniable—though, in truth, it is somewhat deceptive to call technology an industry. Although it does contain some more specific fields, such as computer and software engineering (Fitzgerald & Stol, 2017), tech would perhaps be more accurately termed as an approach. This is because tech can be—and has been—applied in many industries, causing seismic shifts in the constitution thereof. Technology changes the way many things are done; indeed, it has done much to change the extent of what can be done at all (Templeton, Petter, French, Larsen, & Pace, 2019).

In this regard, it is perhaps necessary to limit the scope of "tech" to information technology, simply because technology as a broader term encompasses almost all aspects of modern life. Yet even this more limited definition of what tech defines, touches a myriad of sectors and the industries within them and has reshaped employment in several significant ways. Perhaps the most common of these is the idea of telecommuting (Bernardino, 2017). Today, many jobs can be done long-distance using computers and the internet. While this effect exists within the tech industry itself, it has spread through a number of white-collar industries such as publication, marketing (Blount & Gloet, 2017), and even education. Today, many colleges and universities offer online coursework, and some function exclusively through the internet (McPherson & Bacow, 2015). This has changed the dynamics for both students and educators. Telecommuting has given rise to unprecedented flexibility in employment in a way that can only have significant effects on who can work in certain sectors. Telecommuting is arguably a mostly—or entirely—positive shift for employment because it opens new doors, but it also highlights the immense power of tech to reshape employment.

Other examples of that power are less pointedly positive and instead more clearly suggest a squeezing out effect in which the rise of tech has caused the composition of other sectors to shift. Perhaps the most well-known example of this comes from ride-sharing apps such as Uber and Lyft (Cramer & Krueger, 2016). These applications allow people to hire other people as drivers through a smartphone application rather than using traditional taxi services. The rise of ridesharing has created a few jobs in the technology sector for those operating the companies providing the technology, but their greatest effect on employment is elsewhere. Specifically, these rideshare apps create part-time (or even full-time) driving jobs for ordinary people, allowing anyone with a car and a clean record to pursue gainful employment. However, at the same time, they significantly undercut the taxi industry, as many people now use ride-sharing apps rather than taxis (Cramer & Krueger, 2016). In this regard, the entry of these technology firms into an area causes a squeezing out.

Similar effects have been observed in the lodgings market. Airbnb is a service much like Uber or Lyft, except that it connects travelers with individuals willing to rent space in their homes in the short term (Oskam & Boswijk, 2016). As a result, Airbnb creates job opportunities for people who might otherwise have few. However, the business gained by Airbnb is a loss of business to hotels and other established forms of lodging, costing jobs there. Research (Zervas, Proserpio, & Byers, 2017) has suggested that the net effect on jobs and the local economy from this is near zero: it neither creates nor destroyed a significant number of jobs. Instead, the result of tech firms' entry in these regards is to redistribute employment opportunities, squeezing out existing jobs in favor of new jobs of a different type.

Lest one imagine that this characteristic of the tech industry is an accident or byproduct, it is not. On the contrary, this paradigm of "disruptive" innovation, which aims to use new technology and radical ideas to undercut existing markets and approaches, is a deliberate and even sought-after characteristic of tech companies (Templeton et al., 2019). If successes like Uber and Airbnb remain outliers, it is not because other tech firms do not seek similar results, but because such radical disruption can only occur somewhat infrequently. However, even the more gradual introduction of technology can have effects on employment, such as the rise of automation shifting firms' workforces away from the blue-collar toward white-collar jobs such as R&D (David, 2015).

Indeed, the defense industry has seen an increasing share of automated production in recent years (Noble, 2017). Even as defense firms seek new ways to integrate technology into military products, they also integrate technology into their own production approaches. From the standpoint of the firms, this is wholly beneficial, and yet it serves to undercut the traditionally significant role of manufacturing jobs in defense spending (Bicer et al., 2016; Noble, 2017). Much of the reason why defense spending revitalized the US economy in World War II is the sheer number of manufacturing jobs it created. As defense spending is shifted by technology, it may no longer have that same economic uplifting effect.

Automation aside, however, the greatest relevance of these tech industry examples is that they illustrate the way in which spending in an industry can potentially cause a seismic shift in employment. Although the investment that gave rise to tech firms was mostly private, not government (Cramer & Krueger, 2016), the ultimate source of the spending does not mean that both might not have similar squeezing out effects on the other sectors they are tangent to. At a glance, defense spending might seem a poor parallel to technology, but in many ways, both touch a wide cross-section of the economy. As illustrated by Acosta et al. (2019), defense spending is deeply interrelated to many other sectors because of the extent to which defense innovations can be spun out into civilian innovations or civilian innovation can be spun-in to defense innovation. Furthermore, like tech, defense spending necessarily creates jobs beyond those within the tech company/defense department because of the extent to which the US defense industry relies upon private contractors (Kim, 2018). Therefore, more research is needed to examine whether or not this parallel holds true in terms of defense spending squeezing out blue-collar jobs even as it creates white-collar jobs.

Decline of Manufacturing

It is important to note that there are likely other factors in play that could help explain the decline in blue-collar jobs in Virginia beyond defense spending, regardless of whether the hypotheses developed with respect to squeezing out through defense spending hold true. In particular, the manufacturing sector has seen a sharp decline across the United States in recent decades (Bureau of Labor Statistics, 2019).

Per Pierce and Schott (2016), the swift and sharp decline in US manufacturing capabilities can be traced to trade policy and outsourcing. In 2000, many import duties on Chinese imports were eased or eliminated. This simultaneously benefitted Chinese manufacturers seeking to import goods and US firms aiming to outsource their manufacturing. As a result, many US firms shifted their production to China, which was cheaper without import tariffs, while those that remained faced more difficult competition from outsourcers and native Chinese firms, causing them to struggle and ultimately cut back (Pierce & Schott, 2016). Therefore, both firms that chose to outsource and those who tried to keep their manufacturing within the US both ultimately closed factories and cut back jobs to varying degrees, causing a sharp and sudden decline in US manufacturing jobs. Pierce and Schott (2016) note that this effect is not only robust to the addition of other factors to the analysis but also supported by the fact that European Union nations did not cut tariffs and also did not see a matching decline in their manufacturing sectors.

Other researchers have challenged this view, such as Lawrence (2017). They do not contest the decline in US manufacturing jobs but instead seek to attribute this loss to structural economic factors rather than trade and outsourcing. Lawrence (2017) argued that “relatively faster productivity growth interacting with unresponsive demand has been the dominant force behind the declining share of employment in manufacturing in the United States” (p. 1). Supporting this argument, the researcher also claimed that similar slowdowns in manufacturing have occurred in other developed economies, contrasting with Pierce and Schot’s (2016) claim that the EU nations have not seen a corresponding drop in their own manufacturing sectors. Lawrence (2017) also argued against another factor that other scholars have argued hurts manufacturing, namely automation.

As alluded to above in the technology discussion, automation and robotics do at least, in theory, pose a threat to manufacturing jobs. Unlike trade, automation does not threaten a country with losing manufacturing capacity, only the associated jobs (David, 2015). In essence, as technology and robotics advance, more and more tasks that once required a human touch can instead be done exclusively by automated machines. These machines are better from the standpoint of firms because they do not require payment, are not taxed, cannot unionize, and so on. Thus, when possible, firms will prefer to replace blue-collar workers with robots or automated processes (David, 2015). Whether or not this threat is a threat in reality as well as in theory is more contentious. Researchers such as Lawrence (2017) argue that such fears are overblown and have not yet come to pass, while other scholars such as Bessen (2016) argue that ongoing automation efforts are slowly acting to undercut the manufacturing sector even now. Regardless of which is true, the theoretical threat posed by robotics and automation can be expected to materialize at some point, even if it has not already.

These and other factors work to weaken and chip away at the US economy's manufacturing sector, once the backbone of the economy. Today, as noted above, the Commonwealth of Virginia has nearly as many managers as manufacturing workers per 1,000 jobs (Bureau of Labor Statistics, 2019). Whether or not the defense industry is accelerating this decline, there are a number of other economic and structural factors that have already caused significant damage and likely will continue to do so. Some of these factors, however, may also be interrelated to the specific context of defense. With respect to trade, although it is not common to outsource defense contracts to foreign companies, it does happen (Kim, 2018). Furthermore, even with the sensitive nature of defense production, even American defense companies may outsource the actual production of their defense products. One way of doing this without as significant risk is to outsource the production of components, many of which are more standard while retaining only the production of more proprietary elements domestically (Kim & Shim, 2016). Furthermore, given that many defense products are ultimately exported to US allies, outsourcing part or all of the production to those allies is not unreasonable.

As far as automation, at least some (e.g., Noble, 2017) scholars suggest that the defense industry is one of those most likely to benefit from production automation as well. This is a logical development given the extent to which technology and automated systems are incorporated into many defense products themselves. This means that many defense firms intrinsically possess a large degree of familiarity with such systems. Furthermore, defense contracts are usually awarded through a competitive process in which multiple firms participate in R&D, but only one is ultimately chosen for production (Lee & Park, 2019). This incentivizes defense firms to spend their human capital on R&D rather than production, and so incentivizes approaches like automation that ease production.

Overall, a number of existing factors have contributed to a decline in American manufacturing. Trade and outsourcing likely represent the most significant of these factors, although some scholars still debate the veracity of this (Lawrence, 2017; Pierce & Schot, 2016). Structural economic factors may also potentially play a role in this decline, although less research supports this. Finally, a third contested reason for the loss of manufacturing jobs may be the increasing role of automation in manufacturing, resulting in less actual jobs even when the manufacturing capacity remains regardless of the prior two reasons for the decline of that capacity.

The Commonwealth of Virginia

The state of Virginia, also known as the Commonwealth of Virginia, is one of the 50 states in the United States of America. Virginia is 42,774 square miles, making it the 35th largest state by size. By population, the state is ranked 12th, with 8,517,685 people as of (US Census Bureau, 2019). In terms of income, the state ranks 10th in the nation, with a state GDP of $534,448 billion (Bureau of Labor Statistics, 2019). Nearly 10% of Virginia's GDP comes from government spending.

The government plays a key role in Virginia's economy because of the state's proximity to Washington, DC, the nation's capital. A significant part of this stems further from the fact that the Pentagon, the headquarters of the Department of Defense, is located in Virginia (Bureau of Labor Statistics, 2019). In addition, a number of other government agencies, such as the Central Intelligence Agency, are located in Virginia. The presence of these government agencies also necessarily has an effect on Virginia's private sector. Many defense firms, such as Raytheon, are based in the state to be near the Pentagon or at least maintain a Virginian presence. As a result of this, defense spending has an outsize effect on Virginia's economy even above and beyond the extent to which government spending directly contributes to the state's GDP.

The role of government spending—and defense spending, in particular—in Virginia has shifted over time. Historically, Virginia was the US state with the highest defense spending (NSCL, 2018). However, over time, this has shifted and as of 2017, it ranked second behind California, which saw a defense spending budget of $49 billion to Virginia's $46.2 billion. However, the state remained significantly ahead of the third state, which was Texas at $37.7 billion, and over twice that of fourth place, Maryland's $21 billion (Vergun, 2019). As a national average, defense spending makes up 2.3% of a state's GDP (Vergun, 2019), making Virginia's 8.9% significantly above average. Despite Virginia falling behind California in total defense spending, it remains the state to which defense dollars contribute the highest GDP percentage (Vergun, 2019). Total spending in California only exceeded that in Virginia in 2016-2017, as Virginia was still highest for the 2015 fiscal year (NSCL, 2018). This shift, nonetheless, may mark a turning point in the role of defense spending in Virginia and merits further study.

In terms of employment, the state has seen significantly more white-collar jobs than blue-collar jobs in recent years, with management and financial fields both having large shares of employment per thousand people compared to blue-collar occupations such as production. Indeed, managers alone account for nearly the same share of the Virginian job market as do all production (manufacturing) jobs, while jobs in finance outnumber those in maintenance and cleaning by nearly 50% (Bureau of Labor Statistics, 2019). From 2000 to 2016, the state lost around 136,000 of its roughly 380,000 manufacturing jobs (Khine, 2019), with the trend continuing downward. Thus, it is reasonable to say that the job market in the state has increasingly tilted toward white-collar occupations.

Methodological Precedent

Chapter III of this study details the methodology for the study, along with the rationale for that methodology. However, the approach, a quantitative, longitudinal correlational design was outlined in Chapter I. As a part of the literature review, it was pertinent to identify some existing studies that adopt a similar methodological approach in studying similar issues.

One of the most relevant of those examples comes from the study by Pierce and Schott (2016). In their study, they adopted a similar quantitative and longitudinal analysis to examine the effects on manufacturing jobs as tariffs on Chinese imports were lifted, and US firms outsourced as Chinese goods were increasingly imported. The analysis allowed the researchers to examine the outcomes of interest as the regulatory environment changed, much as the study seeks to examine the balance of blue-collar and white-collar jobs in Virginia as defense spending has changed over time. Like the study, Pierce and Schott (2016) also used existing, public economic data to back their analysis because such data is freely available and highly accurate.

The foundational study for the theory of squeezing out, that of Faggio and Overman (2014), also adopted a similar methodology to study a similar problem. In that case, the researchers sought to determine the extent to which public sector job creation affected private-sector job distribution. For that inquiry as well, longitudinal public datasets represented an ideal source of data, not merely because it was convenient, but because collecting fresh data on the scale, both in terms of numbers and time scale, would have been eminently impractical. By contrast, existing public longitudinal datasets were practical and accurate, allowing for a detailed analysis of how shifts in public sector job creation over time may have driven private-sector jobs in England.

Furthermore, many of the results regarding the effects of disruptive technology on other sectors have employed similar methodologies. For example, Cramer and Krueger (2016) used similar methods to examine the effects of Uber's rise, and market entry has affected taxi industries over time. In this case, not all data were from public agencies, but many similar data could be gleaned from publicly released financial statements. Even when not examining changes over time, broadly similar approaches of applying quantitative, correlational research to public datasets remains germane. For example, Acosta et al. (2019) adopted a large-scale correlational approach in studying the crossover between the defense industry and civilian innovation by examining a public patent dataset. They used correlation analysis to identify the firm characteristics most likely to lead to defense technology being spun off or civilian technology being spun in.

Thus, as this sample of key studies demonstrates a correlational and longitudinal approach to research that was adopted in this study and discussed in Chapter III has a strong basis in existing studies of similar, important issues. Indeed, this approach to research has been successfully applied in both tangential defense research, tangential economics research, and even in the foundational research upon which the theoretical framework for the study is based. Therefore, the existing literature provides a considerable precedent for this approach to research.

Summary

In summary, the purpose of the longitudinal correlational study was to examine the effect of defense spending on blue-collar and white-collar job opportunities in the Commonwealth of Virginia. To help support this purpose, a review of the literature was carried out. The study was supported by the theory of squeezing out, which hypothesizes that significant government spending, such as defense spending, may serve to squeeze out some parts of the private sector even as it boosts others, effectively redistributing jobs. The review of the literature otherwise included the themes of the Commonwealth of Virginia, government spending and the economy, the role of defense spending, technology’s effects on other sectors and employment, and the factors affecting American manufacturing. In the Commonwealth of Virginia, blue-collar jobs such as manufacturing/production are quite low, while white-collar jobs such as management occupy a dominant and ascendant place in the state’s economy (Bureau of Labor Statistics, 2019). Government and defense spending also have an outsized role in Virginia because the state borders the United States capital, Washington, District of Columbia, and hosts the Pentagon.

The defense industry is a significant part of the economy and has historically been able to lift countries out of recession. In recent years, however, the nature of defense has shifted from manufacturing to R&D, even as automation has increased. Thus, defense work is increasingly white-collar rather than blue-collar. Like the tech industry, defense spending has significant interaction with a broad cross-section of the economy. Tech has seen squeezing out in many industries, such as taxis or hospitality, shifting the nature of job opportunities despite not affecting the total number of jobs. Thus, the key question is whether or not defense spending causes a similar squeezing out, or if Virginia's loss of blue-collar jobs is merely a consequence of the wider economic factors that have undermined the US manufacturing industry. Next, in Chapter III, the research methods for this study, which aimed to answer that question, were discussed and rationalized.

CHAPTER III

METHODOLOGY

The purpose of the longitudinal correlational study was to examine the effect of defense spending on blue-collar and white-collar job opportunities in the Commonwealth of Virginia. This chapter addresses the methodological aspects of the study. This study used secondary data to assess the impact of federal government defense spending on Virginia's economy. Data was obtained from publicly available government sources such as The Bureau of Labor Statistics, The Bureau of Economic Analysis, USAspending.gov, and Data.gov. Additionally, data was obtained from census, surveys, and different statistical data regarding the government. This chapter elaborates on these issues of methodology, beginning with the research methodology, followed by the research context, the variables, issues of reliability and validity, and the data analysis. The chapter concludes with a summary.

Research Questions

To recall from Chapter I, the research questions that guided the study are as follows:

RQ_1: Does defense spending predict overall economic growth in the Commonwealth of Virginia?

RQ_2: Does defense spending predict blue-collar job opportunities in the Commonwealth of Virginia?

RQ_3: Does defense spending predict white-collar job opportunities in the Commonwealth of Virginia?

Hypotheses

Based upon the aforementioned research questions, the following hypotheses were created:

$H1_0$: Defense spending does not predict overall economic growth in the Commonwealth of Virginia.

$H1_A$: Defense spending predicts overall economic growth in the Commonwealth of Virginia.

$H2_0$: Defense spending does not predict blue-collar job opportunities in the Commonwealth of Virginia.

$H2_A$: Defense spending predicts blue-collar job opportunities in the Commonwealth of Virginia.

$H3_0$: Defense spending does not predict white-collar job opportunities in the Commonwealth of Virginia.

$H3_A$: Defense spending predicts white-collar job opportunities in the Commonwealth of Virginia.

Methodology

The methodology was an empirical collection of quantitative data forming a numerical paradigm for the research (Bernard, 2017). Quantitative studies, such as this one, draw upon closed-ended data and often upon larger sample sizes to fuel statistical analyses of data. In this regard, quantitative research was a strong approach in cases where the issues under study are well-understood and hence was easily captured by closed-ended data collection or through existing sources of data. Quantitative research was also well-suited to testing theory rather than creating it, as it excels at capturing established theoretical constructs while failing to capture new ideas. The strength of quantitative research, therefore, lies in studies where closed-ended, quantitative, or numerical data were easily gathered from a large sample size (Bernard, 2017). In these cases, statistical techniques such as power analysis allow the researcher to specify certain parameters to achieve an arbitrary level of precision. The quantitative approach to research was a good fit for this study since the issues under study are already inherently numerical. The study sought to study government defense spending and employment rates, both of which are numerical. Furthermore, the study sought to test the theory of squeezing out.

By contrast, qualitative research can be exploratory (Merriam & Tisdell, 2015). It is intended to explore new theoretical ground using open-ended questions that produce long-form descriptive data (Merriam & Tisdell, 2015). Qualitative research is also subjective rather than empirical, seeking to understand the opinions and perceptions of participants (Merriam & Tisdell, 2015). Qualitative research, therefore, may have been a good fit for examining how Virginians *perceive* that defense spending has affected the distribution of employment opportunities. However, it was deemed a significantly inferior fit for this study, which instead sought to empirically examine the effects of defense spending on blue-collar and white-collar jobs. Thus, overall, a qualitative approach was not an appropriate fit, and a quantitative study was deemed appropriate.

Research Design

The research design for the study was correlational and longitudinal. Correlational research, which seeks to test the relationships between variables, is broadly classified as being experimental or non-experimental (Bernard, 2017). Experimental research is preferable in terms of results because an experiment can create significantly stronger results, illustrating causal relations between variables. However, experimental research is much harder to conduct as it requires that the researcher be able to manipulate the variable under study and also randomize participants into control and test groups (Bernard, 2017). Which poses both practical and ethical difficulties to many lines of research. In the case of this study, an experiment would require that the researcher be able to manipulate the level of defense spending, which is far beyond the realm of feasibility. Accordingly, a non-experimental, correlational design is deemed suitable. Correlational research cannot establish causation, but in exchange for this, it can also use data collected "as is" from the real world (Johnson, 2001). Furthermore, while correlational research cannot establish cause and effect, the correlations or associations it determines can afford significant practical utility in terms of predictive power for real-world applications. Thus, a correlational approach was an appropriate choice for the study.

Correlational research can be cross-sectional, historical, or longitudinal. A cross-sectional approach is only necessary when there are no existing datasets of historical data for the study to consider (Johnson, 2001). As the topic of the present study can be informed by a significant body of existing government statistics, a cross-sectional approach is not necessary. Both historical and longitudinal designs use long-term historical data (Johnson, 2001). The difference between these approaches is that historical studies use the entire history as a single set of data, whereas longitudinal research seeks to examine the ways in which the issues under study have changed over time. Given that the present study is concerned with how shifts in government spending over time have shaped the job market composition, a longitudinal approach is the correct choice for this study, allowing the researcher to examine the temporal progression of government spending and its effects.

Research Context

Population and Sample

The population under study was Virginians employed in white-collar or blue-collar jobs within the private sector. In particular, these were quantified by labor category and summarized quarterly. The sampling frame is a statistical term that denotes all the study elements accessible to the researcher at the time of carrying out the research. It may comprise the entire population or a section of it (Rahi, 2018). Data generated from 2009 to 2018 will comprises the sampling frame. These data are quarterly.

Sample sizes in quantitative research are determined through power analysis. In particular, G*Power software allows for the calculation of the necessary sample size to obtain a desired statistical power and significance. For the study, power analysis for linear regression was conducted in G*Power to determine a sufficient sample size using an alpha of 0.05, a power of 0.80, and a large effect size (f2 = 0.35) (Faul et al., 2008).

Under these conditions, using the analysis described later in this chapter, the minimum necessary sample size was 25.

To achieve this sample size, the data from the decade under consideration was examined quarterly rather than annually. The data was divided into fiscal quarters with quarter one (Q1) representing data reported during the respective year for January, February, and March. Quarter two (Q2) representing data reported during the respective year for April, May, and June. Quarter three (Q3) representing data reported during the respective year for July, August, and September. Quarter four (Q4) representing data reported during the respective year for October, November, and December. This creates a sample size of 40 for each variable.

Sources of Data

All data collection for the study relied on secondary data, given the study's retrospective and longitudinal approach, and the fact that data regarding the issues under study had already been collected by government agencies. Through publicly available open-access databases, data were obtained from government sources such as The Bureau of Labor Statistics, The Bureau of Economic Analysis, USAspending.gov, and Data.gov. Additionally, data was obtained from census, surveys, and different statistical data regarding defense spending and occupations in Virginia. All data was downloaded and then entered into SPSS statistical analysis software. Given the public nature of the data and the lack of any direct participants whose confidentiality or anonymity could be compromised, taking steps to protect the data during this process was not necessary.

Variables

The study was concerned principally with four variables: defense spending blue-collar jobs, and white-collar jobs, and overall economic output.

Defense Spending

Defense spending constitutes the independent variable for the study. Defense spending was operationalized by researching "the dollar amount obligated from contract awards, by the Department of Defense, with a place of performance in Virginia". Defense spending was measured as the amount of money obligated quarterly into defense, during that respective period, and as the percentage increase or decrease that defense spending represents for that data collection period compared to the previous one.

Economic Output

Economic output played the role of the dependent variable in RQ_1. Overall economic output was operationalized as the gross domestic product (GDP) in real dollars. It was measured as GDP reported quarterly and as the percentage change for the data collection period relative to the previous data collection period. This was accordingly measured as continuous, ratio data in both cases.

Blue-collar Employment

Blue-collar jobs played the role of the dependent variable in RQ_2. Blue-collar jobs were operationalized by combining several sectors of jobs listed by The Bureau of Labor Statistics. The sectors that were combined are: "Agriculture, Forestry, Fishing and Hunting (NAICS 11), Mining, Quarrying, and Oil and Gas Extraction (NAICS 21), Construction (NAICS 23), and Manufacturing (NAICS 31-33)" (Bureau of Labor

Statistics, 2019). The variable itself was measured in two ways: as a total number of jobs in those categories combined for the data collection period and as the percentage change in them relative to the previous data collection period. This was accordingly measured as continuous, ratio data in both cases. All categories were combined into a single category of blue-collar jobs for the purposes of analysis.

White-collar Employment

White-collar jobs played the role of the dependent variable in RQ_3. White-collar jobs were operationalized by combining several sectors of jobs listed by The Bureau of Labor Statistics. The sectors that were combined are: "Wholesale Trade (NAICS 42), Retail Trade (NAICS 44-45), Transportation and Warehousing (NAICS 48-49), Utilities (NAICS 22), Information (NAICS 51), Finance and Insurance (NAICS 52), Real Estate and Rental and Leasing (NAICS 53), Professional, Scientific, and Technical Services (NAICS 54), Management of Companies and Enterprises (NAICS 55), Administrative and Support and Waste Management and Remediation Services (NAICS 56), Educational Services (NAICS 61), Health Care and Social Assistance (NAICS 62), Arts, Entertainment, and Recreation (NAICS 71), Accommodation and Food Services (NAICS 72), Other Services (except Public Administration) (NAICS 81)" (Bureau of Labor Statistics, 2019). The variable itself was measured in two ways: as a total number of jobs in those categories combined for the data collection period and as the percentage change in them relative to the previous data collection period.

Reliability and Validity

Reliability and validity are important parts of all research. Reliability refers to how well the results hold up to repeated testing—that is, if someone else undertook the same study, would they achieve the same result? Quantitatively, reliability expressed through the strength of the measurement and data collection instruments (Bernard, 2017). That is to say; a quantitative study is reliable if it uses a data collection method that is well-established and likely to produce the same results if applied a second time reliably. In this regard, the reliability of the study was extremely strong because all the variables are something that can be directly measured as numerical quantities, not quantitative measures of non-numerical constructs.

The data provided from the Bureau of Labor Statistics, the Bureau of Economic Analysis, USAspending.gov, and Data.gov are derived from a collection of survey data, census data, and required financial reporting at the state and federal levels. Though extremely strong in reliability, the data are subject to two types of error, sampling, and nonsampling errors. Holmes, Illowsky, and Dean (2017) explained that the magnitude of sampling error is directly interrelated to the process of sampling. Further explaining that factors not related to the sampling process cause nonsampling errors (Holmes et al., 2017). For the purpose of this study, these nonsampling errors could include errors within the reporting periods, lack of responses by respondents, or lack of reporting by an agency. However, these data come from official government sources. Therefore, the most probable weakness in reliability is from the original government measurements, given the large-scale nature of the data collected.

Validity, on the other hand, refers to the rigor with which a study is undertaken, Validity is divided into internal and external validity (Bernard, 2017). Internal validity refers to how well the study answers what it set out to. Internal validity was assured in several ways. First, the study components were carefully aligned, from the problem to the purpose, to the research questions, to the data that was collected to answer those questions. Secondly, the variables were measured naturalistically, ensuring the data collection collects relevant data. Thirdly, the appropriate analysis had been selected to produce answers to the research questions. External validity refers to the generalizability of the study (Bernard, 2017). External validity was assured by the G*power analysis, which was conducted. By exceeding the minimum necessary sample size, it was ensured that the results generalized to the population. The results likely do not generalize to the US as a whole, given the study's focus on Virginia and the state's unique positioning with respect to defense spending. This is by design, however, and does not represent a lack of external validity, merely a delimitation.

Data Analysis

After data sets were collected from the comprehensive search, data sets were presented and described through tables and summaries for data analysis. Subsequently, the modified data sets were examined to establish data patterns using statistical methods. The generated data were entered into the Statistical Package for Social Sciences (SPSS) for analysis. Various statistical tests were used to check for completeness, consistency, and reliability before analysis. Data analysis were carried out on two levels, where both descriptive and inferential analysis are used. As the descriptive analysis involves frequencies and percentages and were used to describe and characterize the data, illustrating overall characteristics of the dataset as well as statistical properties such as means and ranges.

Following the descriptive statistics, inferential statistics were used to test the hypotheses and answer the corresponding research questions. The analyses drew upon linear regression (Kutner, Nachtsheim, Neter, & Li, 2005). As RQ_1, RQ_2, and RQ_3, all took the same form; the analysis approach for answering each was the same. For each RQ, the relevant set of variable pairs (value and percentage change) are the predictors and criteria. For RQ_1, the predictor was defense spending data and the criterion overall economic output. For RQ_2, the predictor was defense spending data and the criterion blue-collar jobs. For RQ_3, the predictor was defense spending data and the criterion white-collar jobs.

Linear Regression

To examine the research questions, a linear regression was conducted on each dependent variable to investigate whether the independent variable predicted the dependent variables. Linear regression was deemed an appropriate analysis since the goal of the study was to assess the extent of a relationship between an interval predictor variable on an interval criterion variable. In this case, the predictor variable was defense spending, and the criterion variables were economic output (RQ_1), blue-collar employment (RQ_2), and white-collar employment (RQ_3).

The assumptions of normality of residuals, homoscedasticity of residuals, absence of multicollinearity, and lack of outliers were assessed. The normality of residuals assumes that the residuals of the regression model follow a normal distribution (bell-shaped curve). Normality was examined with a Q-Q scatterplot of the residuals (Field, 2013; Bates, Mächler, Bolker, & Walker, 2014; DeCarlo, 1997). The assumption of homoscedasticity requires that there is no underlying relationship between the residuals and the fitted values. The assumption was examined with a scatterplot of the residuals and the fitted values (Field, 2013; Bates et al., 2014; Osborne & Walters, 2002). The absence of multicollinearity assumption implies that the predictor variables are not too highly correlated with one another and was assessed using variance inflation factors (VIF). VIF values over 10 will suggest the presence of multicollinearity (Menard, 2009). Lack of outliers was determined as any observation that has a studentized residual (Field, 2013; Stevens, 2009) that exceeds the .999 quantile of a t-distribution, with the degrees of freedom being n-1, where n is the sample size. The simple linear regressions which were used for RQs 1-3 are a specific case of a linear regression in which only a single predictor was used, and hence the assumptions are generally the same.

The assumptions of linear regression, which are linearity and homoscedasticity, will be assessed. Linearity assumes a straight-line relationship between the predictor variable and the criterion variable, and homoscedasticity assumes that scores are normally distributed about the regression line. Linearity and homoscedasticity will be assessed by examination of scatter plots.

Summary

In summary, the purpose of the longitudinal correlational study was to examine the effect of defense spending on blue- and white-collar job opportunities in the

Commonwealth of Virginia. This chapter details the methods by which the study was carried out. The study was guided by three research questions: (RQ_1) What relationship, if any, exists between defense spending and overall economic growth in the Commonwealth of Virginia? (RQ_2) What relationship, if any, exists between defense spending and blue-collar job opportunities in the Commonwealth of Virginia? (RQ_3) What relationship, if any, exists between defense spending and white-collar job opportunities in the Commonwealth of Virginia? To answer these research questions, a longitudinal correlational design was carried out. The study drew data from datasets provided by government agencies. The variables of interest are overall economic output, defense spending, blue-collar jobs, and white-collar jobs. Next, Chapter 4, Results, the relationships amongst these variables were measured using descriptive statistics and linear regressions.

CHAPTER IV

RESULTS

Introduction

The current research is aimed at examining the effects of defense spending on blue-collar and white-collar job opportunities in the Commonwealth of Virginia. In this chapter, the research incorporates the literature discussed in the literature review section. This section further presents the findings of the study based upon the information collected as a result of the methodology and the methods applied in the analysis procedures. This section presents the data used for analyses and the outputs of those analyses in tables and figures without any kind of bias for interpretation.

Data Collection

All data collection for the study relied on secondary data, given the study's retrospective and longitudinal approach, and the fact that data regarding the issues under study had already been collected by government agencies. Additionally, data was obtained from census, surveys, and different statistical data regarding defense spending and occupations in Virginia. Through publicly available open-access databases, the data on the Commonwealth of Virginia's economic output was collected from The Bureau of Economic Analysis. While data on both white-collar and blue-collar job opportunities within the Commonwealth of Virginia was obtained from The Bureau of Labor Statistics. Data on the federal government's expenditures on defense spending was collected from USAspending.gov and Data.gov.

Data Analysis Strategy

The data was analyzed and described through the use of statistical techniques like median, mean, mode, and simple linear regression. Also, graphs, charts, and index tables were generated where they were necessary and compulsory for simplicity of the ideas, easy understanding, and to make the presentation of research work more coherent. For the purpose of analysis, the following abbreviations were used to define the variables; DODS for Department of Defense Spending, VA_GDP for Virginia's GDP, WC_EM for white-collar employment/ job opportunities, and BC_EM for blue-collar employment/ job opportunities.

Since the research was based on secondary data for analyses, it incorporated calculation to combine the assembled data into quarterly groupings. Reliability of data analyses, a necessary but not sufficient condition for validity was tested using cross-validation. Descriptive statistics were employed in describing and characterizing the data, clarifying general information regarding the dataset included statistical features like means and ranges. Outliers were tested as well, and none were found.

For RQ_1, the predictor is defense spending data and the criterion overall economic output. For RQ_2, the predictor is defense spending data and the criterion blue-collar jobs. For RQ_3, the predictor is defense spending data and the criterion white-collar jobs.

Data Analysis Results

Reliability

Introduction. Field (2013) states that the cross-validation of the linear regression model can be used to assess the accuracy of a model. Cross-validation through R^2 evaluates the scatter of the data points around the fitted regression line. Frost (2019) states that R^2 can range from 0%- 100%, where zero indicates that the model accounts for none of the variability in the dependent variable around its mean, and 100% signifies that the model explains all of that variability. While the *adjusted* R^2 indicates the loss of predictive power (Field, 2013). Thus, the *adjusted* R^2, using Stein's formula, was deemed an appropriate measure to assess the accuracy of a model.

Results. Cross-validation, using Stein's formula for the *adjusted* R^2, was conducted for each simple linear regression. Stein's formula states that the *adjusted* $R^2=1-[((n-1)/(n-k-1))((n-2)/(n-k-2))((n+1)/n)](1-R^2)$ where n is equal to the sample size and k is equal to the number of predictors in the model (Field, 2013). The *adjusted* R^2 values produced for each simple linear regression were: *adjusted* R^2 = 0.06 with DODS predicting VA_GDP, *adjusted* R^2 = -0.04 with DODS predicting BC_EM, and *adjusted* R^2 = -0.075 with DODS predicting WC_EM. As can be seen from the cross-validation, the results of this study are not generalizable to other states within the US. These results are in line with and serve as validation for the statistical non-significance found in the study.

Check for Outliers

Introduction. Univariate outliers were examined for GDP, white-collar job opportunities, blue-collar job opportunities, and defense spending. An outlier was defined as any value which falls outside the range of +/- 3.29 standard deviations from the mean (Tabachnick & Fidell, 2013).

Results. There were no outliers present in GDP. There were no outliers present in defense spending. There were no outliers present in white-collar employment. There were no outliers present in blue-collar employment. Since the variables do not show any signs of outlier values, the data is ready for analysis.

Data for Analysis

Introduction. Given that there were no outliers found, the data used to perform further analysis is given in Appendix A; while, the Raw Outputs of the analysis is given in Appendix B. Further, given the secondary nature of the data and the exclusion of the direct involvement of human subjects, consent from the Institutional Review Board was not required, and the analysis is approved to commence (see Appendix C).

Descriptive Statistics

Introduction. Summary statistics were calculated for Virginia's GDP, defense spending, white-collar employment, and blue-collar employment. Note: Means (M), standard deviations (SD), sample size (n), Standard Error of the Mean (SEM), Minimum (Min), Maximum (Max), Median (Mdn). The Glossary, given in Appendix D, provides additional definitions of the terms to follow.

Summary Statistics. The observations for Virginia's GDP had an average of $465,138.27 *(reported in millions of dollars)* (SD = 3.90 × 10^{10}, SE_M = 6.17 × 10^9, *Mdn* = 4.57 × 10^{11}). The observations for defense spending had an average of $9,015.54 *(reported in millions of dollars)* (SD = 2.82 × 10^9, SE_M = 4.46 × 10^8, *Mdn* = 8.50 × 10^9). The observations for white-collar employment had an average of 7,663,611.75 (SD = 344851.88, SE_M = 54525.87, *Mdn* = 7.61 × 10^6). The observations for blue-collar employment had an average of 1,311,488.85 (SD = 34622.95, SE_M = 5474.37, *Mdn* = 1.31 × 10^6). The summary statistics can be found in Table 1.

Table 1

Summary Statistics Table for Interval and Ratio Variables

	VA_GDP (reported in millions of dollars)	*DODS (reported in millions of dollars)*	*WC_EM*	*BC_EM*
Mean	465138.27	9015.54	7663611.75	1311488.85
Standard Error	6173.23	445.77	54525.87	5474.37
Median	457208.55	8497.77	7605736.50	1307864.00
Mode	#N/A	#N/A	#N/A	1303453.00
Standard Deviation	39042.96	2819.31	344851.88	34622.95
Range	141476.60	11718.57	1205442.00	130778.00
Minimum	402871.40	5367.46	7060404.00	1254508.00
Maximum	544348.00	17086.04	8265846.00	1385286.00
Sum	18605530.60	360621.62	306544470.00	52459554.00
Count	40	40	40	40

Note: VA_GDP and DODS have been divided by one million, and all outputs were rounded to the second decimal for illustration purposes. The raw outputs can be found in the appendix.

For the results in Table 1 above, a total maximum of 40 observations were obtained for each variable. The average GDP in Virginia over the evaluation period was $465,138,265,000 with a standard deviation of $39,042,963,809.21. The minimum GDP was $402,871,400,000.00 during the first fiscal quarter of 2019, and the maximum GDP for the state was $544,348,000,000.00 during the fourth fiscal quarter of 2014 with the range between them being given as $141,476,600,000.00 (see Table 1).

The average amount of defense spending in Virginia over the evaluation period was $9,015,540,520.18, with a standard deviation of $445,772,689.04. The minimum amount of defense spending was $5,367,463,528.00 during the first fiscal quarter of 2016, and the maximum amount of defense spending was $17,086,036,726.00 during the fourth fiscal quarter of 2011 with the range between them being given as $11,718,573,198.00 (see Table 1).

The average white-collar job opportunities over the evaluation period was 7,663,612, with a standard deviation of 344,852. The minimum number of reported white-collar job opportunities was 7,060,404 during the first fiscal quarter of 2010, and the maximum white-collar job opportunities was 8,265,846 during the fourth fiscal quarter of 2018 with the range between them being given as 1,205,442 (see Table 1).

The average blue-collar job opportunities over the evaluation period was 1,311,489, with a standard deviation of 34,623. The minimum number of reported blue-collar job opportunities was 1,254,508 during the first fiscal quarter of 2014, and the maximum blue-collar job opportunities was 1,385,286 during the third fiscal quarter of 2018 with the range between them being given as 130,778 (see Table 1).

Quarterly Changes

Introduction. Summary statistics, frequencies, and percentages were calculated for the quarterly changes in Virginia's GDP, defense spending, white-collar job opportunities, and blue-collar job opportunities.

Summary Statistics. Analysis began with Q2 of 2009 and concluded with Q4 of 2018, resulting in 39 observations shown in Table 2. During the evaluation period, defense spending showed the most volatility and produced the greatest range of over 183%. Though, on average, defense spending showed an increase during the fourth quarter of each fiscal year, with Q1 of 2014 being the only exception, as shown below in Figure 1. While Table 3 provides the respective percentage change for each period.

Table 2

Summary Statistics Table for The Quarter-to-Quarter Percentage Change

-	*VA_GDP*	*DODS*	*WC_EM*	*BC_EM*
Mean	0.78%	10.99%	0.37%	0.04%
Median	0.81%	13.97%	0.37%	-0.29%
Minimum	0.03%	-63.65%	-2.55%	-5.05%
Maximum	1.91%	119.67%	3.06%	3.77%
Range	1.88%	183.32%	5.61%	8.82%
Count	39	39	39	39

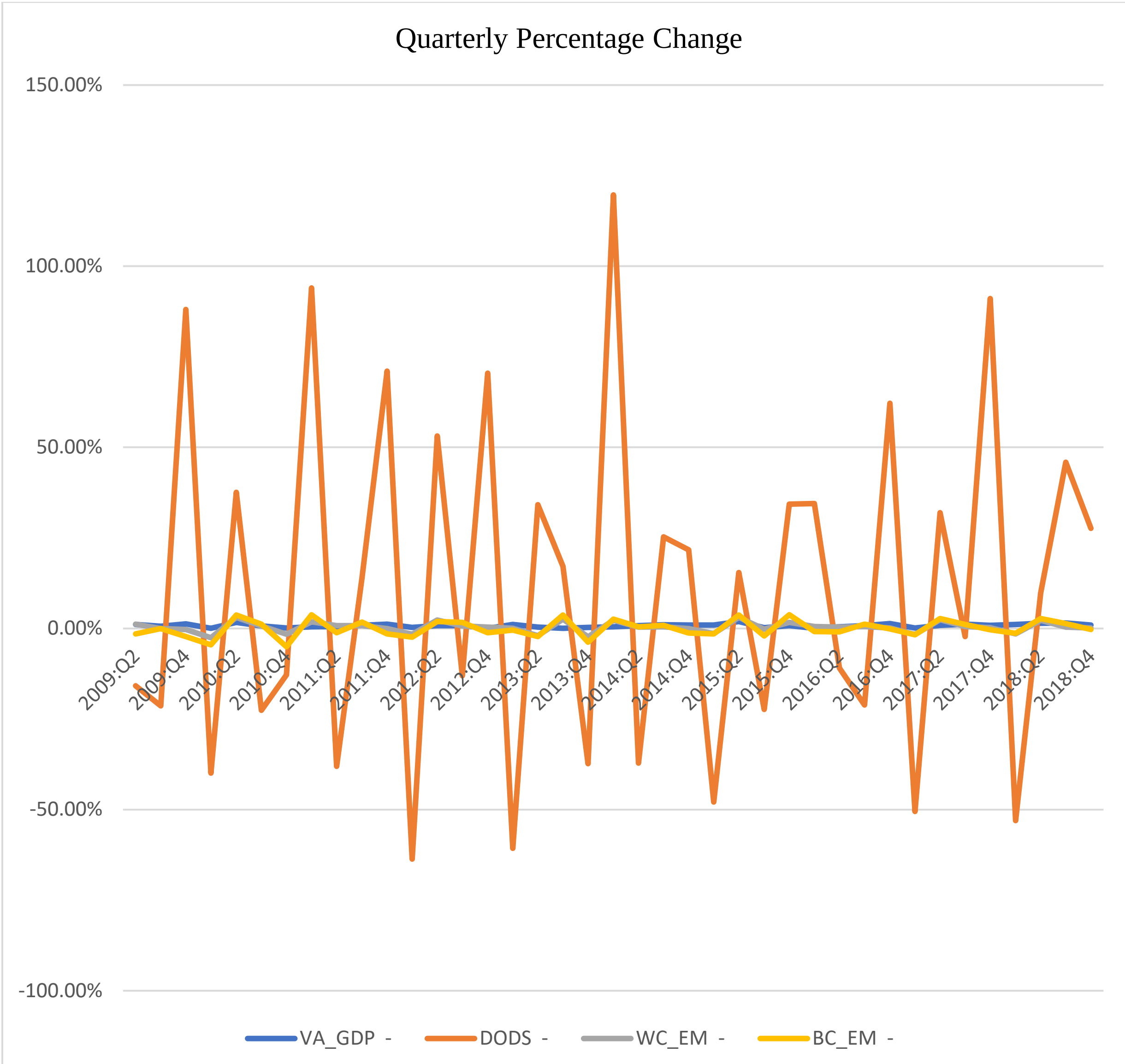

Figure 1.Visualized Quarterly Percentage Changes.

Table 3

Quarter-to-Quarter Percentages

Quarterly Percentage Change									
Period	**VA_GDP**	**DODS**	**WC_EM**	**BC_EM**	**Period**	**VA_GDP**	**DODS**	**WC_EM**	**BC_EM**
2009:Q1	-	-	-	-	**2014:Q1**	0.49%	119.67%	2.26%	2.60%
2009:Q2	1.13%	-15.79%	1.21%	-1.47%	**2014:Q2**	0.74%	-37.13%	0.39%	0.42%
2009:Q3	0.64%	-21.37%	-0.07%	-0.02%	**2014:Q3**	1.03%	25.31%	0.44%	0.85%
2009:Q4	1.30%	88.06%	-0.24%	-2.26%	**2014:Q4**	0.92%	21.69%	0.00%	-1.25%
2010:Q1	0.06%	-39.93%	-2.55%	-4.50%	**2015:Q1**	0.97%	-47.90%	-1.42%	-1.52%
2010:Q2	1.66%	37.56%	3.03%	3.72%	**2015:Q2**	1.91%	15.43%	3.06%	3.67%
2010:Q3	0.72%	-22.61%	0.69%	1.20%	**2015:Q3**	0.20%	-22.37%	-0.17%	-2.10%
2010:Q4	0.13%	-12.80%	-1.60%	-5.05%	**2015:Q4**	0.79%	34.33%	1.71%	3.76%
2011:Q1	0.46%	94.01%	1.84%	3.77%	**2016:Q1**	0.04%	34.50%	0.56%	-0.82%
2011:Q2	0.52%	-38.04%	0.82%	-1.21%	**2016:Q2**	0.46%	-10.95%	0.36%	-0.97%
2011:Q3	0.89%	13.97%	0.81%	1.77%	**2016:Q3**	0.81%	-21.08%	0.54%	1.21%
2011:Q4	1.16%	71.07%	-0.06%	-1.50%	**2016:Q4**	1.39%	62.16%	0.11%	-0.14%
2012:Q1	0.30%	-63.65%	-1.60%	-2.40%	**2017:Q1**	0.11%	-50.52%	-1.64%	-1.71%
2012:Q2	0.80%	53.13%	2.29%	1.93%	**2017:Q2**	0.85%	31.93%	2.37%	2.73%
2012:Q3	0.82%	-13.03%	0.71%	1.64%	**2017:Q3**	1.17%	-2.23%	0.54%	1.08%
2012:Q4	0.03%	70.49%	0.37%	-1.19%	**2017:Q4**	0.86%	91.05%	0.17%	-0.38%
2013:Q1	1.14%	-60.70%	0.05%	-0.43%	**2018:Q1**	1.08%	-53.01%	-1.48%	-1.32%
2013:Q2	0.36%	34.13%	-1.97%	-2.23%	**2018:Q2**	1.44%	9.78%	2.27%	2.76%
2013:Q3	0.05%	17.18%	2.59%	3.68%	**2018:Q3**	1.55%	45.85%	0.34%	1.39%
2013:Q4	0.31%	-37.33%	-2.33%	-3.76%	**2018:Q4**	0.97%	27.62%	0.11%	-0.29%

Frequencies and Percentages. The results were rounded to whole numbers, and the most frequently observed category of Virginia's GDP was 1% (n = 23, 59%). The most frequently observed category of defense spending was 34% (n = 3, 8%). The most frequently observed category of white-collar job opportunities was 0% (n = 14, 36%).

The most frequently observed categories of blue-collar job opportunities were -1% and -2%, each with an observed frequency of 7 (18%) (Table 3).

Quarterly Percentages of Total Employment Opportunities. On average white-collar job opportunities maintained 86% of total employment opportunities, with blue-collar job opportunities maintaining 14% of total employment opportunities during each quarter of the observation period, shown below in Figure 2 and within the corresponding table in Appendix E. Though, on average, white-collar employment showed a decrease during the first quarter of each fiscal year as shown below in Figure 3 and within the corresponding table in Appendix F.

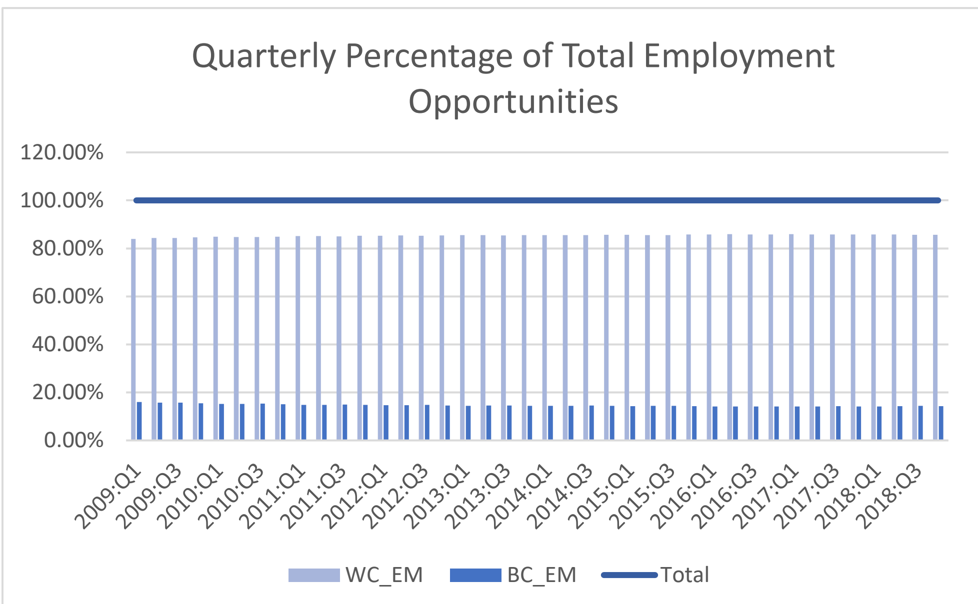

*Figure 2.*Quarterly Percentage of Total Employment Opportunities.

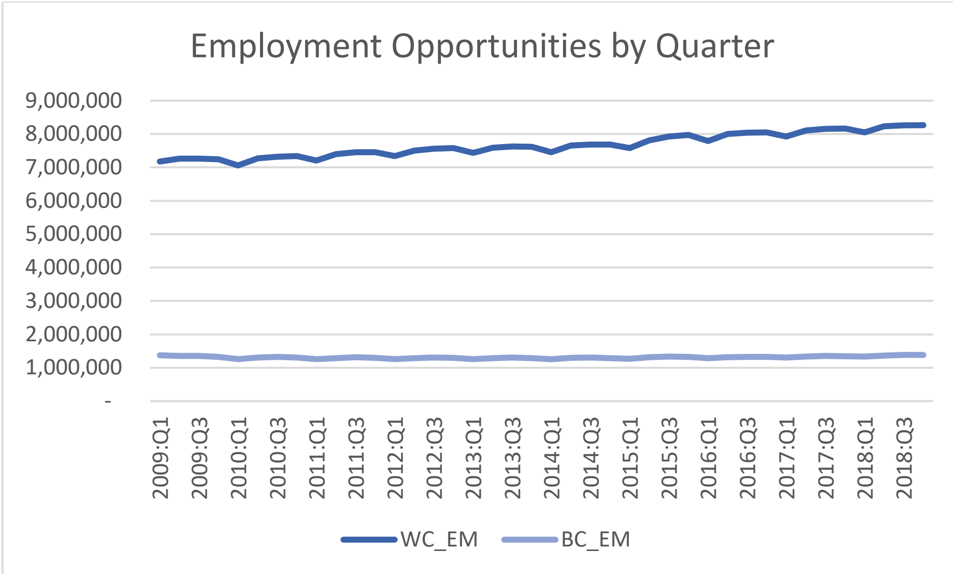

Figure 3.Employment Opportunities by Quarter.

<u>Linear Regression Analysis</u>

Research Question 1

RQ_1: Does defense spending predict overall economic growth in the Commonwealth of Virginia?

Introduction. A linear regression analysis was conducted to assess whether defense spending significantly predicted Virginia's GDP.

Assumptions.

Normality. The assumption of normality was assessed by plotting the quantiles of the model residuals against the quantiles of a Chi-square distribution, also called a Q-Q scatterplot (DeCarlo, 1997). For the assumption of normality to be met, the quantiles of the residuals must not strongly deviate from the theoretical quantiles. Strong deviations could indicate that the parameter estimates are unreliable. Figure 4 presents a Q-Q scatterplot of the model residuals, which indicates the residuals do not strongly deviate from the line and hence normality of residuals.

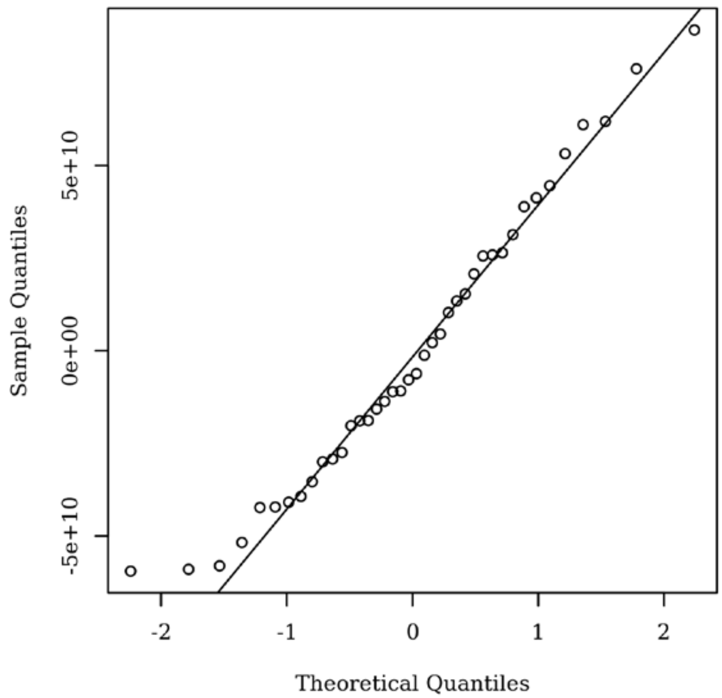

Figure 4. Q-Q scatterplot for normality of the residuals for the regression model.

Homoscedasticity. Homoscedasticity was evaluated by plotting the residuals against the predicted values (Bates et al., 2014; Field, 2013; Osborne & Walters, 2002). The assumption of homoscedasticity is met if the points appear randomly distributed with a mean of zero and no apparent curvature. Figure 5 presents a scatterplot of predicted values and model residuals, which indicates there is no curvature and hence homoscedasticity.

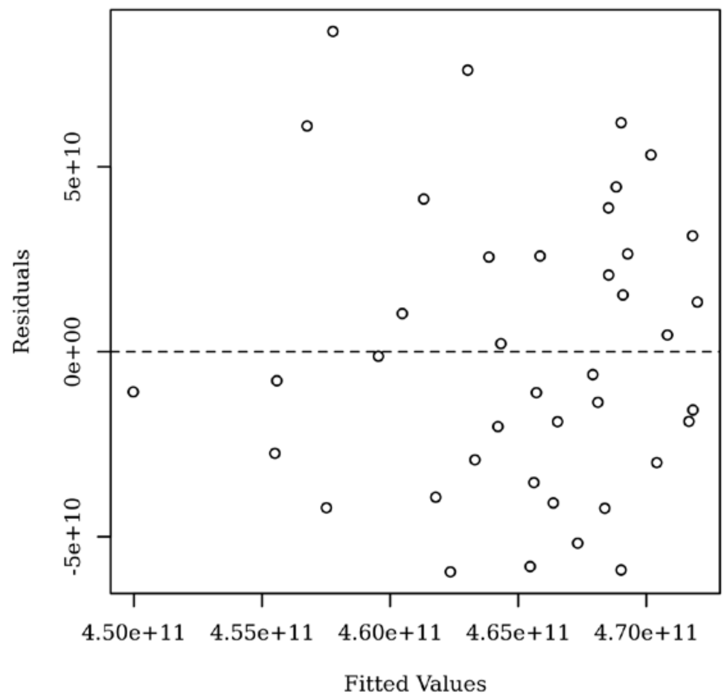

Figure 5. Residuals scatterplot testing homoscedasticity.

Outliers. There were no outliers. However, to identify influential points, Studentized residuals were calculated, and the absolute values were plotted against the observation numbers (Field, 2013; Stevens, 2009). Studentized residuals are calculated by dividing the model residuals by the estimated residual standard deviation. An observation with a Studentized residual greater than 3.31 in absolute value, the 0.999 quartile of a *t* distribution with 39 degrees of freedom, was considered to have significant influence on the results of the model. Figure 6 presents the Studentized residuals plot of the observations.

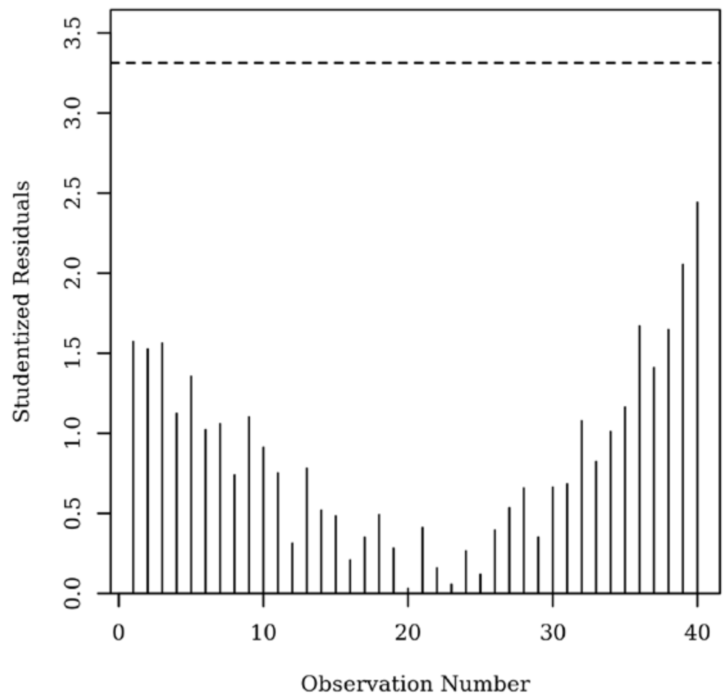

Figure 6. Studentized residuals plot for outlier detection.

Results. The results of the linear regression model were not significant, $F(1,38) = 0.71$, $p = .404$, $R^2 = 0.02$, indicating defense spending did not explain a significant proportion of variation in Virginia's GDP. Table 4 summarizes the results of the regression model.

Table 4

Results for Linear Regression with DODS predicting VA_GDP

Variable	*B*	*SE*	CI	β	*t*	*p*
(Intercept)	482078705579.49	21001007802.73	[4×10^{11}, 5×10^{11}]	0.00	22.96	< .001
DODS	-1.88	2.23	[-6.38, 2.63]	-0.14	-0.84	.404

Note. CI is at the 95% confidence level. Results: $F(1,38) = 0.71$, $p = .404$, $R^2 = 0.02$
Unstandardized Regression Equation: VA_GDP = 5×10^{11} - 1.88*DODS

Research Question 2

RQ_2: Does defense spending predict blue-collar job opportunities in the Commonwealth of Virginia?

Introduction. A linear regression analysis was conducted to assess whether defense spending significantly predicted blue-collar job opportunities.

Assumptions.

Normality. The assumption of normality was assessed by plotting the quantiles of the model residuals against the quantiles of a Chi-square distribution, also called a Q-Q scatterplot (DeCarlo, 1997). For the assumption of normality to be met, the quantiles of the residuals must not strongly deviate from the theoretical quantiles. Strong deviations could indicate that the parameter estimates are unreliable. Figure 7 presents a Q-Q scatterplot of the model residuals, which indicates the residuals do not strongly deviate from the line and hence normality of residuals.

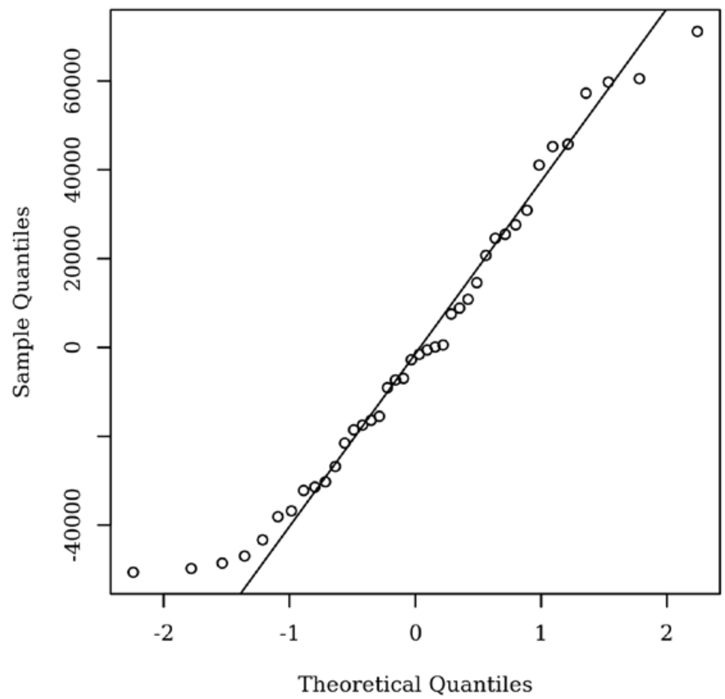

Figure 7. Q-Q scatterplot for normality of the residuals for the regression model.

Homoscedasticity. Homoscedasticity was evaluated by plotting the residuals against the predicted values (Bates et al., 2014; Field, 2013; Osborne & Walters, 2002). The assumption of homoscedasticity is met if the points appear randomly distributed with a mean of zero and no apparent curvature. Figure 8 presents a scatterplot of predicted values and model residuals.

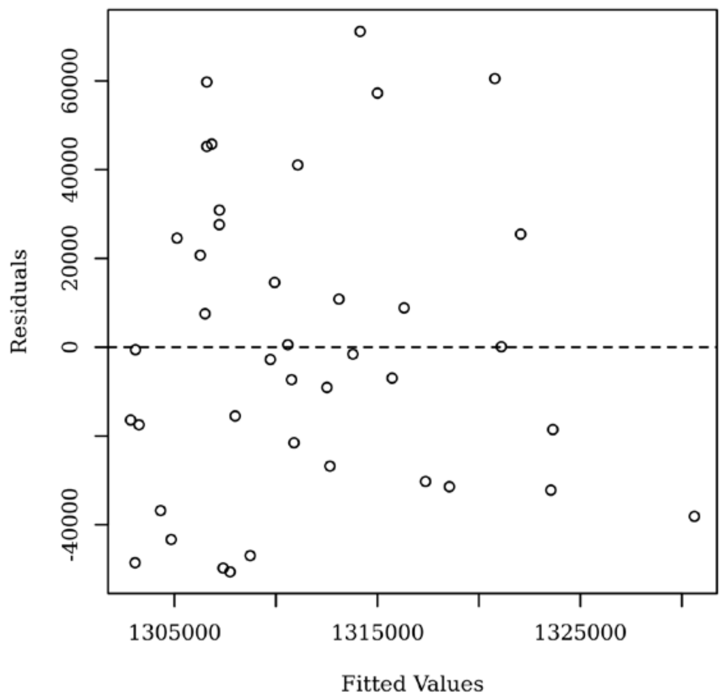

Figure 8. Residuals scatterplot testing homoscedasticity.

Outliers. To identify influential points, Studentized residuals were calculated, and the absolute values were plotted against the observation numbers (Field, 2013; Stevens, 2009). Studentized residuals are calculated by dividing the model residuals by the estimated residual standard deviation. An observation with a Studentized residual greater than 3.31 in absolute value, the 0.999 quartile of a *t* distribution with 39 degrees of freedom, was considered to have significant influence on the results of the model. Figure 9 presents the Studentized residuals plot of the observations. Observation numbers are specified next to each point with a Studentized residual greater than 3.31.

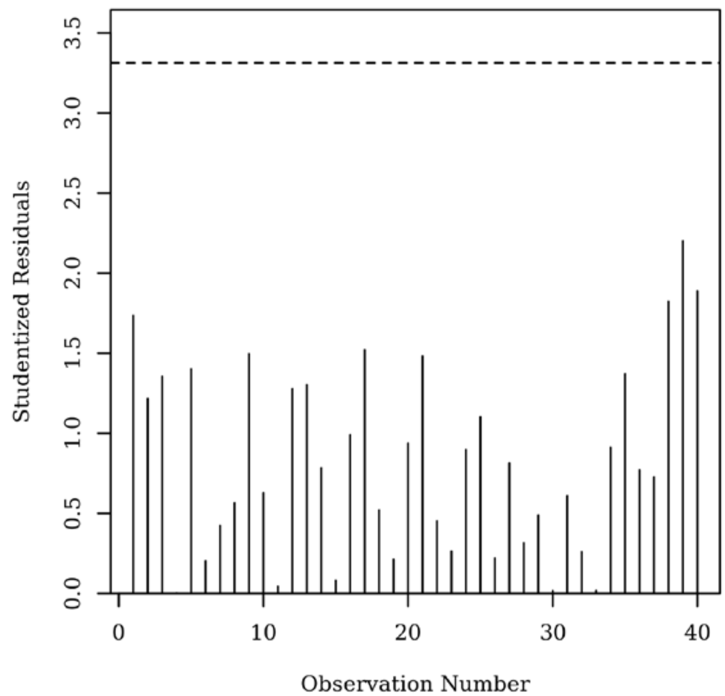

Figure 9. Studentized residuals plot for outlier detection.

Results. The results of the linear regression model were not significant, $F(1,38) = 1.47$, $p = .233$, $R^2 = 0.04$, indicating defense spending did not explain a significant proportion of variation in blue-collar job opportunities. Table 5 summarizes the results of the regression model.

Table 5

Results for Linear Regression with DODS predicting BC_EM

Variable	*B*	*SE*	CI	β	*t*	*p*
(Intercept)	1290120.36	18443.92	$[1 \times 10^6, 1 \times 10^6]$	0.00	69.95	< .001
DODS	0.00	0.00	[-0.00, 0.00]	0.19	1.21	.233

Note. CI is at the 95% confidence level. Results: $F(1,38) = 1.47$, $p = .233$, $R^2 = 0.04$
Unstandardized Regression Equation: BC_EM = 1×10^6 + 0.00*DODS

Research Question 3

RQ3: Does defense spending predict white-collar job opportunities in the Commonwealth of Virginia?

Introduction. A linear regression analysis was conducted to assess whether defense spending significantly predicted white-collar job opportunities.

Assumptions.

Normality. The assumption of normality was assessed by plotting the quantiles of the model residuals against the quantiles of a Chi-square distribution, also called a Q-Q scatterplot (DeCarlo, 1997). For the assumption of normality to be met, the quantiles of the residuals must not strongly deviate from the theoretical quantiles. Strong deviations could indicate that the parameter estimates are unreliable. Figure 10 presents a Q-Q scatterplot of the model residuals, which indicates the residuals do not strongly deviate from the line and hence normality of residuals.

.

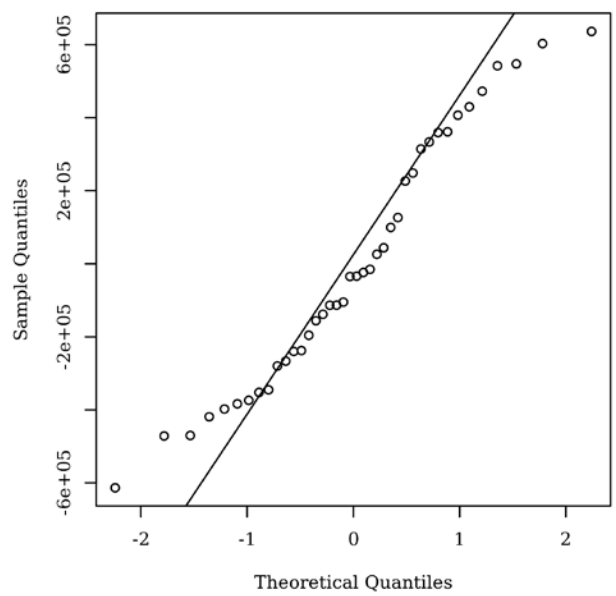

Figure 10. Q-Q scatterplot for normality of the residuals for the regression model.

Homoscedasticity. Homoscedasticity was evaluated by plotting the residuals against the predicted values (Bates et al., 2014; Field, 2013; Osborne & Walters, 2002). The assumption of homoscedasticity is met if the points appear randomly distributed with a mean of zero and no apparent curvature. Figure 11 presents a scatterplot of predicted values and model residuals.

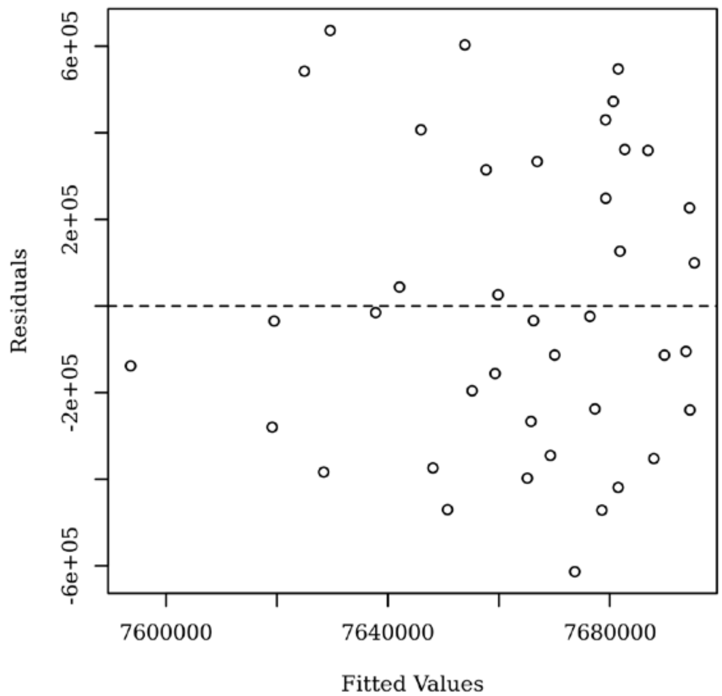

Figure 11. Residuals scatterplot testing homoscedasticity.

Outliers. To identify influential points, Studentized residuals were calculated, and the absolute values were plotted against the observation numbers (Field, 2013; Stevens, 2009). Studentized residuals are calculated by dividing the model residuals by the estimated residual standard deviation. An observation with a Studentized residual greater than 3.31 in absolute value, the 0.999 quartile of a *t* distribution with 39 degrees of freedom, was considered to have significant influence on the results of the model. Figure 12 presents the Studentized residuals plot of the observations. Observation numbers are specified next to each point with a Studentized residual greater than 3.31.

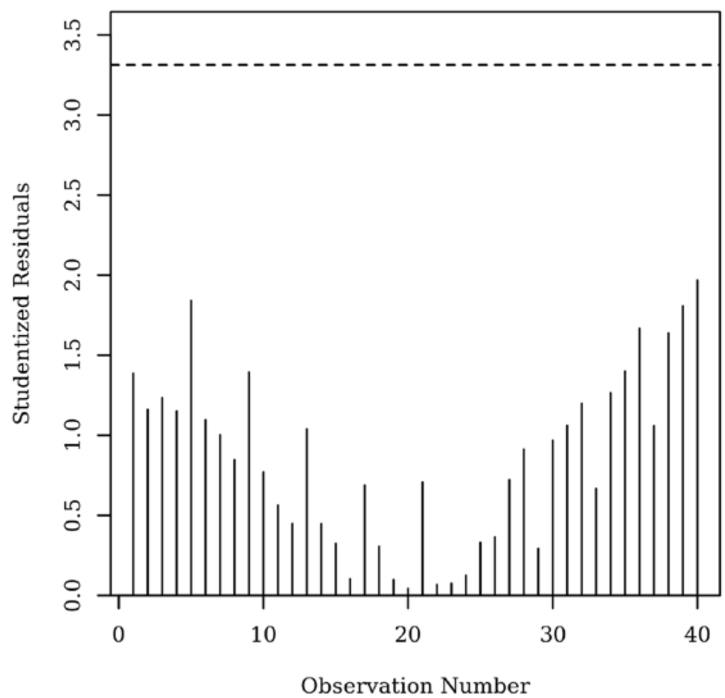

Figure 12. Studentized residuals plot for outlier detection.

Results. The results of the linear regression model were not significant, $F(1,38) = 0.19$, $p = .664$, $R^2 = 0.01$, indicating defense spending did not explain a significant proportion of variation in white-collar job opportunities. Table 6 summarizes the results of the regression model.

Table 6

Results for Linear Regression with DODS predicting WC_EM

Variable	*B*	*SE*	CI	β	*t*	*p*
(Intercept)	7741798.69	186754.33	[7 × 10^6, 8 × 10^6]	0.00	41.45	< .001
DODS	-0.00	0.00	[-0.00, 0.00]	-0.07	-0.44	.664

Note. CI is at the 95% confidence level. Results: $F(1,38) = 0.19$, $p = .664$, $R^2 = 0.01$
Unstandardized Regression Equation: WC_EM = 8 × 10^6 - 0.00*DODS

CHAPTER V

DISCUSSION

Introduction

The chapter reports on all the findings from the data analysis section. It provides an overview of the aims of the study. It provides a recap of the previous research and compares it with the findings of the current research. It then offers the recommendations and implications for the theory and for research. Furthermore, it provides additional areas of research which serve to further the literature base on the effects of defense spending.

Applicability to Research Questions

Research Question 1

To recall, the research question and corresponding null and alternative hypothesis were:

RQ_1: Does spending predict overall economic growth in the Commonwealth of Virginia?

$H1_0$: Defense spending does not predict overall economic growth in the Commonwealth of Virginia.

$H1_A$: Defense spending predicts overall economic growth in the Commonwealth of Virginia.

A linear regression analysis was conducted to assess whether defense spending significantly predicted Virginia's GDP. The results of the linear regression model were not significant, indicating that defense spending did not explain a significant proportion of variation in Virginia's GDP. Thus, the null hypothesis failed to be rejected.

Research Question 2

To recall, the research question and corresponding null and alternative hypothesis were:

RQ_2: Does defense spending predict blue-collar job opportunities in the Commonwealth of Virginia?

$H2_0$: Defense spending does not predict blue-collar job opportunities in the Commonwealth of Virginia.

$H2_A$: Defense spending predicts blue-collar job opportunities in the Commonwealth of Virginia.

A linear regression analysis was conducted to assess whether defense spending significantly predicted blue-collar job opportunities. The results of the linear regression model were not significant. Indicating that defense spending did not explain a significant proportion of variation in blue-collar job opportunities. Thus, the null hypothesis failed to be rejected.

Research Question 3

To recall, the research question and corresponding null and alternative hypothesis were:

RQ_3: Does defense spending predict white-collar job opportunities in the Commonwealth of Virginia?

$H3_0$: Defense spending does not predict white-collar job opportunities in the Commonwealth of Virginia.

$H3_A$: Defense spending predicts white-collar job opportunities in the Commonwealth of Virginia.

A linear regression analysis was conducted to assess whether defense spending significantly predicted white-collar job opportunities. The results of the linear regression model were not significant. Indicating that defense spending did not explain a significant proportion of variation in white-collar job opportunities. Thus, the null hypothesis failed to be rejected.

Limitations of the Study

The main limitation of the study was determining the data, which would be most appropriate for analyses.

NAICS Categories

For the purposes of this study, the following good-producing sectors were considered blue-collar: “Agriculture, Forestry, Fishing and Hunting (NAICS 11), Mining, Quarrying, and Oil and Gas Extraction (NAICS 21), Construction (NAICS 23), and Manufacturing (NAICS 31-33)” (Bureau of Labor Statistics, 2019). While the following service-providing sectors were considered white-collar: “Wholesale Trade (NAICS 42), Retail Trade (NAICS 44-45), Transportation and Warehousing (NAICS 48-49), Utilities (NAICS 22), Information (NAICS 51), Finance and Insurance (NAICS 52), Real Estate and Rental and Leasing (NAICS 53), Professional, Scientific, and Technical Services (NAICS 54), Management of Companies and Enterprises (NAICS 55), Administrative and Support and Waste Management and Remediation Services (NAICS 56), Educational Services (NAICS 61), Health Care and Social Assistance (NAICS 62), Arts, Entertainment, and Recreation (NAICS 71), Accommodation and Food Services (NAICS 72), Other Services (except Public Administration) (NAICS 81)" (Bureau of Labor Statistics, 2019).

Further, the data excluded public sector reporting of data for job opportunities, which directly supported the federal government as federal government employees. This presents an opportunity to redefine white-collar and blue-collar job opportunities, with the inclusion of the public-sector data, and examine the correlation of the job opportunities within the subsectors of these main NAICS sectors. This could produce different results since certain opportunities across sectors may be closely correlated.

Geographic Location

Historically, Virginia was the US state with the highest defense spending (NSCL, 2018). However, over time this has shifted and as of 2017, it ranked second behind California, which saw a defense spending budget of $49 billion to Virginia's $46.2 billion. Despite Virginia falling behind California in total defense spending, it remains the state to which defense dollars contribute the highest GDP percentage (Vergun, 2019), which was the basis for Virginia being selected as the sample state. However, since Virginia is not currently the highest recipient of defense spending, a study of California could produce different results. There is also an opportunity to apply the study to expanded geography, through conducting analyses at the regional or global levels. Further, there is an opportunity to conduct an analysis at the micro-level of county defense spending receipts to examine the effect of defense spending on blue-collar and white-collar job opportunities in those areas.

Defense Spending Definition

Defense spending was established by researching “the dollar amount obligated from contract awards, by the Department of Defense, with a place of performance in Virginia”. Defense spending was measured as the amount of money obligated quarterly into defense during a fiscal quarter. The limitation of this is that defense spending could be expanded to include all spending by the federal government. This would expand data to include all government entities versus a focal entity of the Department of Defense. Further, there is a notable difference between monies obligated, spent, reported, and taxed; these categories create several lenses through which “spending” can be defined and analyzed.

Sample Size

Lastly, based upon the date range, 2009 through 2018, a sample size of 40 was produced, exceeding the desired sample size of 25 obtained from using the large effect in the G*power analysis. A power analysis for linear regression was conducted in G*power to determine a sufficient sample size using an alpha of 0.05, a power of 0.80, and a *medium effect size* (f2= 0.15) (Faul et al., 2008). A medium effect size produces a desired sample size of 55. This creates the opportunity to further expand the sample size through changing the power analysis to a medium effect size and expanding the period of the study or conducting a monthly analysis versus quarterly.

Recommendations and Implications

Recommendations and Implications for Theory

To recall, the theoretical framework underpinning this study is Faggio and Overman's (2014) theory of public sector employment's effects on the distribution of private-sector jobs. In their original study, Faggio and Overman (2014) examined the case of England, where they found that government spending, in the form of public sector job creation, fueled the creation of some private-sector jobs in construction and services (the so-called non-tradable sector) while causing a roughly equal crowding out of jobs in the tradable sector (i.e., manufacturing). The type of crowding suggested by Faggio and Overman (2014), termed "squeezing out", referred to a situation in which government investment in an area caused a shift in the composition of the private sector. To further the body of knowledge pertaining to this theory of squeezing out, this study sought to analyze the effects of government spending, in the form of defense spending, within the private sector.

As shown within the review of literature, the theory and existing literature offer conflicting views on whether a positive relationship exists between economic output and government spending. Prior studies theorized that the economic measure of a country is influenced by government expenditure and that economies that adhere to moderated expenditure experience fewer economic losses and increased economic growth (Mitchell, 2017). Further theorizing that when financial resources are reallocated for increased spending, the financial output of an industry may increase, which stimulates the respective economy (Stiglitz, 2016). While in contrast, other theorist posited that as expenditure allocation increased, the economic performance dropped in response to the increase (Wu et. al, 2010). In further contrast, theorist have also suggested that negative economic growth occurred when; (i) Government size increased (ii) Government expenditure increased and (iii) The number of projects and development programs decreased (Liebman et al, 2017).

This study found that while government expenditure may lead to crowding out, as discussed within the literature review and as found in prior studies, defense spending alone was not a significant predictor of Virginia's GDP, white-collar job opportunities, or blue-collar opportunities. Since the theory and literature offer conflicting views on whether a positive relationship exists between economic output and government spending, it is recommended that further research be carried out to include the public-sector jobs, an expanded time range, or a different geographic region. This will establish repeatability in testing and confirm or refute the study's findings.

Recommendations for Future Research

Furthermore, since defense spending did not explain a significant proportion of variation in white-collar job opportunities, blue-collar job opportunities, or Virginia's GDP, there is an opportunity for the inclusion of a different independent variable in future research. Government expenditure is a widely defined area of the federal government's spending. Faggio and Overman (2014) researched government spending, in the form of public sector job creation; while this study researched government spending, in the form of defense spending. Identifying separate areas of government expenditure as an independent variable that could possibly provide categoric results and be operationalized to broaden the existing literature on this subject. Further, establishing repeatability and presenting an opportunity to confirm or refute the study's findings.

Additionally, during Q4 of 2011, defense spending within Virginia reached its peak. While, during the same observation period, white-collar job opportunities maintained an average of 86% of total employment opportunities, with blue-collar job opportunities maintaining an average of 14% of total employment opportunities. The absence of a resultant effect from increased defense spending on the job opportunities within Virginia presents an opportunity for the identification of separate categories of economic measures as dependent variables. Analyzing additional dependent variables could broaden the existing literature on this subject and establish repeatability in testing. Therefore, further investigation is recommended to assess how other economic activities within Virginia were affected during the evaluation period of 2009-2018.

Lastly, a mediation analysis could be conducted to assess whether there is a mediator which mediates the relationship between government expenditure and the dependent variables. For mediation to be supported, four items must be met: 1) the independent variable must be related to the dependent variable, 2) the independent variable must be related to the mediator variable, 3) the mediator must be related to the dependent variable while in the presence of the independent variable, and 4) the independent variable should no longer be a significant predictor of the dependent variable in the presence of the mediator variable (Baron & Kenny, 1986).

Summary

The purpose of the study was to examine the effects of defense spending on blue-collar and white-collar job opportunities in the Commonwealth of Virginia. The study was supported by the theory of squeezing out, which hypothesizes that significant government spending, such as defense spending, may serve to squeeze out some parts of the private sector even as it boosts others, effectively redistributing jobs. The review of the literature included the themes of the Commonwealth of Virginia, government spending and the economy, the role of defense spending, technology's effects on other sectors and employment, and the factors affecting American manufacturing.

The study was guided by three research questions: (RQ_1) Does defense spending predict overall economic growth in the Commonwealth of Virginia? (RQ_2) Does defense spending predict blue-collar job opportunities in the Commonwealth of Virginia? (RQ_3) Does defense spending predict white-collar job opportunities in the Commonwealth of Virginia? To answer these research questions, a longitudinal correlational design was carried out. The study drew quantitative data from publicly available open-access databases provided by government agencies. The variables of interest were overall economic output (Virginia's GDP), defense spending, blue-collar jobs, and white-collar jobs. The relationships amongst these variables were measured using descriptive statistics and multiple linear regression.

The study had key academic significance, which was aimed at testing and expanding Faggio & Overman's 2014 theory of public sector employment's effects on the distribution of private-sector jobs. The study was important because defense spending makes up such a large part of US government spending and in particular, is a significant portion of Virginia's GDP. The study ultimately found that while government expenditure may lead to crowding out, as found in prior studies, expenditure on defense spending alone was not a significant predictor of Virginia's GDP, white-collar job opportunities, or blue-collar opportunities. This chapter concludes the study with discussion, implications, and limitations.

REFERENCES

Acosta, M., Coronado, D., Ferrándiz, E., Marín, M. R., & Moreno, P. J. (2019). Civil–Military Patents and Technological Knowledge Flows into the Leading Defense Firms. *Armed Forces & Society*, 0095327X18823823.

Alesina, A., & Passalacqua, A. (2016). The political economy of government debt. In *Handbook of macroeconomics* (Vol. 2, pp. 2599-2651). Elsevier.

Allen, P., Bennett, K., & Heritage, B. (2018). *SPSS Statistics: A Practical Guide with Student Resource Access 12 Months*. Cengage AU.

Archuleta, B. J. (2016). Rediscovering defense policy: A public policy call to arms. *Policy Studies Journal*, *44*(S1), S50-S69.

Auerbach, A. J., Gale, W. G., & Krupkin, A. (2018). The federal budget outlook: even crazier after all these years. *Washington, DC: Urban-Brookings Tax Policy Center*

Bivens, J. (2019). Updated employment multipliers for the U.S. economy. Retrieved 23 January 2020, from https://www.epi.org/publication/updated-employment-multipliers-for-the-u-s-economy/

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173-1182.

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2014). Fitting linear mixed-effects models using lme4: arXiv preprint arXiv, *Journal of Statistical Software*.

Bellais, R., & Fiott, D. (2017). The European defense market: Disruptive innovation and market destabilization. *The Economics of Peace and Security Journal*, *12*(1).

Bernard, H. R. (2017). *Research methods in anthropology: Qualitative and quantitative approaches*. Rowman & Littlefield.

Bernardino, A. (2017). *Telecommuting: Modelling the Employer's and the Employee's Decision-Making Process*. Routledge.

Bessen, J. E. (2016). How computer automation affects occupations: Technology, jobs, and skills. *Boston Univ. school of law, law and economics research paper,* (15-49).

Best, J. (2018). Questioning Quintiles: Implications of Choices of Measures for Income Inequality and Social Mobility. *Numeracy*, *11*(2), 6.

Bicer, N., Young, J., & Meyer, L. B. L. (2015). *Defense Industry participation in economic growth* (Doctoral dissertation, Army General Staff College).

Blecker, R. A. (2016). The US economy since the crisis: slow recovery and secular stagnation. *European Journal of Economics and Economic Policies: Intervention, 13*(2), 203-214.

Blount, Y., & Gloet, M. (Eds.). (2017). *Anywhere working and the new era of telecommuting*. IGI Global.

Bureau of Labor Statistics (2019). May 2018 State Occupational Employment and Wage Estimates: Virginia. *BLS.gov.* Retrieved 3 September 2019, from https://www.bls.gov/oes/current/oes_va.htm#51-0000

Cohee, G. L., Barrows, J., & Handfield, R. (2019). Early supplier integration in the US defense industry. *Journal of Defense Analytics and Logistics*.

Cramer, J., & Krueger, A. B. (2016). Disruptive change in the taxi business: The case of Uber. *American Economic Review*, *106*(5), 177-82.

Crowther, G. A. (2017). The Cyber Domain. *The Cyber Defense Review*, *2*(3), 63-78.

d'Agostino, G., Dunne, J. P., & Pieroni, L. (2016). Government spending, corruption and economic growth. *World Development*, *84*, 190-205.

David, H. J. J. O. E. P. (2015). Why are there still so many jobs? The history and future of workplace automation. *Journal of economic perspectives*, *29*(3), 3-30.

DeCarlo, L. T. (1997). On the meaning and use of kurtosis. *Psychological Methods*, 2(3), 292-307

Faggio, G., & Overman, H. (2014). The effect of public sector employment on local labour markets. *Journal of Urban Economics*, *79*, 91-107.

Field, A. (2013). *Discovering statistics using SPSS* (4th ed.). Washington, DC: Sage.

Fitzgerald, B., & Stol, K. J. (2017). Continuous software engineering: A roadmap and agenda. *Journal of Systems and Software*, *123*, 176-189.

Frost, J. (2019). *Regression Analysis: An Intuitive Guide for Using and Interpreting Linear Models* (1st ed.).

Hankins, W. B. (2015). Government spending, shocks, and the role of legislature size: Evidence from the American states. *Social Science Quarterly*, *96*(4), 1059-1070.

Hansen, A. H. (2018). *Monetary theory and fiscal policy*. Pickle Partners Publishing.

Hensel, N. (2016). The defense industry: Tradeoffs between fiscal constraints and national security challenges. *Business Economics*, *51*(2), 111-122.

Intellectus Statistics [Online computer software]. (2019). Retrieved 11 November 2019, from https://analyze.intellectusstatistics.com/

Johnson, B. (2001). Toward a new classification of nonexperimental quantitative research. *Educational Researcher*, *30*(2), 3-13.

Jorge, M. P. (2014). Is there a direct relationship between government expenditures and economic growth? Retrieved 30 August 2017, from https://www.researchgate.net/post/Is_there_a_direct_relationship_between_government_expenditures_and_economic_growth

Jorgenson, D., Gollop, F. M., & Fraumeni, B. (2016). *Productivity and US economic growth* (Vol. 169). Elsevier.

Khine, K. (2019). Manufacturing employment in Virginia. *University of Virginia Stat Chat.* 23 December 2019, from http://statchatva.org/2019/03/19/manufacturing-employment-in-virginia/

Kim, J. H. (2018). Heterogeneity in Political Capital: US Defense Contracts and Lobbying Strategies. *Available at SSRN 3153974.*

Kim, K. T., & Shim, S. R. (2016). Identification on Risk Factors of Outsourcing for Calculating Costs in Defense Industry Using AHP Technique. *Journal of the Korea Institute of Information and Communication Engineering*, *20*(4), 857-865.

Klare, M. T. (2019). Beyond Harvey and Irma Militarizing Homeland Security in the Climate-Change Era. *Revista de Estudos e Pesquisas Avançadas do Terceiro Setor*, *2*(2), 232-237.

Korkmaz, S. (2015). The effect of military spending on economic growth and unemployment in Mediterranean countries. *International Journal of Economics and Financial Issues*, *5*(1), 273 - 280. Retrieved 30 August 2017, from https://dergipark.org.tr/en/pub/ijefi/issue/31967/352125

Kuroki, M. (2016). An Analysis of Perceptions of Job Insecurity among White and Black Workers in the United States: 1977–2012. *The Review of Black Political Economy*, *43*(3-4), 289-300. doi: 10.1007/s12114-016-9237-6

Kutner, M. H., Nachtsheim, C. J., Neter, J., & Li, W. (2005). *Applied linear statistical models* (Vol. 5). Boston: McGraw-Hill Irwin.

Lawrence, R. Z. (2017). *Recent Manufacturing Employment Growth: The Exception That Proves the Rule* (No. w24151). National Bureau of Economic Research.

Lederman, D., & Lesniak, J. T. (2017). In Search of Scale Economies with International Data.

Lee, J. G., & Park, M. J. (2019). Rethinking the national defense R&D innovation system for latecomer: Defense R&D governance matrix. *Technological Forecasting and Social Change*, *146*, 1-11.

Leimbach, M., Kriegler, E., Roming, N., & Schwanitz, J. (2017). Future growth patterns of world regions–A GDP scenario approach. *Global Environmental Change*, *42*, 215-225.

Liebman, J. B., & Mahoney, N. (2017). Do expiring budgets lead to wasteful year-end spending? Evidence from federal procurement. *American Economic Review*, *107*(11), 3510-49.

Lin, K. Y. (2016). *Analysis of pricing models in the defense industry to support cost projections* (No. NPS-OR-16-002). Naval Postgraduate School Monterey United States.

McPherson, M. S., & Bacow, L. S. (2015). Online higher education: Beyond the hype cycle. *Journal of Economic Perspectives*, *29*(4), 135-54.

Menard, S. (2009). *Logistic regression: From introductory to advanced concepts and applications.* Thousand Oaks, CA: Sage Publications.

Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation*. John Wiley & Sons.

Meschi, E., Taymaz, E., & Vivarelli, M. (2016). *Globalisation, technology and the labour market: A microeconometric analysis for Turkey* (No. 026). United Nations University-Maastricht Economic and Social Research Institute on Innovation and Technology (MERIT).

Mitchell, D. (2017). *The Impact of Government Spending on Economic Growth*. *The Heritage Foundation*. Retrieved 30 August 2017, from http://www.heritage.org/budget-and-spending/report/the-impact-government-spending-economic-growth

Nikolova, M. (2015). Government funding of private voluntary organizations: is there a crowding-out effect?. *Nonprofit and Voluntary Sector Quarterly*, *44*(3), 487-509.

Noble, D. (2017). *Forces of production: A social history of industrial automation*. Routledge.

NSCL (2018). Military's impact on state economies. *National Conference of State Legislatures*. Retrieved 30 November 2019, from http://www.ncsl.org/research/military-and-veterans-affairs/military-s-impact-on-state-economies.aspx

Oskam, J., & Boswijk, A. (2016). Airbnb: the future of networked hospitality businesses. *Journal of Tourism Futures*, *2*(1), 22-42.

Pierce, J. R., & Schott, P. K. (2016). The surprisingly swift decline of US manufacturing employment. *American Economic Review*, *106*(7), 1632-62.

Rahi, S. (2017). Research design and methods: A systematic review of research paradigms, sampling issues and instruments development. *International Journal of Economics & Management Sciences*, *6*(2), 1-5.

Rogers, C. (2015). The Forever War, in the Hands of Others: Tracing the Real Power of US Law and Policy in the War on Terror. *Colum. Hum. Rts. L. Rev.*, *47*, 78.

Rucker, D. D., McShane, B. B., & Preacher, K. J. (2015). A researcher's guide to regression, discretization, and median splits of continuous variables. *Journal of Consumer Psychology, 25*(4), 666-678. Retrieved 30 August 2017, from https://doi.org/10.1016/j.jcps.2015.04.004

Steel, R. & Torrie, J.H. (1980); Principles and Procedures of Statistics, A Biometric Approach. McGraw Hill Book Company, New York.

Stevens, J. P. (2009). *Applied multivariate statistics for the social sciences* (5th ed.). Mahwah, NJ: Routledge Academic.

Stiglitz, J. E. (2016). How to restore equitable and sustainable economic growth in the United States. *American Economic Review*, *106*(5), 43-47.

Stohl, R. (2015). Exercising Restraint? The New US Rules for Drone Transfers. *Arms Control Today*, *45*(4), 20.

Templeton, G. F., Petter, S., French, A. M., Larsen, K. R., & Pace, B. (2019). Information Technology Firms: Creating Value through Digital Disruption. *Communications of the Association for Information Systems*, *44*(1), 35.

Tobin, J. (2017). Keynes's Policies in Theory and Practice. In *the Policy Consequences of John Maynard Keynes* (pp. 13-21). Routledge.

US Census Bureau (2019). QuickFacts: Virginia; United States*Census.gov*. Retrieved 30 November 2019, from https://www.census.gov/quickfacts/fact/table/VA,US/PST045218

Vergun, D. (2019). Which state ranks highest in military spending? *Defense.gov*. Retrieved 30 November 2019, from https://www.defense.gov/explore/story/Article/1789129/which-state-ranks-highest-in-military-spending/

Walker, D. (2012). *Trends in US military spending*. Council on Foreign Relations.

Walter, H. (2019). The Defense Industrial Base: How Idiosyncratic and Historical Influences Dictate Its Future. *International Social Science Review*, *95*(1), 4.

Westfall, P. H., & Henning, K. S. S. (2013). *Texts in statistical science: Understanding advanced statistical methods.* Boca Raton, FL: Taylor & Francis.

Works, R. (2017). The impact of technology on labor markets. *Monthly Lab. Rev.*, *140*, 1.

Wu, S. Y., Tang, J. H., & Lin, E. S. (2010). The impact of government expenditure on economic growth: How sensitive to the level of development?. *Journal of Policy Modeling*, *32*(6), 804-817.

Yildirim, J., & Öcal, N. (2016). Military expenditures, economic growth and spatial spillovers. *Defense and Peace Economics*, *27*(1), 87-104. Retrieved from https://doi.org/10.1080/10242694.2014.960246

Zervas, G., Proserpio, D., & Byers, J. W. (2017). The rise of the sharing economy: Estimating the impact of Airbnb on the hotel industry. *Journal of marketing research*, *54*(5), 687-705.

Zullo, R., & Liu, Y. (2017). Contending with Defense Industry Reallocations: A Literature Review of Relevant Factors. *Economic Development Quarterly*, *31*(4), 360-372.

APPENDICES

APPENDIX A

PREPARED DATA FOR ANALYSIS

Introduction. Given that there were no outliers found, the data used to perform further analysis is given below.

Period	VA GDP	DODS	WC_EM	BC_EM
2009:Q1	$402,871,400,000.00	$ 10,498,370,123.00	7,180,584.00	1,372,249.00
2009:Q2	$407,420,100,000.00	$ 8,840,828,543.00	7,267,625.00	1,352,128.00
2009:Q3	$410,035,000,000.00	$ 6,951,658,474.00	7,262,714.00	1,351,824.00
2009:Q4	$415,348,400,000.00	$ 13,072,986,663.00	7,244,999.00	1,321,209.00
2010:Q1	$415,585,400,000.00	$ 7,853,052,920.00	7,060,404.00	1,261,784.00
2010:Q2	$422,473,500,000.00	$ 10,802,434,803.00	7,274,247.00	1,308,762.00
2010:Q3	$425,500,800,000.00	$ 8,360,522,213.00	7,324,227.00	1,324,520.00
2010:Q4	$426,074,000,000.00	$ 7,290,450,504.00	7,207,173.00	1,257,640.00
2011:Q1	$428,048,300,000.00	$ 14,143,971,870.00	7,339,454.00	1,305,093.00
2011:Q2	$430,262,100,000.00	$ 8,763,578,469.00	7,399,365.00	1,289,360.00
2011:Q3	$434,107,200,000.00	$ 9,987,642,080.00	7,459,553.00	1,312,237.00
2011:Q4	$439,127,500,000.00	$ 17,086,036,726.00	7,455,380.00	1,292,511.00
2012:Q1	$440,440,200,000.00	$ 6,210,636,174.00	7,335,785.00	1,261,527.00
2012:Q2	$443,978,100,000.00	$ 9,510,404,404.00	7,503,433.00	1,285,872.00
2012:Q3	$447,634,000,000.00	$ 8,271,551,889.00	7,556,903.00	1,306,966.00
2012:Q4	$447,747,900,000.00	$ 14,102,470,851.00	7,584,773.00	1,291,352.00
2013:Q1	$452,840,400,000.00	$ 5,542,521,063.00	7,588,875.00	1,285,784.00
2013:Q2	$454,448,700,000.00	$ 7,434,424,352.00	7,439,730.00	1,257,141.00
2013:Q3	$454,657,400,000.00	$ 8,711,524,005.00	7,632,434.00	1,303,453.00

2013:Q4	$456,083,500,000.00	$ 5,459,693,365.00	7,454,416.00	1,254,508.00
2014:Q1	$458,333,600,000.00	$ 11,993,232,788.00	7,622,598.00	1,287,124.00
2014:Q2	$461,736,900,000.00	$ 7,539,917,146.00	7,652,499.00	1,292,495.00
2014:Q3	$466,509,100,000.00	$ 9,448,149,594.00	7,685,860.00	1,303,453.00
2014:Q4	$470,797,500,000.00	$ 11,497,239,347.00	7,685,933.00	1,287,124.00
2015:Q1	$475,358,700,000.00	$ 5,989,599,607.00	7,576,484.00	1,267,519.00
2015:Q2	$484,437,200,000.00	$ 6,913,807,510.00	7,808,412.00	1,314,040.00
2015:Q3	$485,423,600,000.00	$ 5,367,463,528.00	7,794,841.00	1,286,441.00
2015:Q4	$489,266,000,000.00	$ 7,210,156,800.00	7,927,987.00	1,334,825.00
2016:Q1	$489,450,700,000.00	$ 9,697,342,215.00	7,972,175.00	1,323,938.00
2016:Q2	$491,723,600,000.00	$ 8,635,018,165.00	8,000,569.00	1,311,152.00
2016:Q3	$495,723,000,000.00	$ 6,815,106,178.00	8,044,131.00	1,326,998.00
2016:Q4	$502,591,900,000.00	$ 11,051,627,765.00	8,052,916.00	1,325,173.00
2017:Q1	$503,144,000,000.00	$ 5,467,968,876.00	7,920,987.00	1,302,513.00
2017:Q2	$507,407,500,000.00	$ 7,213,788,821.00	8,109,090.00	1,338,101.00
2017:Q3	$513,368,500,000.00	$ 7,053,167,092.00	8,153,037.00	1,352,599.00
2017:Q4	$517,779,600,000.00	$ 13,474,736,786.00	8,167,149.00	1,347,526.00
2018:Q1	$523,383,800,000.00	$ 6,331,665,614.00	8,046,126.00	1,329,697.00
2018:Q2	$530,922,200,000.00	$ 6,950,788,143.00	8,228,857.00	1,366,333.00
2018:Q3	$539,141,300,000.00	$ 10,137,995,501.00	8,256,899.00	1,385,286.00
2018:Q4	$544,348,000,000.00	$ 12,938,089,840.00	8,265,846.00	1,381,297.00

APPENDIX B

RAW OUTPUTS

DESCRIPTIVES

Included Variables:
VA_GDP, DODS, WC_EM, and BC_EM

Sample Size (Complete Cases):
N = 40

Summary Statistics: Scale

Variable	M	SD	n	SE_M	Min	Max	Skewness	Kurtosis
BC_EM	1.311×10^6	34622.951	40	5474.369	1.255×10^6	1.385×10^6	0.301	-0.558
DODS	9.016×10^9	2.819×10^9	40	4.458×10^8	5.367×10^9	1.709×10^{10}	0.868	0.178
VA_GDP	4.651×10^{11}	3.904×10^{10}	40	6.173×10^9	4.029×10^{11}	5.443×10^{11}	0.302	-0.923
WC_EM	7.664×10^6	344851.880	40	54525.870	7.060×10^6	8.266×10^6	0.229	-1.141

Quantiles:

	VA_GDP	DODS	WC_EM	BC_EM
10%	415561700000.000	5944891752.600	7260942.500	1261758.300
20%	427653440000.000	6894067243.600	7333473.400	1286327.200
25%	433145925000.000	6951440891.250	7384387.250	1287124.000
30%	440046390000.000	7163059887.600	7450010.200	1290754.400
40%	450803400000.000	7497720028.400	7535515.000	1303077.000
50%	457208550000.000	8497770189.000	7605736.500	1307864.000
60%	472621980000.000	9083756963.400	7685889.200	1316907.600
70%	489321410000.000	10032748106.300	7923087.000	1325720.500

75%	492723450000.000	10574386293.000	7979273.500	1330979.000
80%	502702320000.000	11140750081.400	8044530.000	1339986.000
90%	518340020000.000	13113161675.300	8154448.200	1353972.400

LINEAR REGRESSION WITH VA_GDP PREDICTED BY DODS

Included Variables:
VA_GDP and DODS

Sample Size (Complete Cases):
N = 40

Linear Regression Coefficients:

Variable	B	SE	CI	β	t	p
(Intercept)	482078705579.485	21001007802.734	[4.396 × 10^{11}, 5.246 × 10^{11}]	0.000	22.955	7.104e-24
DODS	-1.879	2.226	[-6.385, 2.627]	-0.136	-0.844	4.038e-01

Note: Confidence interval (CI) is at the 95% confidence level.

Model Fit Statistics:
F(1,38) = 0.713, p = 0.40, R^2 = 0.018, adj. R^2 = -0.007

LINEAR REGRESSION WITH BC_EM PREDICTED BY DODS

Included Variables:
BC_EM and DODS

Sample Size (Complete Cases):
N = 40

Linear Regression Coefficients:

Variable	B	SE	CI	β	t	p
(Intercept)	1290120.364	18443.925	[1.253 × 10^6, 1.327 × 10^6]	0.000	69.948	9.148e-42
DODS	0.000	0.000	[-0.000, 0.000]	0.193	1.213	2.328e-01

Note: Confidence interval (CI) is at the 95% confidence level.

Model Fit Statistics:
$F(1,38) = 1.470$, $p = 0.23$, $R^2 = 0.037$, adj. $R^2 = 0.012$

LINEAR REGRESSION WITH WC_EM PREDICTED BY DODS

Included Variables:
WC_EM and DODS

Sample Size (Complete Cases):
N = 40

Linear Regression Coefficients:

Variable	B	SE	CI	β	t	p
(Intercept)	7741798.690	186754.327	[7.364×10^6, 8.120×10^6]	0.000	41.454	3.030e-33
DODS	-0.000	0.000	[-0.000, 0.000]	-0.071	-0.438	6.637e-01

Note: Confidence interval (CI) is at the 95% confidence level.

Model Fit Statistics:
$F(1,38) = 0.192$, $p = 0.66$, $R^2 = 0.005$, adj. $R^2 = -0.021$

APPENDIX C

CONSENT: INSTITUTIONAL REVIEW BOARD EMAIL

From: IRB Chair
Subject: RE: IRB Application Attached
Date: Sep 11, 2019 at 7:23:50 AM
To: Artaisha Jenkins

You are not required to have IRB approval for your research if human subjects are not involved. See the following link for IRB overview: http://govrel.hamptonu.edu/gm/policies/review_board.cfm.

Good luck on your project.

S. Christopher Owens, PT, ScD
Associate Professor

From: Artaisha Jenkins
Sent: Wednesday, September 11, 2019 7:21 AM
To: IRBCHAIR

Subject: Re: IRB Application Attached

Good morning Dr. Owens,

No it does not involve any human subjects.

Please let me know if any further information is needed, thanks.

Regards,

Artaisha Jenkins

APPENDIX D

GLOSSARY

95% Confidence Interval (95% CI): An interval that estimates the range one would expect *B* to lie in 95% of the time given the samples tested comes from the same distribution.

Degrees of Freedom (*df*): Used with the *F* ratio to determine the *p*-value.

Descriptive Statistics: Descriptive statistics are typically used to describe or summarize the data. It is used as an exploratory method to examine the variables of interest, potentially before conducting inferential statistics on them. They provide summaries of the data and are used to answer descriptive research questions.

Dummy-Code: Performed in order to add a nominal or ordinal independent variable into the regression model; turns the one variable into a series of dichotomous "yes/no" variables, one for each category; one of the categories are left out of the regression as the reference group that all other categories are compared to.

***F* Ratio (*F*):** Used with the two *df* values to determine the *p*-value of the overall model.

Homoscedasticity: Refers to the relationship between the residuals and the fitted values; the assumption is met when the residuals plot has the points randomly distributed (with no pattern), and the distribution line is approximately straight.

Kurtosis: The measure of the tail behavior of a distribution. Positive kurtosis signifies a distribution is more prone to outliers, and negative kurtosis implies a distribution is less prone to outliers.

Mean (*M*): The average value of a scale variable.

Multicollinearity: A state of very high intercorrelations or inter-associations among a set of variables.

Normality: Refers to the distribution of the residuals; the assumption is that the residuals follow a bell-shaped curve; the assumption is met when the q-q plot has the points distributed approximately on the normality line.

Outlier: A data point that is abnormally distant from a set of observations.

Percentage (%): The percentage of the frequency or count of a nominal or ordinal category.

***p*-value:** The probability that the null hypothesis (no relationship in the dependent variable by the independent variable) is true.

Residuals: Refers to the difference between the predicted value for the dependent variable and the actual value of the dependent variable.

R-Squared Statistic (R^2): Tells how much variance in the dependent variable is explained by only the predictor variables.

Sample Minimum (Min): The smallest numeric value in a given sample.

Sample Maximum (Max): The largest numeric value in a given sample.

Sample Size (*n*): The frequency or count of a nominal or ordinal category.

Skewness: The measure of asymmetry in the distribution of a variable. Positive skewness indicates a long right tail, while negative skewness indicates a long left tail.

Standard Deviation (*SD*): The spread of the data around the mean of a scale variable.

Standard Error (*SE*): How much we expect *B* to vary.

Standard Error of the Mean (SE_M): The estimate of how far the sample mean is likely to differ from the actual population mean.

Standardized Beta (*β*): Ranges from -1 to 1; gives the strength of the relationship between the predictor and dependent variable.

Studentized Residuals: Residuals that are scaled by diving the each residual by the estimated standard deviation of the residuals.

***t*-Test Statistic (*t*):** Used with the *df* to determine the *p*-value; also can show the direction of the relationship between the predictor and dependent variable.

Unstandardized Beta (*B*): The slope of the predictor with the dependent variable.

Standard Error (*SE*): How much the *B* is expected to vary.

Variance Inflation Factors: A measurement to assess the amount of multicollinearity present in regression analysis.

APPENDIX E

EMPLOYMENT OPPORTUNITIES BY QUARTER

Time Period	WC_EM	BC_EM
2009:Q1	7,180,584	1,372,249
2009:Q2	7,267,625	1,352,128
2009:Q3	7,262,714	1,351,824
2009:Q4	7,244,999	1,321,209
2010:Q1	7,060,404	1,261,784
2010:Q2	7,274,247	1,308,762
2010:Q3	7,324,227	1,324,520
2010:Q4	7,339,454	1,305,093
2011:Q1	7,207,173	1,257,640
2011:Q2	7,399,365	1,289,360
2011:Q3	7,459,553	1,312,237
2011:Q4	7,455,380	1,292,511
2012:Q1	7,335,785	1,261,527
2012:Q2	7,503,433	1,285,872
2012:Q3	7,556,903	1,306,966
2012:Q4	7,584,773	1,291,352
2013:Q1	7,439,730	1,257,141
2013:Q2	7,588,875	1,285,784
2013:Q3	7,632,434	1,303,453
2013:Q4	7,622,598	1,287,124
2014:Q1	7,454,416	1,254,508
2014:Q2	7,652,499	1,292,495
2014:Q3	7,685,860	1,303,453
2014:Q4	7,685,933	1,287,124
2015:Q1	7,576,484	1,267,519
2015:Q2	7,808,412	1,314,040
2015:Q3	7,927,987	1,334,825
2015:Q4	7,972,175	1,323,938
2016:Q1	7,794,841	1,286,441
2016:Q2	8,000,569	1,311,152
2016:Q3	8,044,131	1,326,998
2016:Q4	8,052,916	1,325,173

2017:Q1	7,920,987	1,302,513
2017:Q2	8,109,090	1,338,101
2017:Q3	8,153,037	1,352,599
2017:Q4	8,167,149	1,347,526
2018:Q1	8,046,126	1,329,697
2018:Q2	8,228,857	1,366,333
2018:Q3	8,256,899	1,385,286
2018:Q4	8,265,846	1,381,297

APPENDIX F

QUARTERLY PERCENTAGES OF TOTAL EMPLOYMENT OPPORTUNITIES

Time Period	WC_EM	BC_EM	Total
2009:Q1	83.96%	16.04%	*100%*
2009:Q2	84.31%	15.69%	*100%*
2009:Q3	84.31%	15.69%	*100%*
2009:Q4	84.58%	15.42%	*100%*
2010:Q1	84.84%	15.16%	*100%*
2010:Q2	84.75%	15.25%	*100%*
2010:Q3	84.69%	15.31%	*100%*
2010:Q4	84.90%	15.10%	*100%*
2011:Q1	85.14%	14.86%	*100%*
2011:Q2	85.16%	14.84%	*100%*
2011:Q3	85.04%	14.96%	*100%*
2011:Q4	85.22%	14.78%	*100%*
2012:Q1	85.33%	14.67%	*100%*
2012:Q2	85.37%	14.63%	*100%*
2012:Q3	85.26%	14.74%	*100%*
2012:Q4	85.45%	14.55%	*100%*
2013:Q1	85.54%	14.46%	*100%*
2013:Q2	85.51%	14.49%	*100%*
2013:Q3	85.41%	14.59%	*100%*
2013:Q4	85.55%	14.45%	*100%*
2014:Q1	85.60%	14.40%	*100%*
2014:Q2	85.55%	14.45%	*100%*
2014:Q3	85.50%	14.50%	*100%*
2014:Q4	85.66%	14.34%	*100%*
2015:Q1	85.67%	14.33%	*100%*
2015:Q2	85.60%	14.40%	*100%*
2015:Q3	85.59%	14.41%	*100%*
2015:Q4	85.76%	14.24%	*100%*
2016:Q1	85.83%	14.17%	*100%*
2016:Q2	85.92%	14.08%	*100%*
2016:Q3	85.84%	14.16%	*100%*
2016:Q4	85.87%	14.13%	*100%*
2017:Q1	85.88%	14.12%	*100%*
2017:Q2	85.84%	14.16%	*100%*
2017:Q3	85.77%	14.23%	*100%*
2017:Q4	85.84%	14.16%	*100%*
2018:Q1	85.82%	14.18%	*100%*
2018:Q2	85.76%	14.24%	*100%*
2018:Q3	85.63%	14.37%	*100%*
2018:Q4	85.68%	14.32%	*100%*

VITA

___________________ Artaisha Jenkins ___________________

Highlights of Qualifications

Entrepreneurial-minded senior executive with consistent success in starting, building, growing, and improving the profitability, performance, and value of companies. Experienced with teaching at the college level. Possesses excellent interpersonal skills, writing skills, verbal communication, and research skills.

Education

Ph.D. in Business Administration (May 2020)
Hampton University

Business Analytics | Economics for Managers | Financial Accounting (Credential of Readiness: CORe) (December 2019)
Harvard Business School Online

Master of Business Administration concentration in Entrepreneurship (May 2014)
American Military University

Bachelors in Integrative Studies concentration in Organizational Administration (August 2010)
George Mason University

Peer-Reviewed Publications

"The Federal Government Spending and The United States Economy: An Empirical Case Study Of 2008- 2017", *Theodore Andrews, MA., Christopher Fisher, MBA.,* ***Artaisha Jenkins, MBA****, and Adeleja A. Odutola, Ph.D., The Journal of Business and Finance Research, Volume 7, Issue 1, Spring/ Summer 2018*

Academic Professional Experience

Professor*- The Center for Applied Economics and Entrepreneurship, Hampton University- Fall 2019*
Prepared and delivered two 12-week Entrepreneurship courses to undergraduate students.

Courses focused on the opportunities and challenges involved with starting, acquiring, owning, and operating new business ventures. As well as provides an in-depth assessment of successful techniques used to finance new business ventures.

Business Lecturer*- Right Choice's Inc.: Operation Inspiring Freedom II- 11/2018*
Prepared and delivered a lecture to undergraduate students, graduate students, and veterans on topics in business management and transitioning from Military to Civilian employment.

Business Lecturer*- The Dive Foundation's Internship Program– 01/2013- 12/2016*
Prepared and delivered lectures to undergraduate and graduate students on topics in financial literacy, business management, organizational communication and culture, financial accounting, principles of marketing, and operations management.

Non-Academic Professional Experience

Founder and Principal Consultant*- Federal Staffing Solutions Inc. – 05/2016- Present*
Develops high-quality business strategies and plans, ensuring their alignment with short-term and long-term objectives. Presided over the startup and organization of a Virginia Stock Corporation. Oversee all operations and business activities to ensure they produce the desired results and are consistent with the overall strategy and mission. Successfully leading business into the fourth year of operations with consistent growth and expanding client base.

Career Consultant – *Multiple State and Federal Government Agencies- 07/2011- Present*
Provides varying levels of support in areas of Business Administration, Business Finance, Management, Human Resources, Operations Management, Economic Analysis, Marketing Strategies, Workflow Solutions, Project Management, and Client Relationship Management.

Financial Management Technician (44C) /Reserve Officer Training Corps (Simultaneous Membership Program)*- United States Army, Virginia National Guard, 07/2008 to 07/2011*

Professional Memberships

American Society for Industrial Security (ASIS) Fellow | American Academy of Project Management (FAAPM) | The National Association for the Advancement of Colored People (NAACP) | Project Management Institute (PMI) | Project Management Institute Thought Leaders Inner Circle | Scrum Alliance