Revamping America's Infrastructure: A Global Study of Private Sector Participation in Transport-Related Public-Private Partnerships

A Dissertation submitted
to the Graduate School
Valdosta State University

in partial fulfillment of requirements
for the degree of

DOCTOR OF PUBLIC ADMINISTRATION

in Public Administration

in the Department of Political Science
of the College of Humanities and Social Sciences

March 2022

Sotayo O Sowemimo

M.S., Governors State University, 2011

BS, Federal University of Agriculture, Nigeria, 2002

This dissertation, "Revamping America's Infrastructure: A Global Study of Private Sector Participation in Transport-Related Public-Private Partnerships," by Sotayo Sowemimo, is approved by:

Dissertation Committee Chair

DocuSigned by:
J S McDonald
FCC599A8AE0F44C...
J. Scott McDonald, Ph.D.
Professor of Political Science

Dissertation Committee Co-Chair

DocuSigned by:
Gerald Merwin
5ABC33AB275D4FF...
Gerald A. Merwin, Ph.D.
Professor of Public Administration

Committee Members

DocuSigned by:
Bernard Tamas
25859E190DD24AF...
Bernard Tamas, Ph.D.
Associate Professor of Political Science

DocuSigned by:
Robert Kellner
E6077B88A6EF4C5...
Robert Kellner, DPA.
Adjunct Professor of Public Administration

Associate Provost of the Graduate School

Becky K. da Cruz
Becky K. da Cruz, Ph.D.
Professor of Criminal Justice

Defense Date

March 30, 2022

FAIR USE

DUPLICATION

I authorize the Head of Interlibrary Loan or the Head of Archives at the Odum Library at Valdosta State University to arrange for duplication of this dissertation for educational or scholarly purposes when so requested by a library user. The duplication shall be at the user's expense.

Signature 

I refuse permission for this dissertation to be duplicated in whole or in part.

Signature _____

ABSTRACT

This study analyzed the structure of private sector participation in 696 public–private partnership (PPP) projects in 12 G-20 countries, through a comparison of fully funded (100%) private sector projects with those substantially funded (51%–99%) and partially funded (50% and below) by the private sector. The main goal of this study is to determine whether PPP is a viable option for revamping America's infrastructure.

Multiple linear regression was then applied to these data because of the presence of continuous outcomes and multiple independent variables. This method of analysis allowed for the development of predictive models explaining contract length and project costs based on private-sector funding levels, the transport subsector, and other predictors.

This study found that substantially funded cases (at 51–99%), or, at the very minimum, partnerships with a private-sector majority (at least 51%) are associated with shorter contract lengths. Partially funded (50% or less) cases are associated with increases in project costs when compared with fully funded (100%) cases.

In the interest of improving the U.S. infrastructure, the results suggest that greater private sector participation should be pursued to the extent possible because this is associated with the shortest contract lengths and lowest project costs. Overall, private sector participation that provides at least 51% of funding was found to be most beneficial, with PPP determined to be a viable option to improve America's infrastructure.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

This dissertation will not have been possible without the invaluable contributions of my committee and family members.

A big thank you to the Chair, Professor Scott McDonald for his numerous reviews, and thoughful feedback that positively shaped this reasearch.

I want to specially thank the Co-Chair, Professor Gerald Merwin for his direction, leadership and compassionate support.

I am appreciative of the contributions of Dr. Bernard Tamas and Dr. Robert Kellner for their guidance, patience, and ecouragement throughout the process.

To my mother, Evangelist Oluyombo Sowemimo, and parents-in-law; Reverend Reuben and Deaconess Tokunbo Adesile, I thank you all for your prayers and moral support.

For their encouragement throughout this process, I am thankful to my uncle and his wife; Engineer Somuyiwa and Mrs. Tiwalade Sowemimo.

Also, I am grateful to my siblings; Justice Funmi Stanley, Mr. Bayo Sowemimo, Mrs. Bose Avoseh, and Barrister Dolamu Sowemimo, together with all their spouses, for your love over the years.

My children; Taiwo, Kehinde and Emmanuel, I thank you for your unconditional support, encouragement, and unwavering belief in my capabilities. I love you all.

Most importantly, I wish to specially thank my wife, Abimbola, who understood this journey and provided support during the low points of the dissertaton process. You are the best best partner I have, and I am forever grateful to be your husband.

DEDICATION

First and foremost, I dedicate this academic achievement to the loving memory of my late father, Chief Soniran Oluwole Sowemimo (August 19, 1942 - August 16, 2013). He was the first person in my direct family line to attend college, and to graduate with a Masters degree in Prague, Czech Repulic, in 1972.

Finally, I dedicate this Doctor of Public Administration degree to God Almighty, my divine helper, and the lifter up of my head. To HIM alone be all the glory.

Chapter I

INTRODUCTION

The U.S. national debt is reaching alarming levels. Despite this ticking time bomb, the public sector continues to face increasing demands for accountability and higher public service delivery. The combined challenge of ballooning debt and pressures from taxpayers for delivery of efficient public service calls for a rational approach to address and readjust public service values (McBridge, Chatzky, & Siripurapu, 2020). In the face of enormous fiscal challenges confronting the public sector, philosophical and ideological arguments between the political left and right continue unabated. Conservatives assert that deficits are primarily driven by overspending, whereas progressives and liberals suggest that tax cuts, especially those benefiting big corporations and wealthy individuals, diminish avenues for needed revenues. The cost of political dysfunction, coupled with the increasing national debt, entitlement programs such as Medicare and Medicaid, and tax cuts have contributed to the neglect and deterioration of America's infrastructure (McBridge et al., 2020).

The role of infrastructure in the overall development of any country is one key to societal welfare. It is therefore imperative for the citizenry to expect their elected leaders to prioritize the funding, development, and operation of infrastructure regardless of obvious fiscal challenges facing government at all levels. Politicians on both sides of the aisle want to revamp, rebuild, and repair infrastructure and build new infrastructural

systems, although disagreements remain concerning how to pay for these investments. This study seeks to provide an in-depth analysis of one approach to infrastructure investment relevant to transport-related public–private partnerships (PPPs) to determine whether the option is plausible for revamping America's crumbling infrastructure. "Revamping infrastructure" is new construction, reconstruction, maintenance, remodeling, modernization, and repair of transportation-related infrastructure across a country (Rodríguez-Pose & Wilkie, 2017).

The nonpartisan Congressional Budget Office (CBO, 2018) compiled the report *Public Spending on Transportation and Water Infrastructure, 1956 to 2017*, which showed a total of $441 billion was spent in 2017, an increase of $25 billion over 2014. To further underscore the state of American roads and bridges, $177 billion was spent on that subsector, while the remainder went to water utilities, mass transit, and rail projects (Congressional Budget Office, 2018). It should be noted, however, that infrastructure spending accounted for only about 2.3% of the gross domestic product, due in part to the difficulty of raising capital for expensive infrastructural development from 1956–2017. Given this background, this study sought the optimal private sector participation rate (as a percentage) in PPP projects, and to determine whether PPPs are a plausible option for revamping America's infrastructure.

What Are Public–Private Partnerships?

Ambiguity and confusion about what constitutes a PPP blur public procurement officials' clarity when advising politicians and public administrators on the appropriateness of adopting PPPs. Martin (2016) suggested that the root of this confusion was imprecise language used by government entities and others in defining and

discussing PPP. Campbell and Diseasa (2014) and Busch and Givens (2012) stated that any agreement between the government and private sector was a PPP. Grants provided by nonprofits to governmental institutions in the areas of health and human services were sometimes erroneously assumed to be PPP (Martin, 2016). Given this confusion, there is a need for clarity. Martin advocated a pragmatic approach in assessing how PPP is defined.

To remove ambiguity, Martin (2016) considered the following definitions before arriving at what he termed, was a more universally acceptable explanation of what PPPs should be. The National Center for Public-Private Partnerships (NCPPP) defines PPP as a contractual agreement between a government at any level and any private entity (2015). The U.S. Department of Transportation defined PPP as "contractual agreements between the public and private sectors that allow greater private sector participation in financing and delivery of transportation projects" (2014, p.1). U.S. states have used a variety of definitions, for example, the Florida Department of Management Services (2014), Maryland State Code (2017), and Virginia Law (1995) have had different definitions of what constitutes PPP, further muddling a cohesive, unified, and generally accepted denotation for PPPs.

Public-Private Partnerships Defined

PPPs may involve the mix of design, construction, financing, operation, and maintenance (Monk, Levitt, Garvin, & South, 2019). Each of the five entities (NCPPP, USDOT, and the three states) share a consensus on defining PPPs as a class of public contracts for the construction or rehabilitation of public facilities, public infrastructure, and provision or supportive ancillary services. For this study, PPPs are agreements

between public agencies and private entities for the construction or rehabilitation of public facilities and infrastructure. It should be noted that PPPs also may provide supportive ancillary services. The following were main features of PPPs according to Levitt, Scott, and Garvin (2019):

1. Typically, they are long-term agreements between public and private entities.
2. While the public sector is not expected to advance all or some of the funds needed, a private entity steps in to provide some public service or infrastructure.
3. Both private and public sector partners are expected to assume some risks; these may be financial, technical, or operational.
4. The public sector is not required to come up with some or all the funding required, a key reason for entering these partnerships. The private sector entity is expected to receive performance-linked payments based on legal agreements and predetermined measurable standards. (p. 21-22)

Nature of a PPP

The scope of a PPP is embodied in an agreement or contract between public and private entities. These relationships may encompass many components including the following:

- The private-sector entity, with or without payment under an existing agreement, transfers the facility to the public sector.
- The facility may be used for a specific period by the private-sector entity. This arrangement may include certain restrictions on operations, standards, and pricing.

- The public-sector entity, with or without payment, in return transfers public facilities, property, or land to the private entity, typically for a specified period.
- The private sector may build, extend, remodel, or revamp a facility.
- The public-sector entity contracts the operating services of the facility.

Finally, it is imperative to emphasize that PPPs also offer a risk sharing arrangement based on a shared aspiration between the entities involved in the partnership, to deliver a mutually agreed upon objective and/or public service (Levitt et al., 2019).

Types of PPPs

While this study focused on exploring private sector participation in PPP as an option for revamping the U.S. infrastructure, the scope of data to be analyzed in this study took a global view of PPPs**.** The following are common types of PPP.

Build Operate Transfer (BOT): The private sector fully finances, then designs, builds, and operates the project. Ownership and legal control of the project is transferred back to the public sector after a certain period ranging anywhere from 10–99 years. Examples are linked motorways in Australia, Sydney Harbor Tunnel, and the City Link in Melbourne (Grimsey & Lewis, 2007).

Build Own Operate (BOO): Unlike in BOT, control and ownership under this type of agreement remains with the private sector. In any BOO arrangement, the private sector provides full funding, builds, owns, and operates the infrastructure perpetually. Examples include Xiamen Airport Cargo Terminal in China and Sukhotai Airport in Thailand (Grimsey & Lewis, 2007).

Leasing: A lease-based PPP is like a BOT but without the funding components. Under what is also referred to as “concession contracts,” the private sector can design and

build or operate without providing the project finances. This allows part of the risk to be transferred to the private sector. For example, some municipalities in Francophone African countries construct water facilities before contracting them out to a private firm to operate and maintain (Rondinelli, 2002).

Joint Ventures (JV): The public and private entities jointly finance, own, and operate a facility. An example is the redevelopment of areas purchased by local governments either to invest in themselves or for private developers (Beauregard, 1998).

Management Contracts: The private sector entity is only partially involved with ownership and possession of the project remaining in the public sector. Examples are Design, Build, Finance, Operate, and Maintain (DBFOM) contracts; Operate, Maintain, and Manage (OM & M) contracts; and Operate and Maintain (O & M) contracts (Grimsey & Lewis, 2007).

Concessions (Contract Period)

Concessions are PPP agreements in which a private sector organization takes on some risks and rewards of financing, constructing (or leasing), and operating and maintaining a transportation facility in exchange for the right to future revenues or payments for a specific period (e.g., +10 years; U.S. Department of Transportation, 2010). The concession term is typically between 30–50 years (Brown et al., 2009). However, depending on the type of PPP and project, a concession period could last anywhere from 10–99 years. For example, the Indiana Tollway project was initially signed as a 75-year concession, and Chicago Skyway projects were initially signed as a 99-year concession (Federal Highway Administration, 2020a).

Equity and Debt in PPP Concessions

There are two ways PPP concessions are financed: debt and equity. The concessionaire and their investors provide capital or equity funds, typically at the start of the project, and may borrow money to cover remaining costs. If the project is for an existing facility, the concessionaire uses debt and equity to gain the right to own or manage and to operate for a mutually agreed period with the public entity. However, for a new project or one needing substantial rehabilitation, the concession company will use money also raised through equity and debt to design, construct, and finance the facility. Revenues from infrastructure service are used to pay the lenders, and revenues remaining after annual loan payments, returns to the investors as profit.

Role of Participants

In every PPP, there are two main entities: at least one unit of government and at least one firm from the private sector. There are additional participants in PPPs whose roles are more nuanced.

Special Purpose Vehicle (SPV): This refers to a company, usually a separate legal entity, whose primary responsibility is to execute the language defined in the contract between itself and the public entity. An SPV coordinates the parties by entering into subcontracts to ensure lending to projects is nonrecursive to the sponsors by virtue of the limited liability nature of a SPV (Grimsey & Lewis, 2007). A SPV also helps to insulate lenders to the project, from potential bankruptcy while the assets and liability remain off balance sheets. This is achieved when preparing group accounts by not allowing any sponsor to have more than 50% of the shares in the SPV and application of normal consolidation principles (Grimsey & Lewis, 2007). Those responsible for adhering to the

dictates of contractual agreements in PPPs are sponsors and equity holders in the SPV (Grimsey & Lewis, 2007).

Financiers: These are private entities that are involved in the funding of a project. The costs of constructing, reconstructing, and developing facilities are usually funded by nonrecourse debts. Therefore, it is necessary for private debt markets to commit significant sums of debt up front (Grimsey & Lewis, 2007). This is because arrangements for financing under the PPP structures are done in ways for facilitating capital-intensive infrastructure transactions while spreading project risk among participants. (Grimsey & Lewis, 2007).

Subcontractors*:* The SPV enters into separate specialized contracts for a subset or portion of construction, equipment supply, and/or operation and maintenance to assure the project company's obligations and responsibilities to the public procurer are delivered (Grimsey & Lewis, 2007).

Advisers: These are professionals who provide financial, legal, technical, and guidance to both the public and private sectors in the structure of PPPs (Grimsey & Lewis, 2007).

Rating Agencies: These agencies are usually involved at the beginning of project planning if the project is to be financed through the issuance of bonds. Rating agencies for PPP projects determine credit worthiness to assure the lenders with some level of certainty, that they will receive timely repayments of principal and payment of interests based on language in the contract (Thompson, 2012).

Insurers: These are companies that provide protection to sponsors and lenders in project financing**.** Insurers conduct risk assessments with the objective of setting up an

appropriate insurance package to limit credit risks of debt issues, typically bonds, to ensure project completion (Grimsey & Lewis, 2007).

Background of the Problem

With the national debt now at the $28.9 trillion mark (U.S. Government Accountability Office, 2021) and taxpayers reluctant to pay more taxes, infrastructure improvements must be cost effective. Therefore, this study focused on private sector participation in completed transport-related PPP projects in selected countries within the Group of Twenty (G20), a collection of twenty of the world's largest economies formed in 1999.

G20 is a bloc of the most important industrialized and developing economies conceived to address global economic and financial stability (Council on Foreign Relations, 2019). To have global spread that cuts across continental boundaries and different economic systems, completed transport-related projects were selected from 12 G20 countries: Argentina, Australia, Canada, China, India, Mexico, Russia, South Africa, South Korea, Turkey, United Kingdom, and the United States. These 12 countries were chosen for several reasons.

Size of the economy: The inclusion of the United States was obvious because the main goal of this study was to examine the option of private sector participation in PPP projects as an option to revamp the country's infrastructure. The United States and China were selected because they represent the world's two largest economies (Itakura, 2020). These selections provided the study valuable insights from two world leading economies.

Varying degrees of PPP practices: Countries like Australia, Canada, and the United Kingdom were chosen because they are regarded internationally as having best

practices for greater engagement with private sector stakeholders in the area of transport-related PPP funding (Martin, Lawther, Hodge, & Greve, 2013). Additionally, the Republic of South Korea was selected as a leading country in the use of PPP for delivery infrastructure in the last 3 decades (the period covered in this study) within the continent of Asia (Deep, Kim, & Lee, 2019).

Variety of funding sources*:* While more advanced countries like the United States, Canada, Australia, and the United Kingdom can easily attract private-sector funding within their countries and from other large, Western, multi-national financial institutions, other countries like Turkey, Mexico, Argentina, India, South Africa, for some projects in Russia, China, and South Korea always or sometimes rely on global and regional institutions (Sengupta, Mukherjee, & Gupta, 2015), such as the World Bank, International Monetary Fund (IMF), African Development Bank (AfDB), and the Asian Development Bank (ADB). The selection of these 12 countries therefore assures the inclusion of a variety of private funding sources.

Developed versus emerging countries: To bridge the divide between the more advanced countries like the United States, Canada, Australia, Republic of South Korea, and the United Kingdom, and those regarded as emerging countries within the G-20, countries such as India, Mexico, Argentina, Turkey, and South Africa were selected to analyze data from these countries for better research outcomes (Pradhan, 2019).

Geographical Dispersion*:* To satisfy the global nature of this research, the selected 12 countries cut across continental boundaries, enabling the study to consider environmental and ecological factors such as geographical weather patterns on the transportation sector (Koetse & Rietveld, 2009). Factors unique to certain regions

included but were not limited to tropical/subtropical (Africa, South America, and most of Asia) versus temperate regions (Europe, most part of Canada, U.S., and others), storm surges, flooding, topography, other climatic and weather-related incidences that can potentially impact on transportation projects (Dasgupta, Laplante, Meisner, & Wheeler, 2007).

Availability of Data*:* Finally, there were readily available secondary transport-related PPP data for all the selected countries.

Infrastructure Investment and Jobs Act

President Biden and Vice President Harris announced their support for a bipartisan infrastructure framework on June 24, 2021 (White House, 2021a). The bipartisan infrastructure framework is a $1.2 trillion plan designed to improve healthy, sustainable transportation options for citizens through modernizing and expansion of transit and rail networks across the country while reducing gas emissions. The bipartisan infrastructure framework also repairs and rebuilds roads and bridges and is the single largest dedicated bridge investment since the construction of the interstate highway system (White House, 2021a). The U.S. Congress passed the bipartisan infrastructure framework, and President Biden signed the $1.2 trillion Infrastructure bill tagged the Infrastructure Investment and Jobs Act into law on November 15, 2021 (White House, 2021b). With the signing of the Infrastructure Investment and Jobs Act, the White House argued the law is an initial deposit for funds needed to revamp America's infrastructure (White House, 2021c). The questions remaining are: Can government partner with the private sector to raise additional $1 trillion dollars to bridge the remaining funding gap for revamping America's infrastructure? What could taxpayers expect from private sector

participation based on analysis of selected completed transport-related PPP projects from countries within the G20? The scope of this dissertation extended beyond the United States because other selected G20 countries are part of the world's largest economies and coordinate global policy on trade, health, climate, and other matters (Council on Foreign Relations (CFR), 2019). It was therefore imperative to analyze data from completed transport-related PPP projects from these countries, to get a clearer picture of the structure of private sector participation in PPPs.

Private Sector Participation in Transport Infrastructure

Historically, except for Chairman Mao Zedong's China and Premier Joseph Stalin's Russia, the private sector has always been involved in infrastructural developments. Though private sector involvement might vary from country to country, the United States is not an exception. In the 19th century, the U.S. transportation systems generally involved private entrepreneurs, often with minimal involvement from public institutions (Floricel & Miller, 2000). However, for most of the 20th century, public institutions at all levels designed, funded, and maintained most transport infrastructure while outsourcing construction to the private sector (Levitt et al., 2019). During the 1980s, propelled by a more conservative political wave, the call for greater private sector participation intensified (Levitt et al., 2019).

PPPs are increasingly becoming the vehicle through which private entities are partnering with governments at all levels to resolve societal challenges (Schwab, 2008; Seitanidi, Koufopoulos, & Palmer, 2010). The United States, like most Western governments, has practiced some form of PPP models (Broadbent, Gill, & Laughlin, 2004) as a strategy for seeking additional funds to address infrastructure delivery. The

fundamental idea behind PPPs goes beyond mere fiscal incentives. PPPs provide an innovative framework to aggregate competencies, resources, and ideas in confronting thorny social problems, some of which have remained unresolved through unilateral approaches (Kolk, Van Tulder, & Kostwinder, 2008; Sandfort & Milward, 2008; Selsky & Parker, 2005). For example, the Virginia Department of Transportation (2019), through their Office of Public-Private Partnerships, completed the I-495 Express Lanes in November 2012, I-95 Express Lanes opened to traffic December 2014, and the Elizabeth River Tunnel reached substantial completion in 2016 to reduce road congestion and boost economic activities. This reported in this dissertation, researched PPPs as an option for the current and future American administration that might seek to revamp America's infrastructure.

The Significance of the Study

A key element of PPPs is private sector participation, where funding and/or technical expertise are brought into construction or rehabilitation of public facilities. The private sector participation rate is defined as the percentage of total funding put into the completion of a transportation project by nongovernment actors (Bayliss & Van Waeyenberge, 2018). These partnerships require contractual agreements between public and private institutions. An analysis of current or completed transport-related PPP projects across selected G-20 countries determined that there are statistically significant differences between the structure of private sector participation and a subsector of the project (type of transportation project) on length of contract and total investments on these projects.

The state of America's infrastructure is alarming. For example, the 2021 Infrastructure Report Card by the American Society of Civil Engineers (ASCE) gave a grade of C-, a marginal improvement from the grade of D+ given in the 2017 report. These reports, while providing an overall assessment of America's infrastructure, underscored the enormity of the problem (American Society of Civil Engineers, 2021).

Table 1 displays the five best and worst states by number and percentage of structurally deficient bridges in the United States.

Table 1.

Structurally Deficient Bridges: Top and Bottom Five States by Number and Percent

Top Five States				**Bottom Five States**			
State	Pct	State	Quant	State	Pct	State	Quant
Nevada	1.6	Washington, DC	9	Rhode Island	24.9	Iowa	4,968
Texas	1.7	Nevada	31	Iowa	20.5	Pennsylvania	4,506
Florida	2.1	Delaware	43	Pennsylvania	19.8	Oklahoma	3,460
Arizona	2.6	Hawaii	64	South Dakota	18.6	Missouri	3,195
Utah	3.1	Utah	95	West Virginia	17.4	Nebraska	2,361

Source: Congressional Budget Office. (2018).

The data in Table 1 are instructive. For example, Iowa had close to 5,000 structurally deficient bridges, whereas Rhode Island had 24.9% of its bridges considered structurally deficient. By every standard, something must be done to revamp America's crumbling infrastructure.

Figure 1, courtesy of the 2021 Infrastructure Report by the American Society of Civil Engineers, highlights the state of America's roadways. Approximately 43% of U.S. roadways are either in poor or mediocre condition, which, as stated earlier, has not shown

any significant improvement from the 2017 report. The United States currently has over 4 million miles of public roadways carrying people and goods to their destinations every single day (American Society of Civil Engineers, 2021). The 2021 report added that there is increasing pressure on these roadways, with vehicle miles reaching 3.2 trillion in 2019. The number of vehicle miles travelled over this deteriorating infrastructure subsequently rose from 15–17% over the last decade. Understanding the structure of private sector participation in past PPP projects informed this study by suggesting a potential important avenue for funding future transport infrastructural projects.

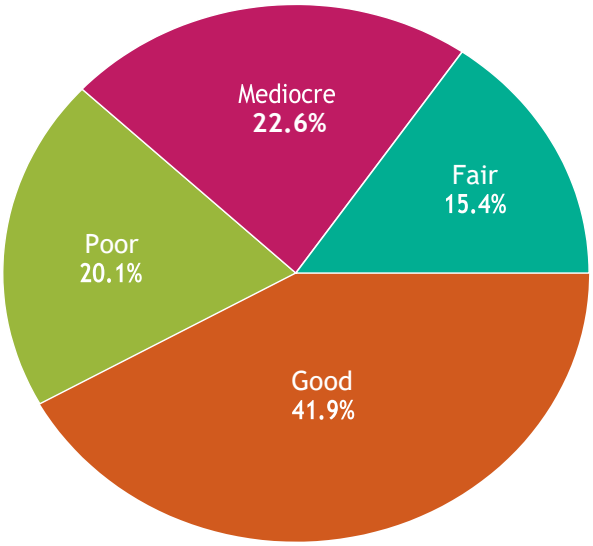


Figure 1. America's Roadway Condition. Copyright 2021 by America Society of Civil Engineers. Reproduced with permission.

Research Goals

Governments across geographical and continental boundaries use private for-profit enterprises to attract private funding and technical capabilities to design, build, maintain, and operate needed public transportation facilities. In the last 4 decades, public institutions have been exploring all types of PPPs through concession contracts. As noted earlier, this study examined the structure of private sector participation in transport-

related PPP projects in 12 G-20 countries (including the United States). "Participation rate" is the percentage of direct or indirect investment put into a PPP project (Levitt et al., 2019).

The findings from this study determined there were statistical differences between the three approaches of funding levels on one hand and the subsector of the transport project (e.g., airport, roads, ports, rail) on the other, which better clarified the role of the private sector in PPPs (Tamošaitienė, Sarvari, Chan, & Cristofaro, 2021). Finally, the findings suggested that PPP was a viable option for revamping America's infrastructure.

Research Questions

With the United States projected to need at least $2 trillion for infrastructural development (White House, 2021c), the research questions for this study were:

RQ1: To what extent, if any, is there a statistically significant difference in length of the contract based on whether a PPP project is fully funded, substantially, or partially funded by the private sector?

RQ2: To what extent, if any, is there a statistically significant difference in project costs based on whether a PPP project is fully funded, substantially, or partially funded by the private sector?

RQ3: To what extent, if any, is there a statistically significant difference in the length of the contract on the subsector of the transport-related PPP project?

RQ4: To what extent, if any, is there a statistically significant difference in the project cost on the subsector of the transport-related PPP project?

Methodology

This study adopted a quantitative method for the analysis of the data under three sections. The first section was the data set of 700 publicly sourced transportation-related PPP projects (1991–2019) from 12 G-20 countries. This period was selected specifically to allow data to be analyzed over 2 decades for better empirical outcomes. The data were primarily sourced from the Australian, Canadian, the UK, the United States government, and World Bank websites. Therefore, this research was exempt from the Internal Review Board (IRB), see Appendix A. Apart from the two major reasons for selecting completed PPP projects outside the United States, in a subset of the period under study, 1995–2016, the United States accounted for only 9% of all PPP infrastructural projects worldwide (Istrate & Puentes, 2011). Expanding the scope of completed PPP projects beyond the United States allowed this study to consider more comprehensive data, also increasing the likelihood of more comprehensive outcomes following analysis. However as stated earlier, the study was careful to limit data collection to only members of the G20. The PPP projects selected from these G20 countries not only cut across continental boundaries, but also types of PPPs, such as BOT, lease, and DBFOM.

The private sector participation rate for this study, as discussed earlier, was divided into the following three categories:

- Partially funded by the private sector (50% or less funding by the private sector);
- Substantially funded by the private sector (51–99% funding by the private sector); and
- Fully funded by the private sector (100% funding by the private sector).

Secondly, selected factors that may affect private-sector funding on PPP projects were identified to determine if they were statistically significant for possible effect. These were economic factors for countries from which these projects were selected, such as London Inter-Bank Offered Rate (LIBOR) interest rate, annual gross domestic product (GDP) growth, IMF global ranking (nominal GDP), and economic freedom score (measure of capitalism). Investment climate factors included the country's accountability, government effectiveness, political stability, regulatory quality, rule of law, and region (e.g., environmental concerns, which included weather pattern and geographical location). These factors were control variables for this study.

In the final section, regression models were used to test the effect of private sector participation rates and subsector of these projects on contract length and project costs. The results derived from these tests provided greater clarity on the private sector's role in PPPs, and suggested that PPP could be a viable option to revamp America's infrastructure.

Clarification for the Study

The following were clarifications for this study:

1. Infrastructure, as defined for this case study, was transportation-related. Examples included roads, bridges, rails, ports, and airports. Cyber, energy, broadband, portable water, sewage and other infrastructures were not within the scope of this dissertation.
2. This study gathered the costs of selected projects as reported but did not isolate individual components of the total costs. Instead, reported values were divided into two categories: public and private-sector funding.

3. This study was conducted from a public policy perspective, focused primarily to analyze the structure of private-sector funding PPPs and determine whether PPP could be a plausible alternative in revamping America's infrastructure. This study therefore assumed that the government could attract all the needed private-sector funding or technical expertise under the right circumstances. As stated earlier, the suitability of the PPP option in revamping the country's infrastructural system was provided based on the findings.

Chapter II

REVIEW OF LITERATURE

The purpose of this chapter is to review the relevant literature to provide a historical perspective and address the relevance of deficit reduction, opportunities, and inherent risks of PPPs. The review of relevant literature provided a theoretical and conceptual framework of the fiscal and efficiency factors of PPP models adopted across the globe. This review summarizes and synthesizes related studies that are pertinent to the research questions (Bearfield & Eller, 2008).

This review examined the literature about numerous completed PPP projects around the world, including works on PPPs in Canada, the United Kingdom, Australia, and the United States as well as areas on the continent of Asia. Examining the work of scholars and other researchers who have studied PPPs as a revenue option, provided insight through their intellectual lenses on how successful or counterproductive PPPs have been for the public.

Public–Private Partnerships around the World

Private sector involvement with governments across the globe, to develop transport-related infrastructure, has a long history, such as the Erie Canal that opened in 1825. The Erie Canal is a 363-mile waterway connecting the Great Lakes with the Atlantic Ocean via the Hudson River in upstate New York (Andrist, 2016). The trend of private sector participation in infrastructure development continued into the early 1900s

(Garvin, 2010; Tsamboulas, Verma, & Moraiti, 2013). The PPP model as an option for infrastructure is nothing new but has become more prevalent since the turn of the century (Boardman & Vining, 2010; Hodge, Greve, & Boardman, 2010; Newman & Perl, 2015; Siemiatycki, 2015). The first U.S. transcontinental railroad, the Pacific Railroad, was constructed by three private companies on public land (Cooper, 2005). Subsequent routes employing federal land grants, were constructed such as the Southern Pacific Railroad, Atlantic and Pacific Railroad, Northern Pacific Railway, and the California Southern Railroad (Myrick, 1990). The following sections will examine PPPs in Canada, the United Kingdom, Australia, and in the Asia-Pacific region to develop a global view of the development of PPPs in other parts of the world.

Public-Private Partnerships in Canada

The need to build and revamp aging infrastructure is not limited to the United States. Canada explored the PPP option to address the deficit in transportation spending. A review beginning in 1990 of PPP practices in Canada was necessary because it is the most analogous to the United States and data from the country were included in this analysis. According to the Parkland Institute (2011), Canada's infrastructure lagged behind that of the United States. For decades, Canada had used PPP to deliver large-scale public infrastructure. Siemiatycki (2015) examined PPP practice between 1990 and 2015 in Canada, where 220 projects were either completed or in progress. Siemiatycki divided the Canadian PPP experience into two phases. The first phase was projects delivered in the 1990s with the following objectives:

- Alternate source of funding through concession-style PPPs. These are PPP agreements in which a private sector entity took on some risks and rewards of

financing, constructing (or leasing), and operating and maintaining a transportation facility in exchange for the right to future revenues or payments for a specific period (U.S. Department of Transportation, 2010).

- Off-balance sheet accounting of infrastructure. This allowed further investments by government without running afoul of debt limits (Brown et al., 2009).
- Decentralization of decision-making from politicians to technocrats and the nonpartisan arms of agencies (Cohn, 2008; Engel, Fischer, & Galetovic, 2011; Newman, 2013).
- Significant risk transfer to the private sector. Private funding and long-term operating period spurred innovation, transferring construction and risk to the private sector (Grimsey & Lewis, 2004).

The second phase of PPP practice included projects from early 2000s and were shaped by the experience from the 1990s. Policymakers were determined to learn from mistakes made during the first phase and projects on getting maximum value for this investment (Garvin & Bosso, 2008). It should be noted that while Canadian authorities' primary objective was to attract private-sector funding, some infrastructure did not generate new sources of revenue to repay all the private investments. In this situation, the government was still obliged to repay these private investors (Hodge & Greve, 2010; Quiggin, 2004).

Due to budgetary shortfalls and increasing population, the Province of Alberta needed to revamp existing and aging infrastructure to meet demand. Opara and Elloumi (2017) examined how the most expensive project in provincial history, the Anthony Henday ring road (4.2 billion USD), emerged, how the PPP model became an attractive

option due to the unpredictability of traditional project delivery methods, and how budgetary concern helped shape policy, politics, and general acceptance. Opara and Elloumi traced the turning point to the normalization of PPPs as policy in 2003 when the private sector, in collaboration with the government, delivered critical infrastructure through design, financing, operation, and maintenance of roads, among other elements.

As in any country, the debate between advocates and skeptics did not stop proponents of the PPP model who argued for the timely delivery and budget savings associated with it, while opponents suggested that inherent risks guaranteed that taxpayers would eventually pay for these projects. Opara and Elloumi (2017) focused on efficiency and questioned whether PPPs were more efficient than projects that were publicly funded (Flinders, 2005;Grimsey & Lewis, 2004; Loxley & Loxley, 2010; Vining & Boardman, 2008). Opara and Elloumi (2017) stated that the metric used to measure efficiency; value-for-money (VfM)**,** was questionable, could be manipulated (Heald, 2003; Hodge & Greve, 2007), and was not universally accepted. VfM is the determination of a desired procurement outcome based on the best possible price (Grimsey & Lewis, 2007). It should be noted, VfM is not necessarily determined by the lowest price, but based on the combination of financial and nonfinancial factors relevant to the procurement (Partnership Victoria, 2010).

Opara and Elloumi (2017) successfully used the Anthony Henday highway in Edmonton to show the path for the emergence of PPP in the Province of Alberta was necessitated by fiscal challenges after the September 11, 2001, terrorist attacks in the United States. The political will to explore all viable options was due to the pressing need for quick infrastructure delivery, which could boost bureaucratic capacity and enhance

organizational capacity. Opara and Elloumi asserted what they termed' ‘institutional environment’, was an important factor in the success and acceptability of PPPs in Alberta. Institutional environment was defined as a combination of formal and informal standards set to guide the behavior of all individuals operating within the Alberta Infrastructure delivery environment (Opara & Elloumi, 2017). Institutional environment was a key point in PPP practices in the Province of Alberta and Canada in general because it specifically espoused unique factors that contributed to the success of the PPP project. The main take away was that specific areas and countries did have some unique influence on the success or failure of any PPP project (Jooste, Levitt, & Scott, 2011). As part of the analysis for this study, factors such as peculiar national investment climate that may have potentially had an impact on the private sector participation and success of PPP projects, were tested. Okpara and Elloumi also stated that strong political support shaped the policymaking processes which undoubtedly affected organizational capabilities and, by extension, PPP projects. A measure of political instability and/or politically motivated violence, including terrorism in a country (World Bank Group, 2020) was included in the analysis for this study in order to test the potential effect of political stability. It was imperative to point out that missing from the Canadian experience was any reference to structure of private-sector funding for the projects examined by these authors. This was therefore a gap in the literature that this study began to fill.

Public-Private Partnerships in the United Kingdom

In the United Kingdom, PPPs can be traced as far back as 1700–1800s when they were viewed as one element in delivering quality services and enhancing overall

competitiveness (HM Treasury, 2000). Early private sector participation in the delivery of transport infrastructure in the United Kingdom, included a patchwork of rail links that developed into a national network during the railway boom of 1840s (Schwartz, Gregory, & Thévenin, 2011). The main difference between private sector involvement in the delivery of transport infrastructure centuries ago and now is that it was uneven, patchy, and unorganized (Schwartz et al., 2011). However, the Private Finance Initiative (PFI), introduced in 1992 with the aim of having the private sector design, build, finance, and operate public infrastructure, was an essential and core component of PPPs in the government's investment in public infrastructure (HM Treasury, 2012). PFIs are legal agreements that last for decades and are a partnership between a client (i.e., a government entity and a private sector consortium [SPV] to design, build, finance, manage, and, in some instances, maintain a project; European PPP Expertise Center, 2012). In 1996, the Public-Private Partnership Program (sometimes referred to as 4Ps) was initiated as an extension of traditional Private Finance Initiative. A total of 68 PFI projects worth about $6.55 billion by 1997 was generated (HM Treasury, 2000). It should be noted that the 4Ps were structured as conventional PPPs with agreements between public agencies and private entities for the construction or rehabilitation of public facilities and infrastructure (Martin, 2016). There were two key differences between 4Ps and PFI based in the way the arrangement was financed. These were the following:

a) PFI used debt and equity finance through the private sector as capital costs upfront, however, this was not required for the 4Ps. There was thus more flexibility to structure contributions which could include public sector finance.

b) Secondly, while 4Ps might be structured as a joint venture or contract, PFIs made use of a SPV, as stated earlier, by entering into contractual arrangements with the public sector, and financing arrangements with its shareholders and other external financiers.

The New Right Conservative administration aggressively privatized the provision of public services and encouraged public choice in services consumption (Buchanan, 1975; Osborne & Gaebler, 1992). However, private sector involvement was precipitated by issues of bureaucratic inefficiencies within the public sector, cumulating in the emergence of neo-liberal ideologies (Grimshaw, Vincent, & Willmott, 2002), Nevertheless, PFIs remain at the center of PPP projects in the UK.

The PFI model typically allowed the private sector to design, build, finance, and operate facilities based on strict requirements provided by the public agency (Corner, 2006). Typical PFI agreements usually lasted anywhere from 25–30 years (European PPP Expertise Center, 2012). The initial justification for adopting PFI in the UK was that it generated more significant investments than revenues from the government (HM Treasury, 2000). The UK government later modified the basis for using PFIs, suggesting they provided a better value for money if a long-term assessment was done about costs and risk management expertise, and there was greater probability that services were delivered within a specified standard (HM Treasury, 2006). Figure 2 displays the PFI projects in England, with 30 transport-related projects financed through the PFI model, accounting for just about 6% of the total of 528 projects.

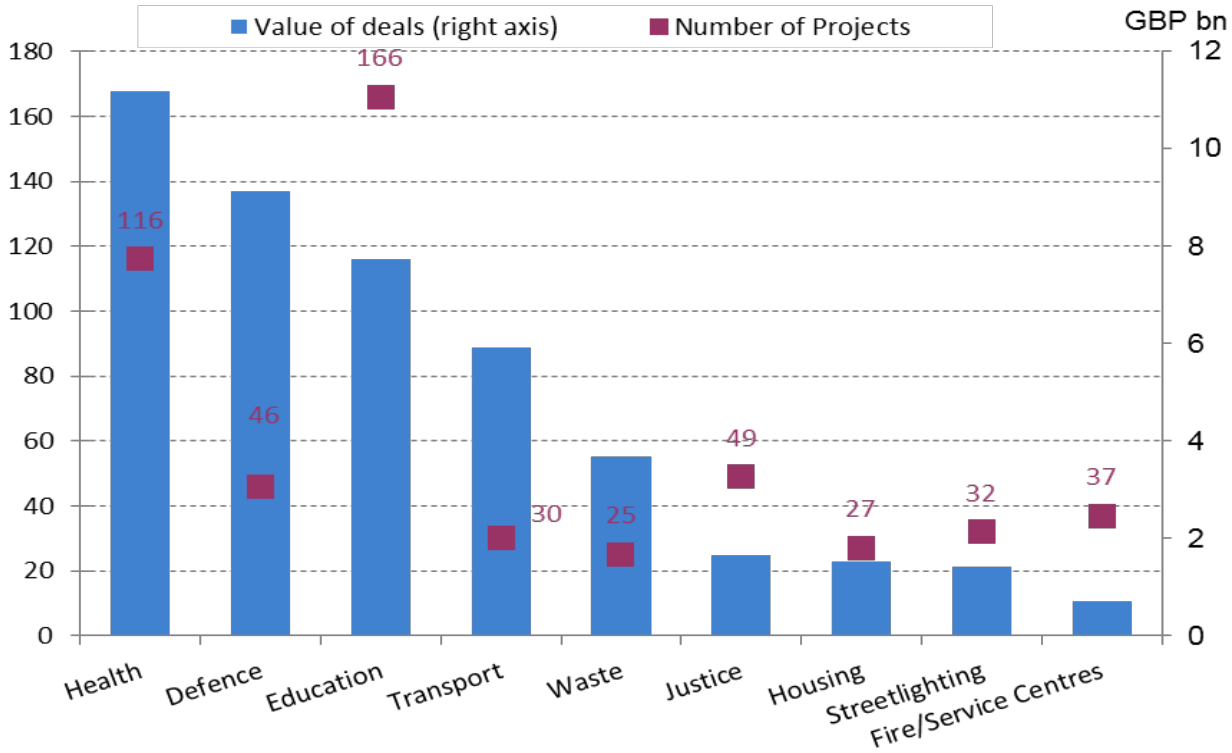


Figure 2. PFI projects in England by sectors. Copyright 2012 by European PPP Expertise Center (EPEC). Reproduced with permission.

Although PFI transportation-related projects made up approximately 6% of the total number of PFI projects, the total investments needed for these projects were significant, trailing only health, defense, and educational sectors in value of projects (European PPP Expertise Center, 2012). On the right axis in Figure 2, the total costs for 30 transportation-related projects stood at 6 GBP (approximately $12 billion) in 2010, underscoring the enormity of resources needed to build, upgrade, repair, and maintain 21st-century infrastructure (European PPP Expertise Center, 2012). Broadbent and Laughlin (2005) examined the role and contribution of PFI as a tool of infrastructural investment in the modernization of the UK agenda, and argued that the availability of funds, coupled with concern for achieving higher efficiency levels, should form the basis for any private sector involvement in the provision of public services. The authors also

suggested that the need for modernization at the macro-societal level became subsumed with the goal of achieving higher efficiency and attempts to control capital assets.

A key feature of PPPs in the UK was the organizational structure in Her Majesty's Treasury, the Infrastructure Delivery Team. This structure consisted of a PPP Policy Team responsible for strategic direction of PPP policy. The Policy Team provided advice to top government officials. Assurance Team monitoring to ensure that deals were well structured commercially. Infrastructure Delivery Team charged with effective delivery of infrastructure projects**.** Infrastructure Finance Team ensured funding for the PFI projects across all sectors of the economy including transportation (European PPP Expertise Center, 2012)**.** The purpose of this structure was to support prioritization, planning, and enabling effective delivery of infrastructure in the United Kingdom (European PPP Expertise Center, 2012).

Finally, the main conclusion from this review is that PFIs in the UK were a classic form of PPPs (Hodges & Mellett, 2012) and were embedded in the fabric of the infrastructure development plan.

Public-Private Partnerships in Australia

Beh (2015) examined PPP practices across Australia and noted the renaming of the old Department of Transport and Regional Services (DoTARS) by the then-Prime Minister Kevin Rudd's government in 2007. The department is now called the Department of Infrastructure, Transport, Regional Development, and Local Government, a move Beh suggested sent a clear message to the country and technocrats of a new vision for the department. Beh argued to make PPP most efficient, both the private and public sectors should operate within their areas of comparative advantage. The private

sector should concentrate on funding and superior technical expertise, whereas the Australian government should improve bidding and evaluation processes and create a national market for PPP (Maguire & Malinovitch, 2004).

The Sydney Harbor Tunnel was an infrastructure project completed through PPP initiatives in Australia. The tunnel opened in August 1992 following 4 years of construction at a cost of 408 million USD (Parliament of New South Wales, 2017). This tunnel was conceived as an alternative vehicular crossing of Sydney Harbor to reduce congestion on the Sydney Harbor Bridge. The project was a classic PPP between the government of New South Wales and private sector entities. The project agreement was for 30 years and included maintenance and revenue collection.

English (2006) divided PPP in Australia into two eras: pre-2000 and the period beginning in 2000 that led to the creation of Partnerships Victoria. The establishment of Partnerships Victoria was significant for three reasons. First, it provided a broader understanding of PPPs by accepting the term "public–private partnerships," which allowed the inclusion of various PPP models that had been separately designated with other acronyms (English & Guthrie, 2003). Second, Partnerships Victoria removed the delivery of state-subsidized hospital and corrective services from the private sector in favor of PPP agreements. Finally, the State of Victoria started working on a wide range of PPP-specific mechanisms. These mechanisms, it should be pointed out, were modelled after the United Kingdom's private finance initiative (PFI). Specifically, these referred to certain procedures on pre-contractual decision-making prior to contract signing, and strict oversight of both construction and operating phases (English, 2005). A significant development in Australian PPP occurred in 2005 when the federal and state governments

settled on a joint harmonization approach to PPP implementation and development. Two PPP models have been adopted in Victoria. The model patterned after the UK's PFI allowed government agencies to provide core public services, whereas private sector partners handled ancillary services. The main characteristics of this model allowed governments to assume demand risk, pay for services, and a guaranteed stream of revenues. The second PPP model, used for infrastructure development such as toll roads, transferred revenue risk to the private sector consortium with no direct government guarantees (English, 2006).

The core reasons for adopting the PPP model in Victoria and, by extension, all of Australia were the transfer of substantial risk to the private sector and the assurance of cost savings, which must be reflected in the evaluation of VfM before any agreement. The English (2006) study of Australian PPPs referred to a public sector comparator (PSC) used in Australia to determine if a PPP project would provide better cost savings via VfM compared to traditional public procurement options. English affirmed PSCs were based on estimated net capital and operating costs over project life and on the hypothetical provision of infrastructure calculated by net present cost. English suggested that beyond the primary objectives of cost savings and efficiency, there was a need for independent oversight to assure the proper use of both public resources and other nonmonetary elements. These nonmonetary elements included accessibility and provision of quality services, adequacy of facilities, achievement of objectives, and full compliance with stated terms in the agreement or contract. In the absence of independent oversight, the author concluded deep skepticism of PPP outcomes would linger (Hodge & Greve,

2007), and treasury departments could not be goal-setters, rule-makers, and evaluators of PPPs.

Again, missing from these reviews were, first, how to create the structure of private funding, and second, how the transportation subsector of the projects affected the overall PPP process in Australia.

Public-Private Partnerships in China

China was not left out in using PPP to meet its infrastructural needs. China embraced the BOT model to build and revamp infrastructure, primarily to attract foreign investors and lenders (Wang et al., 2000). Ownership and legal control of the project would be transferred back to the public sector after a certain period (Grimsey & Lewis, 2007). Private participation in the provision of public infrastructure could however be traced back to the 1980s (Ke, Wang, & Chan, 2009). Toward the end of the 1990s, the Chinese government was determined to clean up some illegal and unregulated projects and invested substantial amounts of treasury bonds into infrastructure. This move resulted in the termination of the first round of private investment (Shen et al., 2005).

However, China's PPP adventure faced challenges. Beh (2015) identified some challenges of PPP development in China including funding, difficulty in obtaining government approval, breach of contractual agreements, and a lack of regulations. Beh concluded that China, as a matter of priority, should establish regulatory agencies, unambiguous legislation, and fair exit mechanisms.

Public-Private Partnerships in South Korea

The Republic of South Korea turned to PPP to address infrastructure needs by passing The Private Capital Inducement Act, enacted on September 16, 1998, for

Infrastructure Development, enabling private infrastructure development (Park, 1998). Kim, Kim, Shin, and Lee (2011) gave an account of a more recent trend in public–private partnerships, especially for BOT in Korea. Kim et.al., (2011) reported that as of 1995, BOT accounted for just 0.5% of the total social overhead capital (SOC) investment; by late 2008, it had increased to 18.4% of total SOC investment.

Public-Private Partnerships in Other Asian Countries

The Japanese government exempted PFIs from the 5-year limitation placed on the central government from entering into new contracts in other sectors of the economy in order to boost infrastructure, beginning in 1999 (Akintoye, Beck, & Hardcastle, 2003). Enthusiasm about this form of PPP model among local governments increased due to budget shortfalls (Nakamura, 2000).

Stein (1994) highlighted Vietnam's involvement in BOT, supported by an amendment of the Foreign Investment Law in December 1992, which amended foreign investment and the BOT regulations. These legislative frameworks provided authorization for private sector entities to enter into partnerships or BOT agreements with public agencies of the government of Vietnam.

Taiwan successfully used PFI to deliver the Taiwan High-Speed Rail that opened in January 2007, after the country passed a law to support the injection of private-sector funding into the project in November 1994. Lu, Wu, Chen, and Lin (2000) divided projects in Taiwan into three broad categories: construction-stage projects, bidding-stage projects, and planning-stage projects. Such enthusiasm for injection of private-sector funding for infrastructure projects was not limited to Asian countries, but extended to governments across North America, Europe, and Africa. Ball (1999) opined that PPP was

viewed as a viable option that cut across many sectors, including transport-related projects and elsewhere.

This literature review clearly indicates that there was private sector participation in the development of infrastructure on the continent of Asia, which further affirmed PPP was truly a global phenomenon. It was also noteworthy that the People's Republic of China (world's second largest economy) had also embraced private participation to deliver on infrastructure needs since the 1980s (Ke et al., 2009). Data from China are therefore included as part of the analyses for this study.

Public-Private Partnerships in Africa

The increased demand for infrastructure and paucity of funds made the PPP model attractive to countries in the continent of Africa. Nigeria, Africa's largest economy, turned to the PPP option to address huge demand for infrastructure development (Nwangwu, 2016). While the majority of countries on the continent were not part of the developed economies, South Africa is a member of the G20. Countries in Africa were also involved in transportation-related projects with foreign private partners.

As noted by Osei-Kyei and Chan (2016), the PPP option for building infrastructure was gaining ground in developing regions as well. The authors examined three projects: the Lekki toll road concession project (Nigeria), N4 toll road (South Africa), and Port of Maputo (Mozambique). They highlighted policy implications for transport-related PPP projects that could enhance the effectiveness and increase success of future projects. Some of these policies were competent stakeholder management, which Chan, Lam, Chan, Cheung, and Ke (2009) noted should be a requirement for a successful public–private partnership. Other requirements were transparent and open

competitive bidding, effective management of toll fees, and massive participation by local investors. Figure 3 shows private participation investments in infrastructure projects among developing regions from 2010 to 2019:

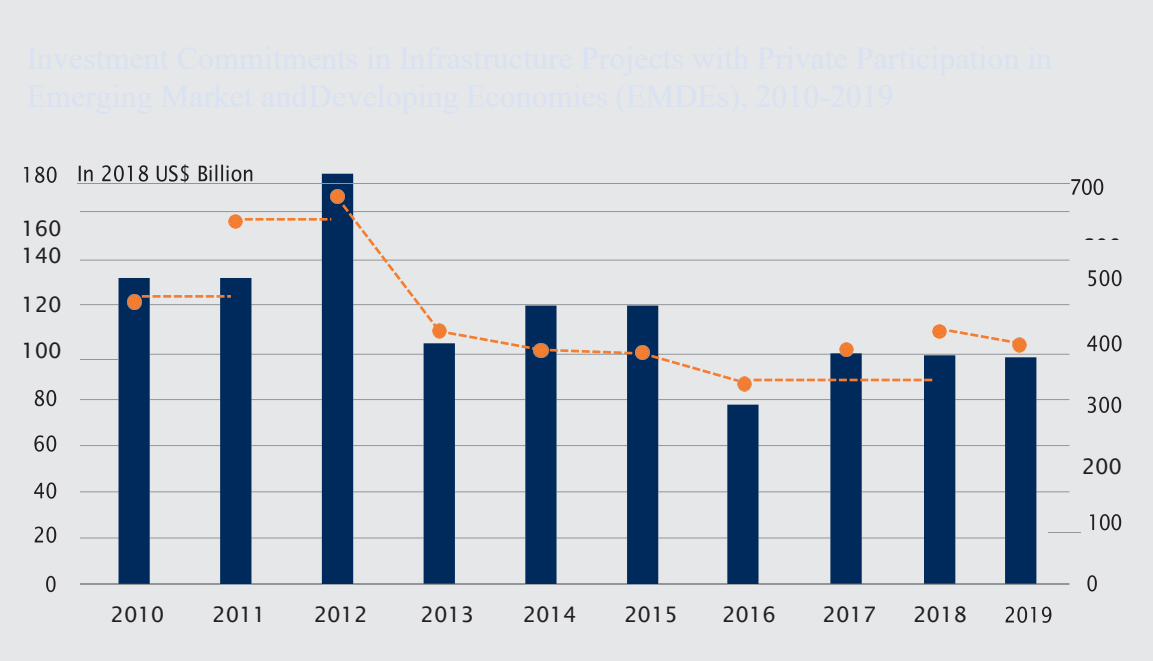


Figure 3. Private sector investments in infrastructure project among developing economies from 2010–2019. Copyright 2020 by World Bank. Reproduced with permission.

A World Bank Group report, *Private Participation in Infrastructure (PPI), 2019 Annual Report* showed there was a decrease in funding levels for projects in developing countries due to dampened investment climate in 2019. Investments in new PPP infrastructure projects in South Africa decreased to two in 2019 when compared to record high of 21 in 2018 (The World Bank, 2020). However, 2019 saw increased investment commitments in 62 countries when compared to 2018. It should be noted that two African countries, Sudan and Malawi, were beneficiaries of these investments in 2019 (The World Bank, 2020). Once again, the global attractiveness of PPP continues to grow also on the continent of Africa.

Public-Private Partnerships in the United States.

The history of private participation in infrastructure development in the United States is traceable to the beginning of the republic, but the term "public–private partnership" has only recently come into use. The strategy adopted by the government during the late 18th century was to leverage land assets for infrastructure projects through land franchises and grants for railroads and canals, among other projects (Papajohn, Cui, & Bayraktar, 2011). Private sector partnerships in the development of U.S. infrastructure projects in date as far back as late 1700s and include projects such as the Illinois Central Railroad, the New York City Subway, and Dulles Greenway in Virginia (Garvin, 2007).

As stated earlier, the Pacific Railroad, the first U.S. transcontinental railroad in was constructed in 1862 by the private sector, with public sector land as an enticement (Cooper, 2005). The Pacific Railroad is a 1,912-mile continuous railroad joining the eastern U.S. rail network at Council Bluffs, Iowa, to the Pacific Coast at Oakland Long Wharf on San Francisco Bay (Cooper, 2005). Subsequent routes were constructed, such as the Southern Pacific Railroad linking Atchison, Kansas to Los Angeles and the Denver and Rio Grande linking Denver to Grand Junction Colorado (Cooper, 2005).

Other examples are the Atlantic and Pacific Railroad linking Albuquerque to Los Angeles, the Northern Pacific Railway connecting Chicago with Seattle, and the California Southern Railroad, connecting San Diego Bay to Los Angeles (Myrick, 1990). Within the last 2 decades, transportation revitalization projects such as the Chicago Skyway and the Indiana Tollway, both involving multi-year lease agreements, brought the effects of these partnerships on the government and taxpayers to the fore. The Chicago Skyway project, originally costing $1.83 billion, signed a 99-year concession,

but was later resold to another private entity at $2.8 billion (Federal Highway Administration, 2020a). Similarly, the total cost of the Indiana Tollway project was initially put at $3.8 billion with a 75-year concession but also re-awarded to another set of private investors at $5.725 billion under a new 66-year agreement (Federal Highway Administration, 2020b). Despite the huge investments needed for the delivery of infrastructure, the popularity of PPPs as an option for alternative funding, continues to increase in the United States. However, it is imperative to point out that road users and taxpayers ultimately end up paying the costs through taxes or user fees (Lagle, 2019). It was therefore worth exploring the viability of private sector participation in PPPs for revamping aging infrastructure in the United States.

U.S. Public-Private Partnerships

Two articles addressed how PPPs have fared in various states within the United States. Papajohn, Cui, & Bayraktar (2011), employing a survey targeting state engineers, asked PPP-related questions to assess experience, type of PPP model used, rationale for picking the model, successes, financing mechanisms, effectiveness of communication, schedule of delivery, budget evaluation, risk, assessment of outcomes, and state legislative framework. Table 2 displays respectively levels of experience with PPPs.

Table 2.

Responses of States to Level of PPP Practices

Level of PPP Practices	States
Experienced with PPP	California, Connecticut, Florida, Minnesota, South Carolina, Texas, and Virginia.
Currently practicing PPP	Colorado, Nevada, and Washington.
Planning to start using PPP	Alabama, Arizona, Illinois, Kansas, Kentucky, Louisiana, Michigan, Missouri, Mississippi, North Carolina, New York, Pennsylvania, Tennessee, Vermont, and West Virginia.
Not planning to use PPP	Montana, North Dakota, Oregon, South Dakota, Utah, Wisconsin, and Wyoming
No response	Alaska, Arkansas, Delaware, Georgia, Hawaii, Idaho, Iowa, Indiana, Maine, Maryland, Massachusetts, Nebraska, New Hampshire, New Jersey, New Mexico, Ohio, Oklahoma, Rhode Island.

Note. From Papajohn, D., Cui, Q., & Bayraktar, M. E. (2011). Copyright 2011 by American Society of Civil Engineers. Reprinted with permission.

The implications from this research were significant for the following reasons. Based on the responses to the survey, only 10 states responded that they were experienced or currently using PPPs to develop their infrastructure, just 31% of the 32 respondents when the survey was conducted in 2011. Second, the top two reasons why states decided to opt for PPPs were cost savings and faster delivery of projects. The fiscal constraints faced by many states were neither new nor surprising and included rising debt and pension obligations, dwindling revenue, increasing public disgust with over-taxation, and a perceived drop in the quality of social services (Thurmaier & Willoughby, 2001). The imperative of fiscal prudence and the need to seek additional avenues for funding were logical explanations for why state officials were increasingly entering PPPs. Only 7 of the 32 responded (22%) to the survey by Papajohn et al. (2011) to place themeselves in the experienced category, those using PPPs as an alternative source of funding for delivery of their transport-related infrastructure.

Casady, Eriksson, Levitt, and Scott (2020) examined institutional maturity for infrastructure PPP under the public management paradigm known as the New Public Governance (NPG), using the U.S. PPP market as a case study. NPG simply referred to a 21st-century strategy for addressing delivery of public services (Waheduzzaman, 2019). Casady et al. (2020) developed a PPP model based on a framework proposed by Mahalingam, Seddon, Santosh, and Srinivasan (2011) that defined institutional maturity based on the three parameters of legitimacy, trust, and capacity.

- Legitimacy: This required governments at all levels to play leading roles in promoting the validility of a PPP option because it could serve as an alternative to the delivery of traditional infrastructure, since it involves private sector participation.
- Trust: Formal rules such as those that established relationship standards and procedures within government regulatory frameworks were needed to foster trust in PPPs. These rules enhanced effectiveness and transparency between the public and private sector partnerships.
- Capacity: The need for governments to develop lasting safeguards to ensure private entities focused on generating long-term, inflation adjusted returns on their investment, but also to understand delivery of infrastructure as part of civic responsibility.

These safeguards would assure citizens that public service would not be sabotaged by the private sector desire for profits (Forrer, Kee, Newcomer, & Boyer, 2007).

In assessing institutional maturity based within the U.S. PPP market (based on these parameters), Casady et al. (2020) identified some entrenched institutional barriers such as how states and county governments were constrained to operate under traditional procurement laws and regulations based on buyers/sellers rather than on partnerships (Martin, 2005).

Secondly, most of the significant capital projects such as the Interstate Highway Program and the Urban Mass Transportation Agency's urban mass transit programs of the 1970s, 1980s, and 1990s were funded using 90% federal and 10% local government dollars. This lopsided arrangement meant the states and local governments responsible for operations and maintenance of these infrastructure had little incentive politically to continue spending on maintaining existing capital projects over the long-term (Surowiecki, 2016). Based on the unbalanced funding model, politicians within the state and local jurisdictions would rather allow roads, bridges, and other infrastructure to deteriorate until the federal government allocated new funding to replace existing infrastructure (Bennon, Kim, & Levitt, 2017).

Finally, on the institutional barriers, Casady et al. (2020) identified tax exempt public bonds which disincentivized private investments in U.S. infrastructure via PPP. These bonds have traditionally favored government financing, operation, and maintainance of infrastructure. These barriers the authors argued, had negatively affected the legitimacy, trust, and capacity of PPPs with the United States.

Casady et al. (2020) concluded, despite the inherent challenges affecting the legitimacy, that trust and capacity within U.S. PPP continued to gain traction. Thirty-six states plus Puerto Rico and the District of Columbia have launched or closed at least one

PPP transaction since 2015 (Casady, Eriksson, Levitt, & Scott, 2018). States also continued to build capacity for their PPP programs directly through their departments of transportation, such as Florida and Texas. Other states, such as Virginia, California, Washington, Michigan, Oregon, Colorado, Georgia, and Indiana created agencies to enhance their PPP programs.

U.S. States With Enabling PPP Legislation

One way to assess states' openness to PPP as an option for meeting their transportation-related infrastructural needs, was to check for enabling PPP legislation in each state. Per the U.S. Department of Transport (2018), 36 states, the District of Columbia, and Puerto Rico had statutory frameworks for implementing transportation-related PPP projects. States with "broad legislation" were those with laws that did not limit the use of PPP procurement to certain types of projects or sponsoring agencies, while states with "limited legislation" had laws restricting the use of PPP to specific projects or projects sponsored by select agencies (U.S. Department of Transport, 2018). Table 3 indicates the states with and without enabling PPP legislation.

Table 3.

List of States With and Without PPP Legislation by the Federal Highway Administration, 2018

Broad Legislation	Limited Legislation	No Legislation
Arizona	Alabama	Hawaii
Colorado	Alaska	Idaho
Delaware	Arkansas	Iowa
Florida	California	Kansas
Georgia	Connecticut	Montana
Illinois	Minnesota	Nebraska
Indiana	Nevada	New Jersey
Kentucky	North Carolina	New Mexico
Louisiana	Tennessee	New York
Maine	Texas	North Dakota
Maryland	Utah	Oklahoma
Massachusetts	Vermont	Rhode Island
Michigan	Wisconsin	South Dakota
Mississippi	n=13	Wyoming
Missouri		n=14
New Hampshire		
Ohio		
Oregon		
Pennsylvania		
South Carolina		
Virginia		
Washington		
West Virginia		
n=23		

Source: U.S. Department of Transport. (2018).

Public-Private Partnerships and Cost Savings

As the private sector increasingly partnered with governments across the globe, including the United States', to deliver public infrastructure, a common metric used to evaluate the suitability or performance of PPPs has been potential cost savings. Lucyshyn, Vitale, and Steinhoff (2016) cautioned that despite increasing budgetary issues faced by governments at all levels, PPP should not be used as a silver bullet to solve endemic and chronic fiscal problems, and neither should PPPs be relied upon as a

permanent solution for investment decisions. Lucyshyn et al. suggested that PPP be used as a tool for managing risk, to spur innovation with the objective of cost control, and should never be viewed merely as a financing option.

There were significant financial risks associated with PPPs. For example, a survey conducted by Akintoye, Taylor, and Fitzgerald (1998) for selected clients and contractors found there was significant risk allocation involved for both public and private actors for most PPP projects. However, the expectation by the UK government was that all risks associated with a PFI would be shouldered entirely by the private sector. Lam (1999) stated that significant risks are associated with PFI or BOT projects throughout the construction and especially at the end of construction**.** Lucyshyn et al. (2016) also highlighted what they termed as inherent challenges to this new approach, a potential disruption of the old and tested order, which they argued threatened operational structure and diminished predictability.

Lucyshyn et al. (2016) also pointed out legal and regulatory constraints, noting one-third of U.S. states had no legal framework for PPPs (Table 3 supports their assertion) and suggested that even at the federal level, there was no specific legislation. Lack of legal framework constrained the use of PPPs under the Budget Enforcement Act of 1990 because it limited discretionary spending, and the pay-as-you-go process required legislative action on direct spending or revenues which would cut more deficit (Lucyshyn et al., 2016)**.** The Budget Enforcement Act created caps for discretionary spending caps that mandated any spending for certain programs must be deficit-neutral or deficit-reducing. For example, any additional spending on infrastructure would have to be offset by increased revenue or decreased spending elsewhere.

However, despite the risks and lack of national legislation, Akintoye, Beck, and Hardcastle (2003) affirmed that PPPs still offered significant cost reductions regardless of the model, either in the design-build or operational stages of the project. Hodge and Greve (2009), while alluding to the increasing popularity of PPPs, cautioned that findings on cost savings and effectiveness on PPPs were far from convincing and often ambiguous. They continued that there was a need for evidence-based learning and synthesis, and opined those assessments of PPPs were dubious, weak, and involved counterfactual evaluative design features.

Costs and Length of Contract

Cost-saving metrics have been used by researchers to gauge the effectiveness of PPP projects. Few studies linked project costs and the length of contract to funding levels transportation-related projects. Belay and Torp (2017) analyzed road projects to test whether a correlation existed between cost performance and length of contract on the schedule of delivery. The authors examined different sizes of road projects and found a negative correlation between the costs and schedule of delivery, and concluded that only a small fraction of longer projects (projects with the length of contracts with 10 or more years) showed relatively large cost deviations compared to smaller ones (those with a length of less than 10 years).

Chasey, Maddex, and Bansal (2012) used costs and schedule of delivery to evaluate how efficient PPP projects were in North America. Chasey et al. (2012) compared 12 completed PPP projects with traditional, publicly funded projects and concluded PPP projects had greater efficiency than traditional ones. Each of the PPP projects generated greater cost savings and was all delivered ahead of schedule compared

to those that were publicly funded. While the study focused on the effects of construction cost containment strategies, it did not account for the impact that any amendment or change to an initial contract had on a studied projects. This was perhaps a weakness, because a critical factor for any successful project (e.g., the potential effect of well-written specifications to minimize change orders and subsequent cost increases) was not considered.

Private Sector Participation

Private sector involvement with public infrastructure projects has historically been facilitated by governments through privatization or PPP policies. However, unlike privatization, where a publicly owned asset was permanently transferred, with the PPP approach, governments transfer ownership of an asset to private partners for a specified period of time. Kim (2015) defined PPP units as independent governmental or quasi-governmental entities**,** typically set up to provide preproject screening, prioritization, education, support, and expert advice to private entities wishing to participate in PPPs**.** These PPP units also served as a policy tool that provided greater clarity for public officials regarding on long-term implications of potential contractual agreements. A key goal of these contracts was to assure PPP contracts are in the public interest.

Levitt et al. (2019) listed Australia, Canada, China, India, and the United Kingdom as some of the major countries that have created PPP units. The authors suggested these countries were the first to advocate for a regional PPP unit as a tool to spur greater private sector participation in infrastructure delivery in the United States. Levitt et al. proffered two broad economic theories to support the impact of regional PPP units as a catalyst for more private sector participation in the delivery of infrastructure.

First, PPP contracts have typically been complex, usually with high transaction costs, which included costs for data collection on potential transactions, negotiation, and contract enforcement (Benham & Benham, 2010); therefore, PPP units consolidated expertise into a single unit removing unnecessary bottlenecks to the private sector to entering into a potential agreement. Second, these PPP units provided a greater level of assurance for potential private sector investors, reducing incentives for the government to engage in opportunism to renege on or renegotiate the original agreement. Infrastructure projects often required huge investments, that were usually irreversible, and limited to a specific location and purpose. PPP units, therefore, provided a framework that facilitated credible precommitment by both private and public partners, eliminating any potential areas of uncertainty and disagreement in the negotiated contract. This framework allowed a potential private investor to experience a degree of certainty that an agreement will not be renegotiated.

The race to attract more private sector participation for infrastructure delivery hinged on initiatives such as the PPP units described by Levitt et al. (2019). The main objective of this dissertation was to explore private sector participation in transport-related PPP projects and by extension, determine whether the structure of private-sector funding were statistically significant. Results from this study provided further incentive for greater private sector partnership in PPP for delivery of infrastructure.

Conclusion

In conclusion, PPPs are a global phenomenon embraced by governments with either developed or developing economies, primarily as a response to fiscal constraints, potential cost savings, technological innovations, and sometimes for timely delivery of

projects. This dissertation sought and determined whether there were statistically significant differences between projects that are: partially funded, substantially funded, and fully funded by the private sector.

Chapter III

METHODOLOGY

The purpose of this study was to examine the structure of private sector participation in completed transport-related private-public partnerships (PPP) projects in 12 G-20 countries (including the United States). The study's main goal is to provide a framework for future projects by comparing completed projects that are fully funded by the private sector, those substantially funded with more than half of the total investment by the private sector, and those partially funded with half or less of the total investment by the private sector. A secondary dataset was used for data analysis. The following research questions guided this study:

RQ1: To what extent, if any, is there a statistically significant difference in length of the contract based on whether a PPP project is fully, substantially, or partially funded by the private sector?

RQ2: To what extent, if any, is there a statistically significant difference in project costs based on whether a PPP project is fully funded, substantially, or partially funded by the private sector?

RQ3: To what extent, if any, is there a statistically significant difference in the length of the contract on the subsector of the transport-related PPP project?

RQ4: To what extent, if any, is there a statistically significant difference in the project costs on the subsector of the transport-related PPP project?

This chapter includes a discussion of the research method and design appropriate for the study. It will also include a detailed discussion of the secondary dataset as well as the data collection procedures involved in the study. Additionally, the details of the data analyses, procedures to address the research questions posed in the study, and variables involved in each analysis will be included. The chapter ends with a summary of the key points of the research methodology and ethical considerations of this study.

Research Method

A quantitative method was used to examine the structure of private sector participation in completed transport-related PPP projects in 12 G-20 countries, including the US. A quantitative approach was appropriate for the study because of the expected large amount of numeric data available from the secondary data source. A quantitative research method is appropriate for studies that entail a large amount of secondary data, such as when investigating project costs (Creswell, 2018; Lodico, Spaulding, & Voegtle, 2006).

Additionally, a quantitative methodology is effective while measuring the relationship between the type of variables under study (Creswell, 2018). The research questions focused on investigating potential relationships between variables such as length of contract and project costs, which are appropriate for quantitative studies (Bloomfield & Fisher, 2019). Prior studies that dealt with costs employed quantitative methods because costs were measured numerically as was length of contract. The numerical nature of costs and length of contract required the use of quantitative methods

to ensure an objective assessment of potential relationships between variables (Millea, Wills, Elder, & Molina, 2018). The quantitative method enables researchers to offer objectivity and numeric precision to generalize and replicate findings (Nardi, 2018), thus, the quantitative method was employed.

Quantitative methods are appropriate in examining relationships between variables (Balkin, 2014; Pruett & Absher, 2015). A quantitative method was appropriate for the study because secondary numeric data were used to determine the relationships between length of contract and project costs, as well as the type of project being fully funded, substantially, or partially funded by the private sector.

Research Design

A research design can be described as a framework of approaches and techniques used in integrating the different research constituents to answer a research question (Fellows & Liu, 2015). A quantitative, nonexperimental, comparative design was used to determine whether there were differences in the length of contract and project costs based on the type of PPP project being fully funded, substantially funded, or partially funded by the private sector as well as the subsector of the transport-related PPP project. The data were drawn from secondary sources such as the websites of Victoria State, Austrailian government (Partnership Victoria, 2010), the Canadian Council for Public-Private Partnerships (P3 Spectrum, 2020), New South Wales (NSW) government (New South Wales, 2020), United Kingdom's Private Finance Initiative and Private Finance (United Kingdom Government, 2018), U.S. Department of Transportation Federal Highway Administration (U.S. Department of Transportation, 2020), and the World Bank (2020).

This study was a nonexperimental quantitative study that did not require a manipulation of variables (Aggarwal & Ranganathan, 2019). The variables in this study were drawn from existing sources; thus, manipulation of participants or use of interventions were not involved. Moreover, the project data were compared based on existing characteristics of the projects. Therefore, the study was nonexperimental in nature.

This study was comparative because the focus was to examine the potential differences between variables. The independent variables in the study were:

a) the type of funding of PPP project and, b) transport subsector of the project. The PPP projects were classified as fully funded, substantially funded, or partially funded by private sector. The subsectors included airport, bridge, highway, transport facility, port, railroad, and road. The dependent variables were the length of contract and the project costs. The focus of the comparative study was to determine whether there were differences in length of contract and project cost based on the type of funding and transportation subsector.

A multiple linear regression was then conducted because there were more than one independent variable (Thomas & Thomas, 2017). Multiple regression was chosen for this study because it is an effective statistical method to develop a predictive model on how private-sector funding levels and transport subsector impacted contract length and project costs.

Target Population

The target population for this study was transport-related PPP projects within 12 G-20 countries (including the United States). The transportation sector was only a small

share of completed PPP projects around the world. Therefore, the population was 700 available cases. Selection was based on three criteria:

1) Data were collected from transportation-related projects completed between 1991-2019 from the following G-20 countries: Argentina, Australia, Canada, China, India, Mexico, Russia, South Africa, South Korea, Turkey, United Kingdom, and the United States. These 12 countries were chosen to be geographically diverse, and each had transport-related PPP data readily available.
2) The lengths of contracts for selected completed transport-related PPP projects were from 10–99 years. This represented the range of project duration for the vast majority of PPP projects (U.S. Department of Transportation, 2010).
3) Finally, for proper assessment of private sector participation in PPP projects, selection had to include every transportation subsector (airport, bridge, highway, port, rail, road, and other closely-related transportation facilities) and other types of PPPs, as defined in Chapter 1.

Based on these criteria, 700 completed transport-related PPP projects were retrieved from governmental sources, private sector websites, and scholarly articles. The disaggregration of the population of completed PPP projects selected from each country are displayed in Tables 4, 5 and 6.

Table 4.

Countries and Number of Cases

Country	Number of Projects
Argentina	24
Australia	20
Canada	40
China	170
India	210
Mexico	100
Russia	14
South Africa	6
South Korea	15
Turkey	31
United Kingdom	35
United States	35
Total (*N*)	700

Sources: Australian Victoria State government (Partnership Victoria, 2010), Canadian Council for Public-Private Partnerships (P3 Spectrum, 2020), New South Wales (NSW) government (New South Wales, 2020), United Kingdom's Private Finance Initiative and Private Finance, U.S. Department of Transportation, (U.S. Department of Transportation, 2020),and World Bank (World Bank, 2020).

Table 5.

Number of Cases Through Time (1990–2019)

Year of Project	Number of Projects
1990–1994	8
1995–1999	127
2000–2004	83
2005–2009	188
2010–2014	190
2015–2019	104
Total (*N*)	700

Sources: Australian Victoria State government (Partnership Victoria, 2010), Canadian Council for Public-Private Partnerships, New South Wales (NSW) government, United Kingdom's Private Finance Initiative and Private Finance (United Kingdom Government, 2018), U.S. Department of Transportation, (U.S. Department of Transportation, 2020), and World Bank (World Bank, 2020).

Finally, from the same sources, the table below shows contract lengths in years.

Table 6.

Number of Cases and the Length of Contract (In Years)

Length of Contract (In Years)	Number of Cases
10–19	69
20–29	261
30–39	284
40–49	12
50–59	61
60–69	1
70–79	5
80- 89	0
90–99	7
Total (*N*)	700

Sources: Australian Victoria State government (Partnership Victoria, 2010), Canadian Council for Public-Private Partnerships (P3 Spectrum, 2020), New South Wales (NSW) government (New South Wales, 2020), United Kingdom's Private Finance Initiative and Private Finance, U.S. Department of Transportation, (U.S. Department of Transportation, 2020),and World Bank (World Bank, 2020).

Data Collection Procedures

The data collected in the study were from secondary sources. As stated earlier, the data collected for this study were mostly from the following websites: Australian Victoria State government (Partnership Victoria, 2010); the Canadian Council for Public-Private Partnerships (P3 Spectrum, 2020); NSW government (New South Wales, 2020); United Kingdom's Private Finance Initiative and Private Finance (United Kingdom Government, 2018); U.S. Department of Transportation (2020); and World Bank (2020). The websites include publicly available data used in the study. However, Institutional Internal Review Board (IRB) exemption was obtained (see Appendix A) to ensure that handling of data adhere to ethical standards and would not violate any laws from any of the 12 countries. Data sources for the 700 cases are presented in Table 7, which also displays the data sources employed for each country.

Table 7.

Data Sources

Country	Sources of Data
Argentina	World Bank (World Bank, 2020).
Australia	Victoria State Government (Partnership Victoria, 2010). Plenary–an independent long-term investor and manager of public infrastructure (Plenary Group, 2018). Amber Infrastructure Group–an international infrastructure investment manager (Amber Infrastructure Group, 2020). New South Wales (NSW) Government (New South Wales, 2020). Tunnel Talk News (Tunnel Talk, 2013). CUTS Institute for Regulation & Competition (CIRC)–not for profit and independent research and capacity building Organizations active in sustainable infrastructure including PPPs (CUTS Institute for Regulation & Competition - CIRC, 2013).
Canada	Canadian PPP Projects (P3 Spectrum, 2020).
China	World Bank (World Bank, 2020).
India	World Bank (World Bank, 2020).
Mexico	World Bank (World Bank, 2020).
Russia	World Bank (World Bank, 2020).
South Africa	World Bank (World Bank, 2020).
South Korea	Private Partnerships in Korea (Kim, 2011). Public–Private Partnership Infrastructure Project: Case Studies from the Republic of Korea (Kim, Kim, Shin, & Lee, 2011). Korea's Case of Public Private Partnerships for Infrastructure Development (Yoo, 2010). Uijeongbu Light Rail Transit (Railway Technology, 2018).
Turkey	World Bank (World Bank, 2020).
United Kingdom (UK)	United Kingdom Government – Private Finance Initiative and Private Finance (United Kingdom Government, 2018).
United States (U.S.)	U.S. Department of Transportation (U.S. Department of Transportation, 2020), Federal Highway Administration (Federal Highway Administration, 2020a), (Federal Highway Administration , 2020b).

Sources: Australian Victoria State government (Partnership Victoria, 2010), Canadian Council for Public-Private Partnerships, New South Wales (NSW) government, United Kingdom's Private Finance Initiative and Private Finance (United Kingdom Government, 2018), U.S. Department of Transportation, (U.S. Department of Transportation, 2020), and World Bank (World Bank, 2020).

Operationalization of Data

The variables involved in the study were operationalized based on several criteria. Private sector participation rate was the percentage of the total funding put into a PPP project by private entities (Levitt et al., 2019). The independent variables included in the statistical analysis consisted of the private sector participation rate and subsector for each project. The dependent variables consisted of the length of the contract and project costs. The control variables were LIBOR, change in GDP, IMF global ranking, economic score, inflation rate, accountability, government effectiveness, political stability regulatory quality, rule of law, and environmental factor. The reasons each control variable was selected and deemed important are provided later in this chapter under three sections– economic, investment, and environmental factors.

Independent Variables

All PPP projects had a distinct characteristic: they always involved a partnership between one or more units of government and the private sector to provide public services. As stated earlier, the independent variable was the private sector participation rate. It should be noted, this rate could either be direct in terms infusion of cash or credit from either party or could be indirect such as tax incentives from the government or it could involve logistical support, which included but was not limited to human expertise, technological innovation, and provision of land. Table 8 shows the definition of the categories of private sector participation rates.

Table 8.

Definition of Private Sector Participation Rates

Categories of Private Sector Participation Rates	Definition
Partially Funded	Less than 50% of private-sector funding
Substantially Funded	51%–99% of private-sector funding
Fully Funded	100% of private-sector funding

For proper delineation during data analysis and to distinctively analyze these three categories, private sector participation rates for selected PPP projects were labeled as fully funded (dummy coded as 3), substantially funded (dummy coded as 2), or partially funded (dummy coded as 1).

The second independent variable was the subsector of a PPP project. The following were the subsectors included in the data collection for this study: airports, bridges, highway, ports, rail, road, and other transportation facilities, including but not limited to train and ticketing stations.

Dependent Variables

The first dependent variable was length of the contract, referring to a legally binding agreement that ranged from 10–99 years, where the private sector was expected to realize profits. The second dependent variable was project cost (i.e., the total amount spent on the PPP project). Costs for all selected projects were measured in millions of USD. A small percentage of the data was not reported in USD. In these cases, the annual average historical exchange rates for the year the projects were completed, were used to convert Canadian, Australian, British, and Korean currencies to USD. The historical exchange rates (with data on exchange rates as far back as 1953) were generated using

the Fxtop currency converter (Fxtop, 2020). These conversions were normalized into real or constant USD costs after adjustment for inflation. Length of the contracts were all measured in whole years.

Control Variables

Control variables were divided into three groups of potential factors that might affect private-sector funding on selected PPP projects: economic factors, investment climate factors, and regions.

Economic Factors

There are some economic factors that might affect return on investments in the delivery of transport projects by private companies in any country, and potentially determine the success of any PPP projects (Lourdes, Federico, Francisco Javier, & Casiano, 2018), such as interest rates, GDP, IMF global ranking, measure of capitalism, and national inflation rates. These factors could affect whether a private institution provided funding and the level of investment given to a transport-related PPP project. These variables are elaborated upon below.

LIBOR: An international benchmark interest rate that determines borrowing costs between banks (Bankrate, 2020). Private-sector funding in the delivery of transportation-related infrastructure included financing options from banks and other financial institutions. Bickerton and Gruneberg (2013) examined the impact of changes in LIBOR rates on some UK construction projects and noted how wholesale interest rates affected these projects. Bickerton and Gruneberg concluded that banks' lending to developers depended on risk management, retail interest rates, and expectations of return on investments. To determine any potential impact on transport-related PPP projects across

the 12 G20 countries, average annual LIBOR interest rates for the year each project was executed were included in the analysis. The Macrotrends (2020) website provided historical chart for the LIBOR rates used for this study.

GDP: The GDP (real GDP) is the market value of finished goods and services produced in a country's geographical boundary in a year. It is a measure of a country's economic health. The GDP also gives an approximate size of the economy. The annual percent change in GDP of the countries in which the projects were executed was another control variable for this study. Data were retrieved from the St. Louis Federal Reserve Bank (St. Louis FED, 2020).

IMF Global Ranking (Nominal GDP): While the real GDP measures the monetary value of goods and services, it does not capture current market prices. The IMF global ranking of countries, also known as the "nominal GDP," however, gives value of finished goods and services adjusted to the rate of inflation. The nominal GDP was another control variable used to test how this value might have affected private sector participation in PPPs. Data were retrieved from the World Population Review (2020b).

Economic Freedom Score: Capitalism is an economic system in which a country's trade and industry are mostly controlled by private entities, rather than the government. While no country can fully be a capitalist economy, a measure based on comparison of economies is available from the World Population Review (2020a). This ranking, known as the economic freedom score, was one of the control variables used to test the effect of the degree of openness in national economies.

Inflation Rate: The percentage change in inflation annualized. While the nominal GDP adjusts value of finished goods and services to the rate of inflation, the rate of

inflation is the percent change in the consumer price index (CPI). The average CPI was a measure of a country's average level of prices based on the cost of a typical basket of consumer goods and services at a given period (Kokoski, 2000). The data source for the inflation rates was the International Monetary Fund (IMF) website (2020).

Investment Climate Factors

Investment climate factors are specifically related to the unique investment climate in each country. The variables used here were accountability, political stability, government effectiveness (e.g., the time or monetary cost of different bottlenecks such as days to clear goods through customs), regulations, legal permits, or approval to build, and the rule of law (Dollar, Hallward-Driemeier, & Mengistae, 2006). The investment climate in each of these countries was a potential factor that might affect private sector participation in transport-related PPP projects. Melitz (2003) stated that investment climate affected the threshold levels of productivity in a country. The selected country's accountability, political stability, government effectiveness, regulatory quality, and rule of law were also included as control variables. Data for these variables were developed by the Worldwide Governance Indicators (WGI) project and were retrieved from the World Bank website (World Bank Group, 2020). All data were reported using the range of -2.5 (weak) to 2.5 (strong).

Accountability: This "reflects the extent to which a country's citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and a free media" (Kaufmann, Kraay, & Mastruzzi, 2011, p. 4). Annual estimate*s* of accountability which ranged from approximately -2.5 (weak) to 2.5 (strong)

were provided for each country (p. 12). The potential effect of this factor for all selected PPP projects was tested in the analyses.

Political Stability: This measures "the likelihood of political instability and/or politically motivated violence, including terrorism in a country" (Kaufmann et al., 2011, p. 4). Political stability can spur economic growth and enhance completion of infrastructure projects. In times of economic prosperity, the private sector invests in various sectors, including transportation. An annual estimate of political stability which ranged from approximately -2.5 (weak) to 2.5 (strong) was included in the analyses (p. 12).

Government Effectiveness: These are "the quality of public services, the quality of the civil service and the degree of civil service independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies" (Kaufmann et al., 2011, p. 4). Similarly, an annual estimate of government effectiveness for each country which ranged from approximately -2.5 (weak) to 2.5 (strong) was tested to determine if there was an effect on private sector participation for the selected projects (p. 12).

Regulatory Quality: This reflects 'the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development" (Kaufmann et al., 2011, p. 4). A significant risk to private sector investment in a transportation project is regulatory risk (Bitsch, Buchner, & Kaserer, 2010). The estimate of the quality of regulatory governance which ranged from approximately -2.5 (weak) to 2.5 (strong) was also one of the control variables (p. 12).

Rule of Law*:* This reflects "the extent to which agents have confidence in and abide by the rules of society, and in particular contract enforcement, property rights, police, and the courts, as well as the likelihood of crime and violence" (Kaufmann et al., 2011, p. 4). Private companies pay special attention to rule of law in a country, before entering in any partnership to determine if there is a strong legal recourse in case of disputes or contract breaches. To test this factor, an annual estimate of government effectiveness for each country where the projects were located was selected. It ranged from approximately -2.5 (weak) to 2.5 (strong; p. 12).

Per Kaufmann et al. (2011), all the data reported under investment climate were developed using a statistical tool known as an unobserved components model (UCM) to construct a weighted average of the individual indicators for each source. The UCM assigns greater weight to data sources that tend to be more strongly correlated with each other. While this weighting improves the statistical precision of the aggregate indicators, it typically does not affect very much the ranking of countries on the aggregate indicators. The composite measures of governance generated by the UCM are in units of the standard normal distribution, with mean zero, standard deviation of one, and ranging from approximately -2.5 to 2.5, with higher values corresponding to better governance (p. 12).

Regions

Koetse and Rietveld (2009) examined the effect of regions on the transport sector and asserted location had impact on transportation projects. Dasgupta, Laplante, Meisner, and Wheeler (2007) analyzed the impact of weather patterns in four areas: Africa, Asia, Latin America (South America), and Caribbean (sub-region North America). They found

clear differences in these locations. The projects studied herein were from six continents, coded as follows: Africa 1, Asia 2, Europe 3, North America 4, Oceania 5, and South America 6.

Table 9 provides the summary of the variables for this study.

Table 9.

Summary of Variables

Independent Variables	Dependent Variables	Control Variables
Private-sector Funding Level	Length of Contract	Change in LIBOR
Transport Subsector	Project Costs	Change in GDP
		IMF Global Ranking
		Economic Freedom Score
		Inflation Rate
		Accountability
		Political Stability
		Government Effectiveness
		Regulatory Quality
		Rule of Law
		Region

Data Measurement Type

There are basically three levels of measurements for variables: categorical, ordinal, and continuous (Campbell, 2016). A categorical variable is used to categorize attributes that are being measured, and there is no intrinsic ordering of these categories (e.g., the environmental factor above categorized into the six continents. Each continent was assigned a number with no intrinsic magnitude to these categories. However, when the order of the values of the variable was significant, such as the three categories of private sector participation employed in this study (i.e. partially funded, substantially funded, and fully funded), the variables are then referred to as "ordinal" (Campbell, 2016). Continuous variables are numeric; differences between values are important. Interval and ratio levels of measurement are sometimes called "continuous" (Campbell,

2016). Interval scales are numeric scales in which the exact difference between the values matters (e.g., the order on a scale without an absolute zero such as the GDP variable in this study). Ratio scales are similar to interval scales with a clear definition of zero (e.g., length of the contract, project cost).

Levels of Measurement and Categories for Each Variable

The following includes detailed information about the transport-related PPP projects from the 12 G-20 countries ($N = 700$), specifically, the control variables: region, each country's accountability, political stability, regulatory quality, rule of law, government effectiveness, nominal GDP, change in LIBOR, change in GDP, economic freedom score, and rate of inflation. The dependent variables consisted of the length of contract (years) and project costs (U.S. dollars). In addition, an overview of key independent variables of interest will be provided: Private-sector funding Levels [1 = Partially Funded, 2 = Substantially Funded, 3 = Fully Funded] and Sub Sector [1 = Airport, 2 = Bridge, 3 = Highway, 4 = Port, 5 = Rail, 6 = Road 7 = Transport Facility].

The levels of measurement and categories/range for each variable are displayed in Table 10.

Table 10.

Levels of Measurement and Categories for Each Variable

Variable	Level of Measurement	Categories/Range
Accountability	Continuous	Weak to Strong [- 2.5 to 2.5]
Political Stability	Continuous	Weak to Strong [- 2.5 to 2.5]
Government Effectiveness	Continuous	Weak to Strong [- 2.5 to 2.5]
Regulatory Quality	Continuous	Weak to Strong [- 2.5 to 2.5]
Rule of Law	Continuous	Weak to Strong [- 2.5 to 2.5]
Private-sector funding Levels	Ordinal	Partially Funded, Substantially Funded, Fully Funded
IMF Global Ranking	Continuous	1 -211
Economic Freedom Score	Continuous	0–100
Inflation Rate	Continuous	Percent (0%–100%)
Project Costs	Continuous	Natural Numbers (1, 2, 3 . . .)
Length of Contract (years)	Continuous	10–99
Change in LIBOR	Continuous	Percent (0%–100%)
Change in GDP	Continuous	Percent (0%–100%_
Sub Sector	Categorical	Airport, Bridge, Highway, Port, Rail, Road, Transport Facility – "Other"
Region	Categorical	Africa, Asia, Europe, North America, Oceania, and South America

The descriptive statistics that were generated are presented as frequency tables for all categorical measures included in this study. Also, measures of central tendency and variability are reported for all continuous items of interest. Measures of central tendency calculated and reported are mean and median, while the standard deviation, range, and minimum and maximum values are reported as measures of variability.

Multiple Linear Regression

Linear regression is a statistical tool that can be used to quantify, summarize, and study relationships between two or more variables (Thomas & Thomas, 2017). As stated

earlier, when there is greater than one independent variable, like in this study, then multiple regression should be employed (Thomas & Thomas, 2017).

The following assumptions were tested in a multiple linear regression:

1. There is a linear relationship between a dependent variable and every independent variable. It also assumes a linear relationship between a dependent variable and all independent variables, collectively. Scatter plots easily test linearity between these variables (Thomas & Thomas, 2017).
2. Multicollinearity arises when there is a correlation between independent variables. The assumption for a multiple linear regression is that independent variables are not highly correlated. To check multicollinearity, the variance inflation factor (VIF) of a linear regression must be less than 10. If VIF is greater than 10, there may be multicollinearity. The results would then be checked against VIF and the correlation matrix (Thomas & Thomas, 2017).
3. Finally, any error between what is observed and the predicted values should be normally distributed. According to the Shapiro-Wilk normality test, normality can be checked with the goodness of fit test on residuals of the regression (Maharjan, 2017).

Based on the purpose and the research questions posed in the study, a quantitative, nonexperimental, comparative study was deemed as the most appropriate to use.

Research Hypotheses

Four hypotheses were developed for this study. Each of these hypotheses is presented here in both null and alternative forms.

Hypothesis 1_0. There is no statistically significant difference in length of the contract based on whether a PPP project is fully, substantially, or partially funded by the private sector.

Hypothesis 1_A. There is a statistically significant difference in the length of the contract based on whether a PPP project is fully, substantially, or partially funded by the private sector.

Hypothesis 2_0. There is no statistically significant difference in project costs based on whether a PPP project is fully funded, substantially, or partially funded by the private sector.

Hypothesis 2_A. There is a statistically significant difference in project costs based on whether a PPP project is fully funded, substantially, or partially funded by the private sector.

Hypothesis 3_0. There is no statistically significant difference in the length of the contract on the basis of the subsector of the transport-related PPP project.

Hypothesis 3_A. There is a statistically significant difference in the length of the contract on the basis of the subsector of the transport-related PPP project.

Hypothesis 4_0. There is no statistically significant difference in the project costs on the basis of the subsector of the transport-related PPP project.

Hypothesis 4_A. There is a statistically significant difference in the project costs on the basis of the subsector of the transport-related PPP project.

Hypothesis 1 posited that the length of the contract would be correlated with private-sector funding, the subsector of the PPP project, the LIBOR rate, change in GDP, the economic freedom score, nominal GDP, and the rate of inflation,

accountability, government effectiveness, political stability, regulatory quality, rule of law, and the environmental factor.

The second hypothesis posited that there would be a correlation between project costs and private-sector funding, the subsector of the PPP project, the LIBOR rate, change in GDP, the economic freedom score, nominal GDP, the rate of inflation, accountability, government effectiveness, political stability, regulatory quality, rule of law, and the environmental factor. The null hypothesis posited that the project costs and this same set of measures would not be significantly associated.

Hypotheses 3 and 4 further examined group differences. Hypothesis 3 posited that there was a statistically significant difference in the length of the contract on the subsector of the transport-related PPP project, with the associated null hypothesis positing that there would be no statistically significant difference. As opposed to length of the contract, Hypothesis 4 instead examined project costs, while both hypotheses incorporated the same set of control measures.

Data Analysis Plan

To test all four null hypotheses, multiple linear regression analyses were conducted. In relation to the first two null hypotheses, these models served to test whether the length of the contract and project costs, hypotheses 1 and 2, respectively) were different between private-sector funding categories and the subsector of the PPP project, considering the control variables of the LIBOR rate, change in GDP, the economic freedom score, nominal GDP, the rate of inflation, accountability, government effectiveness, political stability, regulatory quality, rule of law, and the environmental factor.

With respect to the third and fourth null hypotheses, this same method was used to examine significant differences in the length of the contract and project costs on the subsector of the transport-related PPP project in relation to hypotheses 3 and 4, respectively. The same controls were examined here as was proposed to be included in the models testing null hypotheses 1 and 2. All categorical predictors were recoded into a series of dummy variables and included in all regression models as dummy variables, with one category omitted in each analysis to serve as the comparison category. The effects relating to all included dummy measures were then compared with the omitted comparison categories. In addition, to account for the clustered nature of the data on the basis of country, all regression models were run clustering standard errors on the basis of country.

The assumptions of linear regression analysis were tested prior to conducting the analyses. The assumptions, including linearity and the lack of influential outliers, were tested using scatterplots, whereas multicollinearity was tested through the use of variance inflation factors, and normality of the errors was examined through the use of histograms, normal quantile-quantile plots, and detrended quantile-quantile plots.

Ethical Considerations

Boeck and Durif (2014) revealed that ethical considerations have increasingly become one of the fundamental aspects of a research study as issues are prone to arise during the study. The researcher undertook various steps before proceeding with data collection. All data involved in the study were public domain secondary data drawn from public websites. Using public and archived data did not require permission from the institutions studied. Although the internal accuracy of the reported and archived

information cannot be confirmed, there is a regulatory requirement for honesty in reporting accurately all the data retreived. No potential ethical concerns existed in this study because there was no possibility of harm or violation of confidence (Thakur & Lahiry, 2019). No names or private information of any individuals in the data were used, and no laws were violated. All data was stored in a password-protected computer owned by the researcher. Moreover, all data will only be used for the purpose of this study. Data will be deleted 5 years after the completion of the study.

Chapter IV

RESULTS

In this chapter, the results of the analyses conducted for this study are presented and discussed. The results include descriptive statistics consisting of sample sizes and frequencies associated with all categorical measures included in this study, along with measures of central tendency and variability associated with all continuous measures being calculated and reported. Following this, a series of four multiple linear regression analyses are reported to test this study's four null hypotheses. Finally, a summary is presented which includes a discussion of the results of the hypotheses tested.

Descriptive Statistics

This section describes the characteristics of the data in this study. First, as a reminder, the subsector (one of the independent variables for this study) is airports, bridges, highways, ports, rail, road, and other transport facilities. Other transport facilities are a set of intermodal infrastructures that provide an interface between transport modes, enabling passengers and/or cargo to transit (Preston, 2020), such as highway rest areas, parking areas, train, and ticket stations. Other examples are runways, cranes, and transportation warehouses not operated by airport or port authorities (Preston, 2020). Only 696 of the 700 cases were eventually used for this study, with four outlying cases deleted prior to the regression analyses being conducted.

Table 11 presents the sample sizes and percentages of responses associated with the subsectors included in this study. The most frequent response was “transport facility,” which included approximately 61% of the sample, with “rail” constituting approximately 16% of the population. “Airport” and “road” subsectors accounted for 8.5% and 7.5% of the sample respectively, with all other categories representing less than 4% each.

Table 11.

Frequencies and Percentages of Categorical Measures for Subsector

Measure/Category	*N*	%
Subsector		
Transport Facility	425	61.1%
Rail	110	15.8%
Airport	59	8.5%
Road	52	7.5%
Highway	25	3.6%
Bridge	20	2.9%
Port	5	0.6%
Total (*N*)	696	100.0%

Table 12 shows the IMF ranking for the 12 countries from which the PPP projects for this study were collected. The IMF ranking employs nominal GDP to rank countries by measuring the value of finished goods and services adjusted to the rate of inflation ranging from 1–211, with 1 being the highest rank. The United States held a rank of 1 at the time of the study (World Population Review, 2020b).

Table 12.

Frequencies and Percentages of Categorical Measures for IMF Ranking by GDP

Measure/Category	*N*	%
IMF Ranking by GDP		
1 - United States	35	5.0%
2 - China	170	24.4%
5 - United Kingdom	35	5.0%
7 - India	210	30.2%
10 - Canada	40	5.7%
11 - South Korea	15	2.2%
12 - Russia	14	2.0%
14 - Australia	20	2.9%
15 - Mexico	100	14.4%
18 - Turkey	28	4.0%
26 - Argentina	24	3.4%
38- South Africa	5	0.8%
Total (*N*)	696	100.0%

Source: World Population Review. (2020b).

The most common response consisted of a rank of 7 (India), with these cases comprising slightly above 30% of the sample. Following this, cases with a ranking of 2 (China) accounted for slightly above 24% of the sample, with this followed by a ranking of 15 (Mexico), which composed slightly above 14% of the sample. Close to 6% of the sample had a ranking of 10 (Canada), with 5% each having a ranking of 1 (U.S.) or a ranking of 5 (UK). All remaining categories of response (South Korea, Russia, Australia, Argentina, and Turkey) each composed 4% or less of the sample. Tables 13 and 14 present frequencies and percentages of categorical measures for the region and funding levels for this study.

Table 13.

Frequencies and Percentages of Categorical Measures for Region

Measure/Category	*N*	%
Region		
1-Africa	5	0.7%
2-Asia	395	56.8%
3-Europe	77	11.1%
4-North America	175	25.1%
5-Oceania	20	2.9%
6-South America	24	3.4%
Total (*N*)	696	100.0%

Table 14.

Frequencies and Percentages of Categorical Measures for Funding Levels

Measure/Category	*N*	%
Private-Sector Funding Levels		
Partially Funded	84	12.1%
Substantially Funded	216	31.0%
Fully Funded	396	56.9%
Total (*N*)	696	100.0%

The majority of cases, close to 57% of the sample, were from Asia, with slightly above 25% from North America. European cases comprised slightly above 11% of the sample, with Africa, Oceania, and South America each composing less than 4% of the sample. Finally, regarding private-sector funding levels, close to 57% of these cases were fully funded (100%) by the private sector, with 31% being substantially funded (51%–99%), and slightly above 12% partially funded (50% and less).

Table 15 presents the measures of central tendency and variability associated with the continuous variables included in this study. Means and medians are presented along with measures of variability–standard deviation, minimum and maximum scores, and range. The variables examined here are contract length, percent private, percent public,

total investment, total investment adjusted for inflation, total investment adjusted for inflation (Johnson transformed).

Table 15.

Measures of Central Tendency and Variability on Continuous Measures

Measure	Scale	Mean	Median	*SD*	Range	Min.	Max.
Contract Length (years)	10–99	29.23	30.00	12.24	89.00	10.00	99.00
Percent Private	0–100	84.49	100.00	22.71	88.00	12.00	100.00
Percent Public	0–100	15.42	0.00	22.58	88.00	0.00	88.00
Total Investment	Continuous	444.96	170.50	735.81	6881.60	0.40	6882.00
Total Investment (Adjusted for Inflation)	Continuous	542.18	219.05	873.68	7273.67	0.60	7274.27
Total Investment (Adjusted for Inflation–Johnson Transformed)	Continuous	0.31	0.15	0.60	2.83	-0.46	2.37
GDP	Continuous	5.53	5.90	3.56	25.10	-10.90	14.20
LIBOR	0–100	3.20	2.76	2.09	7.89	0.56	8.45
Economic Freedom	0–100	62.40	58.40	8.61	28.70	52.20	80.90
Inflation Rate	0–100	5.59	4.00	4.96	36.50	-1.40	35.10
Accountability	-2.5 to 2.5	0.04	0.40	0.99	3.35	-1.75	1.60
Government Effectiveness	-2.5 to 2.5	0.38	0.12	0.70	2.74	-0.73	2.01
Political Stability	-2.5 to 2.5	-0.42	-0.50	0.75	3.41	-2.01	1.40
Regulatory Quality	-2.5 to 2.5	0.20	-0.23	0.76	2.97	-0.92	2.05
Rule of Law	-2.5 to 2.5	0.15	-0.07	0.81	2.80	-0.88	1.92

Note. N = 696. All Total Investments (i.e., including those adjusted for inflation and transformed) are in millions of USD.

Transformation of variables plays a key role in regression analysis (Cook & Weisberg, 1999). The Johnson (also known as Yeo-Johnson) transformation is a useful parameter in statistical analysis for selecting transformation procedures for linearity or normality (Yeo & Johnson, 2000). Johnson transformations are well-established tools to transform variables whose distribution are skewed to a more normal distribution (Raymaekers & Rousseeuw, 2021).

The total investment adjusted for the inflation variable was not normally distributed, so the Johnson transformation tool was used to uphold the assumptions of linear regression. Due to the skewness in the total investment adjusted for the inflation variable, the Johnson tool (mathematical algorithm) was applied before the regression analysis to reduce the skewness and to get the distribution of the data to approximate normality. Total investment (adjusted for inflation, Johnson transformed) was therefore included in Table 15. The other control variables included in the study are GDP, LIBOR, economic freedom, inflation rate, accountability, government effectiveness, political stability, regulatory quality, and rule of law.

Differences between the mean and median values were found to be very similar for some variables with nonnormal distribution due to skewness. Variance changed substantially from variable to variable, indicating different levels of kurtosis among these measures, which suggests varying levels of nonnormality.

Due to discrepancies between the mean and median values for some variables, medians will be focused on here, along with the standard deviations. Contract length has a median of 30 years (SD = 12.24). Percent private funding has a median of 100 (SD = 22.71), and percent public funding has a median of zero (SD = 22.58). Total investment

has a median of 170.50 million USD (*SD* = 735.81), with the amount adjusted for inflation having a median of 219.05 million USD (*SD* = 873.68), and the Johnson transformed measure having a median of 0.15 million USD (*SD* = .60).

The annual change in GDP, the annual percent change in the market value of finished goods and services produced in a country, has a median of 5.90% (*SD* = 3.56). The LIBOR interest rate is an international benchmark interest rate that determines borrowing costs between banks (Bankrate, 2020). LIBOR has a median of 2.76% (*SD* = 2.09). Economic freedom is an index for measuring the degree an economic system is controlled by private entities. It is measured on a scale of 0–100, with 0 being the lowest. Economic freedom had a median score of 58.40 (*SD* = 8.61). The inflation rate had a median of 4% (*SD* = 4.96). Accountability with a scale of -2.5 to 2.5 (i.e., weak to strong), reflects the extent to which a country's citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and a free media (World Bank Group, 2020), has a median of 0.40 (*SD* = 0.99).

Government effectiveness with a scale of -2.5 to 2.5 (i.e., weak to strong), which reflects the quality of public services, the quality of the civil service, the degree of civil service independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies (World Bank Group, 2020), has a median of 0.12 (*SD* = 0.70). Political stability, which measures the likelihood of political instability and/or politically motivated violence, including terrorism in a country" (World Bank Group, 2020), has a median of -0.50 (*SD* = 0.75), with regulatory quality having a median of -0.23 (*SD* = 0.76), and rule of law has

a median of -0.07 (*SD* = 0.81). Similarly, both political stability and rule of law are measured on scales of -2.5 to 2.5 (i.e., weak to strong).

Regression Analyses

Four multiple linear regressions were conducted to test the four null hypotheses for this study, with both null and alternative forms presented below. Null hypotheses were tested, with the control variables (i.e., region, investment climate, and economic factors) included into each of the regression analyses.

Hypothesis 1_0. There is no statistically significant difference in length of the contract based on whether a PPP project is fully, substantially, or partially funded by the private sector.

Hypothesis 1_A. There is a statistically significant difference in the length of the contract based on whether a PPP project is fully, substantially, or partially funded by the private sector.

Hypothesis 2_0. There is no statistically significant difference in project costs based on whether a PPP project is fully funded, substantially, or partially funded by the private sector.

Hypothesis 2_A. There is a statistically significant difference in project costs based on whether a PPP project is fully funded, substantially, or partially funded by the private sector.

Hypothesis 3_0. There is no statistically significant difference in the length of the contract on the basis of the subsector of the transport-related PPP project.

Hypothesis 3_A. There is a statistically significant difference in the length of the contract on the basis of the subsector of the transport-related PPP project.

Hypothesis 4_0. There is no statistically significant difference in the project costs on the basis of the subsector of the transport-related PPP project.

Hypothesis 4_A. There is a statistically significant difference in the project costs on the basis of the subsector of the transport-related PPP project.

Diagnostics were conducted to test the main assumptions of multiple linear regression. The Durbin-Watson coefficients failed to indicate any substantial similarities within the same independent variables (i.e., autocorrelation), though variance inflation factors did indicate high multicollinearity (i.e., correlation between two or more control variables) in some cases. However, changes were not made to these models as this would have required the removal of predictors. See Appendix B for all statistics created for assumptions testing and diagnostic purposes.

As stated earlier, total investment and total investment adjusted for inflation were not normally distributed, hence, these variables needed to be transformed to meet an assumption of linear regression, so that any error between what is observed and the predicted values are normally distributed (Thomas & Thomas, 2017). The Johnson family of transformations (Yeo & Johnson, 2000) was applied to total investment adjusted for inflation to achieve normal distribution with the original measure having a very high degree of positive kurtosis. Kurtosis is a statistical measure used to describe the degree to which variables cluster in the tails or the peak of a frequency distribution (Cain, Zhang, & Yuan, 2017). A positive kurtosis indicates that a distribution is thick because the variables do not extend far from the mean (Cain, Zhang, & Yuan, 2017).

However, there was no major presence of heteroscedasticity, meeting an assumption for regression analysis. The scatterplots of the regression standardized

residuals alongside the regression standardized predicted values failed to indicate the presence of substantial outliers in the data. Partial regression plots indicated linearity (i.e., showing a linear relationship between a dependent variable and all independent variables, collectively) with only a few outlying cases deleted prior to the regression analyses being conducted.

Hypothesis 1: Regression Analysis with Length of the Contract on Level of Funding

Table 16 presents the results of the first regression analysis conducted using the length of contract on the level of funding. Dummy measures pertaining to the level of private-sector funding were statistically significant, with the dummy measures included in these models representing partial (50% and less) and substantial (51%–99%) funding from the private sector, and with the private sector providing full funding (100%) being omitted from these analyses as the comparison category.

Table 16.

Hypothesis 1: Regression Analysis With Length of the Contract on Level of Funding

Measure	*B*	*SE*	Beta	*t*	Tol.	VIF
(Constant)	-8.141	19.062		-0.427		
Partially Funded (50% or less)	12.730	1.739	0.339	7.321***	0.517	1.933
Substantially Funded (51% -99%)	7.989	1.431	0.302	5.583***	0.379	2.639
LIBOR	0.073	0.246	0.012	0.295	0.624	1.602
GDP	0.521	0.173	0.151	3.006**	0.438	2.285
IMF Ranking	-0.948	0.168	-0.505	-5.655***	0.139	7.170
Economic Freedom	0.705	0.292	0.496	2.409*	0.026	38.105
Inflation Rate	-0.037	0.112	-0.015	-0.331	0.542	1.844
Accountability	6.552	1.560	0.531	4.201***	0.069	14.407
Political Stability	-5.605	1.935	-0.343	-2.897**	0.079	12.612
Government Effectiveness	-3.709	2.457	-0.211	-1.510	0.057	17.550
Regulatory Quality	0.912	2.870	0.057	0.318	0.035	28.731
Rule of Law	-5.212	2.838	-0.346	-1.837	0.031	31.917
Africa	20.969	7.013	0.145	2.990**	0.473	2.112
Asia	-11.255	2.840	-0.456	-3.964***	0.084	11.920
Europe	-4.032	1.984	-0.103	-2.032*	0.429	2.332
Oceania	1.755	3.057	0.024	0.574	0.636	1.571
South America	14.834	5.050	0.221	2.937**	0.196	5.115

Note. *p<.05, **p<.01, ***p<.001; Adjusted R^2 = .228; $F(17, 678) = 13.082$, $p < .001$; $N = 696$.

For all cases with p-values less than the common alpha level of 0.05, the results from the unstandardized beta coefficient value (*B*) found that the length of the contract increased by an average 12.730 years in cases where the private sector provided partial funding as compared with when the private sector-provided full funding. Additionally, the length of the contract increased by an average 7.989 years in cases where private-sector funding was substantial as compared to when it fully funded the project.

GDP, IMF ranking, economic freedom, accountability, political stability, and region of the world reached statistical significance because their p-values are less than the common alpha level of 0.05. First, a positive unstandardized beta coefficient value of 0.521 was found for GDP, with a one standard deviation in GDP associated with a 0.151 standard deviation increase in length of the contract. A negative unstandardized beta coefficient value of -0.948 was found for IMF ranking, with a one standard deviation increase in IMF ranking associated with a 0.505 standard deviation decrease in length of the contract. Economic freedom was also found to have a positive unstandardized beta coefficient value of 0.705, with a one standard deviation increase in economic freedom associated with a 0.496 standard deviation increase in length of the contract. The results indicate cases with positive unstandardized beta coefficient values are associated with lengthier contract, and those with negative coefficient values with decrease in length of contract. It is imperative to state that shorter length of contract suggests higher efficiency in the execution of transport projects (Antoine, Alleman, & Molenaar, 2019).

The effects of accountability, political stability, and region also reached statistical significance. Accountability has a positive coefficient value of 6.552; a one standard deviation increase in accountability is associated with a 0.531 standard deviation increase in length of the contract. Political stability has a negative coefficient value of -5.605, with a one standard deviation increase in political stability yielding a 0.343 standard deviation decrease in length of the contract. These results suggest accountability and political stability has an impact on the PPP project because they are associated with a decrease in length of contract.

Regarding region, with North America as the comparison category, significance was found for African, Asian, European, and South American projects. A significantly longer contract length was found in Africa and South America as compared with North America, and a significantly reduced contract length was found in Asia and Europe as compared to North America. Specifically, the average contract length was increased by 20.969 years in Africa as compared with North America, and the average contract length was increased by 14.834 years in South America. The contract length was reduced by 11.255 years in Asia and by 4.032 in Europe as compared to North America. These results suggest that the region where a project is located has some effects, with Asia and Europe associated with a shorter length of contract when compared to North America.

This regression model achieved statistical significance, with 22.8% of the variation in contract length explained by the following predictors: partial private-sector funding, substantial private-sector funding, LIBOR, GDP, IMF ranking, economic freedom score, inflation rate, accountability, political stability,

government effectiveness, regulatory quality, rule of law, and regions of the world Africa, Asia, Europe, Oceania, and South America.

Hypothesis 2: Regression Analysis With Project Costs on Level of Funding

Table 17 presents the results of the multiple linear regression analysis conducted with project costs on level of funding, with this analysis also serving to test null Hypothesis 2. In this analysis, significance was indicated for the effects of private-sector funding, LIBOR, IMF ranking, economic freedom, accountability, political stability, rule of law, and environmental factor. These variables all have their p-values less than the common alpha level of 0.05.

Table 17.

Hypothesis 2: Regression Analysis With Project Costs on Level of Funding

Measure	*B*	*SE*	Beta	*t*	Tol.	VIF
(Constant)	-1.998	0.926		-2.157		
Partially Funded (50% or less)	0.241	0.084	0.132	2.857**	0.517	1.933
Substantially Funded (51% -99%)	0.107	0.070	0.083	1.544	0.379	2.639
LIBOR	-0.038	0.012	-0.134	-3.186*	0.624	1.602
GDP	-0.005	0.008	-0.032	-0.641	0.438	2.285
IMF Ranking	0.019	0.008	0.206	2.318*	0.139	7.170
Economic Freedom	0.034	0.014	0.496	2.420*	0.026	38.105
Inflation Rate	-0.004	0.005	-0.035	-0.777	0.542	1.844
Accountability	-0.357	0.076	-0.593	-4.707***	0.069	14.407
Political Stability	-0.449	0.094	-0.563	-4.776***	0.079	12.612
Government Effectiveness	-0.038	0.119	-0.045	-0.321	0.057	17.550
Regulatory Quality	-0.130	0.139	-0.166	-0.934	0.035	28.731
Rule of Law	0.658	0.138	0.895	4.772***	0.031	31.917
Africa	0.435	0.341	0.062	1.276	0.473	2.112
Asia	-0.183	0.138	-0.152	-1.324	0.084	11.920
Europe	-0.209	0.096	-0.110	-2.170*	0.429	2.332
Oceania	0.127	0.149	0.036	0.856	0.636	1.571
South America	0.242	0.245	0.074	0.988	0.196	5.115

Note. *p<.05, **p<.01, ***p<.001; Adjusted R^2 = .234; $F(17, 678) = 13.461$, $p < .001$; $N = 696$.

First, with regard to the funding levels, while significance was not found for the effect of those substantially funded, significance was indicated for the effect of those partially funded as compared with those fully funded by the private sector. Specifically, project costs increased by 0.241 ($0.241 million USD) in cases of partial private-sector funding as compared to full private-sector funding.

Next, with regard to LIBOR, the result has a negative coefficient value, with a one standard deviation increase in LIBOR found to be associated with a 0.134 standard deviation decrease in project costs. IMF ranking and economic freedom both reached statistical significance with positive coefficient values of 0.019 and 0.034 respectively. A one standard deviation increase in IMF ranking has a 0.206 standard deviation increase in project costs, and a one standard deviation increase in economic freedom is associated with a 0.496 standard deviation increase in project costs. The results suggest both IMF ranking and economic freedom have a significant impact because they are associated with a change in project cost.

Accountability and political stability achieved statistical significance with negative coefficient values of -0.357 and -0.449. First, regarding accountability, a one standard deviation increase in accountability is associated with a 0.593 standard deviation decrease in project costs, whereas a one standard deviation increase in political stability was found to be associated with a 0.563 standard deviation decrease in project costs. The variable, rule of law has a positive coefficient value of 0.658, with a one standard deviation increase in rule of law associated with a 0.895 standard deviation increase in project costs. These results suggest accountability and political stability have an impact because they are associated with a decrease in

project costs. Similarly, the rule of law also achieved statistical significance and is associated with change in project costs.

Finally, the region variable also achieved significance, but only with respect to Europe as compared with project costs in North America. Project costs decreased an average of 0.209 ($0.209 million USD) in Europe as compared to North American costs. This regression model achieved significance, with 23.4% of the variation in project costs explained on the basis of this model.

Hypothesis 3: Regression Analysis With Length of the Contract on Subsector

Table 18 presents the results of the multiple linear regression using the length of the contract as the dependent variable and the subsector as the independent variable. This analysis tested the third null hypothesis. The results found significance for the effects of the subsector, IMF ranking, economic freedom, accountability, government effectiveness, and region because their p-values are less than the common alpha level of 0.05.

Table 18.

Hypothesis 3: Regression Analysis with Length of the Contract on Subsector

Measure	*B*	*SE*	Beta	*t*	Tol.	VIF
(Constant)	-14.496	20.077		-0.722		
Subsector: Airport	14.021	1.595	0.319	8.790***	0.780	1.282
Subsector: Bridge	3.323	2.948	0.045	1.127	0.635	1.574
Subsector: Highway	4.638	2.650	0.071	1.750	0.633	1.579
Subsector: Port	2.065	4.998	0.014	0.413	0.865	1.156
Subsector: Rail	8.059	1.179	0.240	6.837***	0.833	1.200
Subsector: Road	7.737	1.605	0.166	4.819***	0.865	1.156
LIBOR	0.032	0.240	0.006	0.134	0.611	1.637
GDP	0.214	0.170	0.062	1.256	0.422	2.369
IMF Ranking	-1.395	0.177	-0.742	-7.893***	0.117	8.583
Economic Freedom	0.933	0.307	0.656	3.038**	0.022	45.290
Inflation Rate	-0.126	0.109	-0.051	-1.163	0.530	1.885
Accountability	4.135	1.408	0.335	2.937**	0.079	12.648
Political Stability	-3.377	1.914	-0.207	-1.765	0.075	13.301
Government Effectiveness	-6.344	2.326	-0.360	-2.728**	0.059	16.946
Regulatory Quality	-0.356	2.850	-0.022	-0.125	0.033	30.532
Rule of Law	-3.759	2.761	-0.249	-1.361	0.031	32.567
Africa	37.316	7.000	0.258	5.331***	0.441	2.268
Asia	-9.532	2.960	-0.386	-3.220**	0.072	13.963
Europe	-6.505	1.953	-0.167	-3.330**	0.410	2.437
Oceania	3.997	3.309	0.055	1.208	0.504	1.983
South America	16.341	5.079	0.244	3.217**	0.179	5.576

Note. *p<.05, **p<.01, ***p<.001; Adjusted R^2 = .284; $F(21, 674) = 14.117$, $p < .001$; $N = 696$.

Three subsectors (airport, rail, and road) were found to be statistically significant with increased contract length. For the airport subsector, on average, the contract length is increased by 14.021 years, by 8.059 years for rail, and road case contract lengths is increased by 7.737 years when compared with the transport facility subsector (comparison category).

The IMF ranking displayed in Table 18 is statistically significant because it has a p-value of 0.000 less than the common alpha level of 0.05. Also, IMF ranking has a negative coefficient value of -1.395, with a one standard deviation increase in IMF ranking, yielding a 0.742 standard deviation decrease in contract length. This result suggests that IMF ranking affects contract length because a negative coefficient value is associated with a decrease and thus, a shorter contract length. Economic freedom has a positive coefficient value of 0.933, with a one standard deviation increase in economic freedom associated with a 0.656 standard deviation increase in contract length. This result suggests economic freedom has a significant effect upon contract length because p-values are less than the common alpha level of 0.05.

Accountability has a positive coefficient value of 4.135, whereas government effectiveness has a negative coefficient value of -6.334. Regarding accountability, a one standard deviation change yields a 0.335 standard deviation increase in contract length. Also, government effectiveness yields a one standard deviation change in contract length, which produced a 0.360 standard deviation decrease in contract length. These results suggest both accountability and government effectiveness are

statistically significant because both are associated with changes to the length of the contract.

Finally, looking at the region variable, which compares Africa, Asia, Europe, and South America to North America, positive coefficient values were found in relation to the effects of Africa and South America; however, there were negative coefficient values found with regard to Asia and Europe. For all subsectors (airport, bridge, highway, port, rail, and road), contract length increased by 37.316 years in Africa, and by 16.341 years in South America when compared to the transport facility subsector which is the comparison category. Additionally, the contract length decreased by 9.532 years in Asia, and by 6.505 years in Europe. This regression model achieved significance, with 28.4% of the variation in the length of the contract explained based on this model.

Hypothesis 4: Regression Analysis With Project Costs on Subsector

Table 19 presents the results of the multiple linear regression conducted using project cost as the dependent variable and subsector as the independent variable. This analysis tested the fourth null hypothesis. The results found significance (p-values less than the common alpha level of 0.05) for the effects of the subsector, LIBOR, accountability, political stability, rule of law, and region.

Table 19.

Hypothesis 4: Regression Analysis With Project Costs on Subsector

Measure	*B*	*SE*	Beta	*t*	Tol.	VIF
(Constant)	-1.257	0.990		-1.270		
Subsector: Airport	0.074	0.079	0.035	0.942	0.780	1.282
Subsector: Bridge	0.300	0.145	0.084	2.062*	0.635	1.574
Subsector: Highway	0.393	0.131	0.123	3.007**	0.633	1.579
Subsector: Port	-0.529	0.246	-0.075	-2.147*	0.865	1.156
Subsector: Rail	-0.076	0.058	-0.047	-1.309	0.833	1.200
Subsector: Road	0.370	0.079	0.163	4.669***	0.865	1.156
LIBOR	-0.041	0.012	-0.145	-3.501***	0.611	1.637
GDP	0.000	0.008	-0.001	-0.026	0.422	2.369
IMF Ranking	0.016	0.009	0.173	1.821	0.117	8.583
Economic Freedom	0.024	0.015	0.346	1.585	0.022	45.290
Inflation Rate	-0.004	0.005	-0.030	-0.663	0.530	1.885
Accountability	-0.398	0.069	-0.663	-5.739***	0.079	12.648
Political Stability	-0.386	0.094	-0.484	-4.088***	0.075	13.301
Government Effectiveness	-0.095	0.115	-0.111	-0.832	0.059	16.946
Regulatory Quality	-0.055	0.141	-0.070	-0.388	0.033	30.532
Rule of Law	0.647	0.136	0.880	4.752***	0.031	32.567
Africa	0.409	0.345	0.058	1.186	0.441	2.268
Asia	-0.235	0.146	-0.195	-1.610	0.072	13.963
Europe	-0.190	0.096	-0.100	-1.969*	0.410	2.437
Oceania	0.166	0.163	0.046	1.017	0.504	1.983
South America	0.057	0.250	0.017	0.228	0.179	5.576

Note. *p<.05, **p<.01, ***p<.001; Adjusted R^2 = .267; $F(21, 674) = 13.082$, $p < .001$; $N = 696$.

With respect to subsector (bridge, highway, port, and road), each produced significant results on project costs. Project costs were increased by 0.300 ($0.300 million USD) in the case of the bridge subsector, 0.393 ($0.393 million USD) for highway subsector and 0.370 ($0.370 million USD) for road subsector while being reduced by 0.529 ($0.529 million USD) in the case of port subsector.

LIBOR has a negative coefficient value of -0.041, with a one standard deviation increase in LIBOR producing a 0.145 standard deviation decrease in project costs. Accountability and political stability also have negative coefficient values of -0.398 and -0.386 respectively. A one standard deviation increase in accountability yields a 0.663 standard deviation decrease in project costs, whereas a one standard deviation increase in political stability produced a 0.484 standard deviation decrease in project costs. These results suggest LIBOR, accountability, and political stability each has an impact upon project costs since each is associated with decreases in project costs. The rule of law also reached statistical significance since the p-value is less than the common alpha level of 0.05 and is associated with a change in project cost. The rule of law has a positive coefficient value of 0.647, with a one standard deviation increase in rule of law producing a 0.880 standard deviation increase in project costs.

With regard to the effects of the region, only Europe significantly differs from North America, with project costs reduced by 0.190 ($0.190 million USD) among European cases as compared to the North American cases. This regression

model achieved significance, with 26.7% of the variation in project costs explained based on this model.

Summary

In addition to descriptive statistics for each key variable, this chapter presented a series of four regression analyses that tested the study's null hypotheses. The four null hypotheses posited no relationship between the independent variables of private-sector funding levels and subsector of the transport-related PPP project and the dependent variables of the length of the contract and project costs. The results of the multiple linear regression analyses indicate that each of the four null hypotheses was rejected, with support indicated for all four alternative hypotheses. The following chapter will discuss these results in relation to previous literature and theory, along with the limitations of the study, possibilities for future research, as well as implications and conclusions.

Chapter V

CONCLUSION

This chapter presents a discussion of the results, conclusions, and recommendations. The discussion ties together this study's research questions, hypotheses, objectives, and literature review to determine the extent to which the results found in this study are similar to, or different from, previous researchers' findings. This discussion also focuses on the broader implications of the findings via evaluation and interpretation, including justifiable speculation as to the implications of the results. Conclusions focus on the research questions and objectives and relate to how the study contributes to the existing body of knowledge in determining the viability of public–private partnerships (PPPs) in revamping America's transport infrastructure and its application to improve the human condition. Finally, limitations of the current study are presented and briefly discussed as well as recommendations for further study.

Methods and Procedures

This study analyzed the structure of private sector participation in completed PPP projects within 12 G-20 countries and determined a framework for future projects through a comparison of fully funded private sector projects with those substantially funded or partially funded by the private sector. The aims were achieved through the statistical analysis of secondary data. This study used quantitative analyses to

test hypotheses, to determine the relationships between measures of interest, and to make sense of the vast amounts of statistical data available relevant to this subject. The study also incorporated a quantitative, nonexperimental, comparative design that tested the statistical effect of contract lengths and project costs through multiple linear regression analysis on the basis of the PPP project's being fully funded (at 100%), substantially funded (at 51%–99%), or partially funded (at 50% or less) by the private sector. Also tested through multiple linear regression analysis were possible statistical significance effects of contract lengths and project costs disaggregated by the transportation subsector. Multiple linear regression was chosen because of the presence of continuous outcomes and multiple independent variables. This method of analysis allows for the development of predictive models explaining contract length and project costs based on private-sector funding levels, transport subsector, and control variables grouped into economic factors, investment climate factors, and the region.

Discussion and Implications of the Results

Four hypotheses were tested in this study.

Hypothesis 1_0. There is no statistically significant difference in length of the contract based on whether a PPP project is fully, substantially, or partially funded by the private sector.

Hypothesis 1_A. There is a statistically significant difference in the length of the contract based on whether a PPP project is fully, substantially, or partially funded by the private sector.

Hypothesis 2_0. There is no statistically significant difference in project costs based on whether a PPP project is fully funded, substantially, or partially funded by the private sector.

Hypothesis 2_A. There is a statistically significant difference in project costs based on whether a PPP project is fully funded, substantially, or partially funded by the private sector.

Hypothesis 3_0. There is no statistically significant difference in the length of the contract on the basis of the subsector of the transport-related PPP project.

Hypothesis 3_A. There is a statistically significant difference in the length of the contract on the basis of the subsector of the transport-related PPP project.

Hypothesis 4_0. There is no statistically significant difference in the project costs on the basis of the subsector of the transport-related PPP project.

Hypothesis 4_A. There is a statistically significant difference in the project costs on the basis of the subsector of the transport-related PPP project.

There were numerous statistically significant results, as seen in the regression analyses that tested these hypotheses. The four null hypotheses yielded no statistically significant relationship between the two independent variables (private-sector funding level and subsector of the transport-related PPP project) and the dependent variables (length of the contract and project costs). The four null hypotheses were rejected, providing support for the four alternative hypotheses. Embedded in the answers to these questions is the roadmap that defines the desired outcome of this dissertation, namely, finding that PPP is a viable option to revamp America's infrastructure. The following section discusses the implications of this study.

Private-sector Funding Levels

The contract length was significantly increased in cases where the private sector provided either partial (at 50% or less) or substantial funding (at 51%–99%) as compared with full funding. It is imperative to point out that cases with partial funding (at 50% or less) from the private sector had lengthier contracts than those with substantial (at 51%–99%) private-sector funding. These results therefore establish that partnerships that have at least 51% private sector participation were associated with shorter contract lengths. In cases where private-sector funding was substantial (51%–99%) as compared with full (100%) funding of the project, the study found no significant impact on project costs. However, project costs significantly increased in cases of partial private-sector funding as compared with full private-sector funding. Again, these results suggest that any PPP project with at least 51% private sector participation by the private sector was associated with lower project costs.

Subsector Effect

The independent variable subsector was found to significantly impact both the length of the contract and project cost. First, from the results of the analysis, all the subsectors (airport, bridge, highway, port, rail, and road) were found to be statistically significant, with airport, rail, and road associated with a significantly increased contract length; contract lengths increased by about 14, 8, and 7 years, respectively. These results indicate unique challenges to policymakers in finding ways to review the overall contract process for PPP projects to determine if the anticipated duration is within acceptable limits in these three subsectors (airport, rail, and road). These results are particularly applicable to smaller road contracts associated with relatively shorter miles because, in

theory, their duration should be shorter when compared to larger contracts that may span several hundreds of miles.

For project cost, the effects of bridge, highway, port, and road subsectors were found to be statistically significant when compared with the transport facility subsector. These results also suggest that stakeholders should specifically target bridge, highway, and road subsectors with the objective of reducing overall project costs.

Effects of Economic Factors

The results from the study indicate some economic factors have effects on contract length and project costs. For example, a higher GDP and economic freedom score are associated with the length of contract. Though the result from the analysis shows an increase in the length of contract, a longer contract may not necessarily suggest a negative impact for some projects that ordinarily take longer to complete, for example, airports and ports. The IMF ranking is associated with decrease in the length of the contract because a negative unstandardized beta coefficient value (i.e., a negative value suggests a shorter contract length) from the first regression analysis.

Also, from the results, an increase in LIBOR is associated with a decrease in project costs. Conversely, the IMF ranking and economic freedom score impact project costs because they are associated with increases in project costs. The results established that LIBOR, IMF ranking, and economic freedom all have impact on the project costs, the effect —positive or negative—will vary due to size, scope, and the sector of each project. These results support Lourdes et al.'s (2018) finding that such factors can play significant roles in determining the success or failure of PPP projects.

Effects of Investment Climate Factors

Results from the regression analyses indicate political stability yields shorter contract length and decreases in project cost. This result suggests the likelihood of political instability or politically motivated violence, including terrorism in a country, may affect quick execution of PPP projects, likely increasing both project costs and the length of contracts. Accountability and rule of law are associated with changes in project costs. While this study could not definitely determine the type of impact from most of the investment climate variables, the results do suggest political stability has a positive impact upon contract length and project costs because it reached statistical significance in 3 of 4 regression analyses. Political stability was associated with negative unstandardized beta coefficient values when they were tested with the funding levels. These negative values are associated with shorter contract length and reduced project costs Overall, factors such as accountability, rule of law, and political stability among others that did achieve statistical significance corroborate Dollar et al.'s (2006) assertion that investment factors can impact private sector participation in transport-related PPP projects.

Effects of Region

Results from this study show significantly longer contract length in Africa and South America. Contract lengths increased by about 21 years in Africa and by about 15 years in South America as compared to those in North America. Conversely, significantly shorter contract lengths were found in Asia and Europe. Their mean contract lengths were reduced by about 11 years in Asia and by about 4 years in Europe as compared to North America. The region where the project is located also has an effect on project costs. However, this effect was only found with respect to the comparison between project costs

in Europe as compared with project costs in North America. The average project costs were reduced in Europe as compared with North America.

These results corroborate Koetse and Rietveld's (2009) assertion that region and other environmental factors impact all transportation projects, including PPP ones. Additionally, these results confirm Dasgupta et al.'s (2007) finding that the continent in which a project is situated has an effect on its efficiency.

Culmination

Overall, the results indicate that the contract length with partial funded (50% and less) and substantially funded (51%–99%) PPP projects are likely to be longer than those that are fully funded (100%) by the private sector. It is imperative to point out that partially funded (50% and less) cases have lengthier contracts than those that are substantially funded (51%–99%) by the private sector. Similarly, the project costs are significantly increased for partially funded (50% and less) cases as compared to those that are fully funded (100%) by the private sector. These results illustrate the benefit of greater private sector participation in transport-related PPPs with regard to both contract length and project cost. Additionally, these results show funding levels of private sector partnerships are correlated with project cost and length of the contract. The partnerships with the private sector's having the majority share in terms of the funding level were shown to be most efficient.

Three subsectors road, rail, and airport present particular challenges to policymakers in finding ways to reduce the average length of the contract. Some of these challenges include but are not limited to figuring out better competitive bidding requirements and reduction in bureaucratic processes for better contractual outcomes.

Overcoming some of these issues may attract more competitive private sector partners and could reduce the average length of contracts in these three subsectors. Similarly, the results show bridge, highway, and road subsectors, were more associated with higher project costs when compared with the transport facility subsector which served as the comparison category in the regression analysis. Government incentives like tax breaks for private sector partners involved in these projects and reductions in regulations may help cut some of the overhead costs in these subsectors. However, from the results, the port subsector provided a bright spot with a significant reduction in average project cost when compared to bridge, highway, and road subsectors. As stated earlier, the lengthier contract does not necessarily suggest a negative impact since some transport projects in certain subsectors like construction of airports or ports, take significantly longer period to complete. However, every effort should be made by stakeholders to keep these contracts within acceptable limits to safeguard the interest of taxpayers and the general public.

Other economic factors such as GDP, economic freedom score, and IMF ranking were shown to have some impact on the length of contract. LIBOR, IMF ranking, and economic freedom all were statistically significant; these control variables had impacts on project costs. These results establish the effect of economic factors on transport-related PPP projects. Whatever, the direction of impact, negative or positive, these factors have on project cost or contract length, could not be definitively determined by this study.

Some investment climate factors also reached statistical significance. Accountability, rule of law, government effectiveness, and political stability each has an impact on the length of contract. Additionally, accountability, rule of law, economic freedom score, and political stability have some level of impact on project cost. Similarly,

while the results show these factors have some impact on transport-related PPP projects, this study could not show whether these impacts are negative or positive, with the exception of political stability. Only political stability was associated with shorter contract length and reduced project costs when tested with the funding levels. Also, political stability was associated with reduced project costs when the subsector was tested with project cost as the dependent variable. The results from the analyses suggest the presence of political instability and/or politically motivated violence, including terrorism in a country where a project is executed, will negatively affect the quick execution of a project, thus leading to a lengthier contract and increase in the overall project cost. Private sector investors are likely to avoid entering into partnerships with governments in countries with political instability, thus resulting in less competitive bidding processes, high-risk assessments, and, potentially, increased overall project cost.

Finally, this study shows that region is statistically significant, with a significant increase in the length of contracts in Africa and South America and a significant decrease in contract length in Asia and Europe compared to those in North America. Also, the effect of region on project costs reached statistical significance. Results show a reduction of project costs for projects from Europe as compared to the North American region. These results indicate continental and geographical locations affect transport-related PPP projects.

Revamping America's Infrastructure

Although this study is global in nature, it provides some framework for determining whether PPP is a viable option for revamping America's infrastructure. Each of the 12 countries from which data were collected belongs to the G20, a bloc of the most

important industrialized and developing economies focused on global economic and financial stability (Council on Foreign Relations, 2019). Limiting the scope of data collection to some G-20 countries, afforded the study the opportunity of comparing data from the United States with countries within the same economic group.

Extent of Private Sector Participation

One of the main objectives of this study is to research private sector participation in transport-related PPP. This study found that substantially funded PPP projects (51%–99%) is associated with shorter contract lengths. Also, partially funded (50% or less) PPP cases are associated with increases in project costs when compared with fully funded (100%) cases. In the interest of improving the infrastructure of the United States, the results suggest that greater private sector participation should be pursued to the extent possible, as this is associated with the shortest contract lengths and lowest project costs. A longer contract length, as indicated earlier, may not be negative because it provides the private sector ample time to recoup their investments. An unreasonable or prolonged contract length for PPP projects may erode some advantages which governments expected when they initially entered into these agreements. Any PPP project not executed with the period stipulated in the contractual agreement, ends up costing taxpayers more in the long run, because private sector investors recoup their investments through fees, tolls, and tax incentives from government. Any unnecessary or unjustifiable extension of the length of contract is not in the overall interest of the public since these repayments are paid directly or indirectly by taxpayers.

As stated earlier from the results, contract length increased significantly in cases where the private sector provided both partial (at 50% or less) and substantial funding (at

51%–99%) as compared with full funding (at 100%). Cases with partial funding (at 50% or less) from the private sector had lengthier contracts than those with substantial (at 51%–99%) private-sector funding. Also, project costs significantly increased in cases of partial private-sector funding (at 50% or less) as compared with full private-sector funding (at 100%). These results suggest that PPP projects with at least 51% private sector participation will be associated with a shorter contract and lower project costs. The higher the participation of the private sector in PPPs, the greater the efficiency will likely be. The private sector has a very important role in PPPs and has suggested PPP with a private sector partner with at least 51% funding level, could be a viable option for revamping America's infrastructure.

This finding adds to earlier findings on PPPs with some previous literature questioning whether PPPs are more efficient than those projects which are publicly funded (Flinders, 2005; Grimsey & Lewis, 2004; Loxley & Loxley, 2010; Vining & Boardman, 2008). While other findings support previous research that has suggested PPPs could be used because they lead to projects being completed faster and at a lower cost (Akintoye et al., 2003; Chasey et al., 2012; Hodge and Greve, 2009; Lucyshyn et al., 2016; Papajohn et al., 2011). This study provides an additional layer of knowledge on the possible impact on the length of PPP contracts and potential factors lowering project costs.

Transport Subsector

For U.S. stakeholders, each transport subsector should be targeted with an aim of reducing project costs and shortening the length of contract. This study found the airport, rail, and road subsectors are associated with a significantly increased contract length.

Policymakers in the United States should specifically evaluate each of these three subsectors to determine if the lengths of contracts for a particular PPP project are within acceptable limits. It should be noted that existing contracts should not be excluded from these reviews because signed contracts can be amended, and in some cases, can be renegotiated. This study also found project costs increased with bridge, highway, and road subsectors. With most roads, bridges, and highways in the United States in a deplorable state, it is imperative for stakeholders to scrutinize all future PPP projects in these three subsectors with the aim of reducing overall project costs. Projects in other transport sectors that are traditionally more costly to execute, such as airports and ports, should also be included in any review, if the goal is to reduce overall costs.

Political Stability

This study found higher levels of political stability were associated with shorter contract lengths and a decrease in project costs. It is therefore critical for the United States, the world's largest economy, to maintain its status as the bastion of stable democratic government. Nothing must shake the global confidence in America's tradition of peaceful transfer of power after major national elections. An environment or perception of political instability will affect United States' edge over other countries in attracting private sector investments, and by extension, participation in PPP projects. It is also critical for American politicians on both sides of the aisle to remain united to fight all forms of terrorism, both foreign and domestic, to maintain a stable and predictable political climate. This will continue to assure would-be private sector investors and lenders about America's enduring political democratic system.

North American Region

Finally, this study also found significantly longer contract length in Africa and South America and significantly shorter contract length in Asia and Europe when compared to North America (specifically, the United States, Canada, and Mexico). Also, it found reduced project costs in Europe as compared with those in North America. The U.S. Congress should allocate funding to agencies such as the Department of Transportation, Federal Railroad Administration, and Federal Highway Administration among others, to conduct comparative studies of transport-related PPP projects in selected countries of Asia and Europe. These case studies should preferably be conducted within the same subsector for better outcomes. Transport-related PPP projects from selected countries in Asia and Europe should be compared to similar projects in the United States. The main objective of these studies is to determine possible improvements for acceptable contract lengths and lower project costs for comparable transport-related PPP projects in the United States.

Recommendations for Future Research

This study has a number of limitations. First, random sampling was not used in the study because a purposive sample was more appropriate with the available data. While this choice allowed for certain benefits, it also served to reduce the generalizability and external validity of the study, with the results being applicable to the sample in question, but not necessarily to other countries or other time periods. Future research incorporating random sampling would lose the benefits of the purposive sampling approach taken by this research but would allow for greater generalizability and external validity, leading to a set of results that could be applied to the larger population.

In addition, there are opportunities for future research because the study incorporated a specific set of controls grounded in the literature. Other potential controls may exist either in additional literature, not reviewed by the researcher, or that is currently unknown. The effect of other unused controls may be to omit variable bias, in which the effects of omitted independent variables are, in effect, "absorbed" by the remaining predictors included in the model. Future research, able to take advantage of all research from now until that future date, may be able to incorporate any additional control variables into their specified models, thereby reducing the likelihood of omitted variable bias. Further inquiry comparing countries with similar demographics, within the same geographical regions, and in a specific subsector, may aid researchers to understand possible improvements to PPP projects as it relates to decrease in the length of contract and lower project costs. Finally, additional research could also focus on PPP projects not only in a subsector, but also within a country. It is possible such approach may also provide better outcomes.

Conclusion

All four null hypotheses were rejected, with private sector participation found to be associated with decreased contract length and reduced costs of projects. Overall, private sector participation that provides at least 51% of funding was found to be most beneficial, with PPP determined to be a viable option to improve America's infrastructure.

REFERENCES

Aggarwal, R., & Ranganathan, P. (2019). Study designs: Part 2—Descriptive studies. *Perspectives in Clinical Research, 10*(1), 34–36.

Akintoye, A., Taylor, C., & Fitzgerald, E. (1998). Risk analysis and management of private finance initiative projects. *Engineering Construction and Architectural Management, 5*(1), 9–21.

Akintoye, A., Beck, M., & Hardcastle, C. (2003). *Public-Private Partnerships: Managing Risks And Opportunities.* London: Blackwell Science Ltd.

Amber Infrastructure Group. (2020). *Gold Coast Light Rail*. Amber Infrastructure Group: https://www.amberinfrastructure.com/our-sectors/case-studies/gold-coast-light-rail/

American Society of Civil Engineers. (2021). *Infrastructure report card: A comprehensive assessment of America's infrastructure.* Reston: American Society of Engineers. https://infrastructurereportcard.org/wp-content/uploads/2020/12/National_IRC_2021-report.pdf

Andrist, R. K. (2016). *The Erie Canal.* Boston, MA: New Word City.

Antoine, A. L., Alleman, D., & Molenaar, K. R. (2019). Examination of project duration, project intensity, and timing of cost certainty in highway project delivery methods. *Journal of Management in Engineering, 35*(1), 1–8.

Balkin, R. S. (2014). Principles of quantitative research in counseling: A humanistic perspective . *The Journal of Humanistic Counseling, 53*(3), 240–248. doi:10.1002/j.21611939.2014.00059.x

Ball, J. (1999). Marketing a concept abroad. *Project Finance, 193*(1), 18–19.

Bankrate. (2020). *LIBOR*. Bankrate: https://www.bankrate.com/glossary/l/libor/

Bayliss, K., & Van Waeyenberge, E. (2018). Unpacking the public private partnership revival. *The Journal of Development Studies, 54*(4), 577–593.

Bearfield, D. A., & Eller, W. S. (2008). Writing a literature review: The art of scientific literature. *Public Administration and Public Policy—New York, 61*(3), 120–134.

Beauregard, R. (1998). Public-private partnerships chameleons: The case of the United States. In J. Pierre (ed), *Partnerships in Urban Governance* (pp. 52–70). Palgrave Macmillan: London. doi.org/10.1007/978-1-349-14408-2_4

Beh, L. S. (2015). Managing across public–private partnerships: A review of implementation in China and Australia. *Contemporary Chinese Political Economy and Strategic Relations, 1*(3), 614–633.

Belay, A. M., & Torp, O. (2017). Do longer projects have larger cost deviation than shorter construction projects? *Procedia Engineering, 196*(1), 262–269.

Benham, A., & Benham, L. (2010). The costs of exchange. In P. Klein, & M. Sykuta, *The Elgar Companion to Transaction Cost Economics* (pp. 159–170). Cheltenham,UK and Northampton, MA, USA: Elgar.

Bennon, M., Kim, M. J., & Levitt, R. E. (2017). *US Infrastructure Gap(S): Federal Policy and Local Public Institutions.* Stanford, CA: Stanford Global Projects Center.

Bickerton, M., & Gruneberg, S. L. (2013). The London Interbank Offered Rate (LIBOR) and UK construction industry output 1990–2008. *Journal of Financial Management of Property and Construction, 18*(3), 268–281.

Bitsch, F., Buchner, A., & Kaserer, C. (2010). Risk, return and cash flow characteristics of infrastructure fund investments. *European Investment Bank Research, 15*(1), 106–136.

Bloomfield, J., & Fisher, M. J. (2019). Quantitative research design. *Journal of the Australasian Rehabilitation Nurses' Association, 22*(2), 27–30. doi:10.33235/jarna.22.2.27-30

Boardman, A. E., & Vining, A. R. (2010). Assessing the economic worth of public–private partnerships. In G. A. Hodge, C. Greve, & A. E. Boardman, *International Handbook on Public–Private Partnerships, Chapter 8* (pp. 160). Northampton, MA: Edward Elgar.

Boeck, H., & Durif, F. (2014). An overview of ethical considerations when using RFID with consumers. *International Journal of Cyber Society and Education, 7*(2), 157–164.

Broadbent, J., Gill, J., & Laughlin, R. (2004). *The Private Finance Initiative in the National Health Service.* London: CIMA.

Broadbent, J., & Laughlin, R. (2005). The role of PFI in the UK government's modernization agenda. *Financial Accountability & Management, 21*(1), 75–97.

Brown, J. W., Pieplow, R., Driskell, R., Gaj, S., Jeffrey Seiders, J., Garvin, M. J., . . . & Saunders, M. (2009). *Public-Private Partnerships for Highway Infrastructure: Capitalizing on International Experience (No. FHWA-PL-09-010). United States.* Federal Highway Administration, Office of International Programs. Alexandria, VA: Federal Highway Administration U.S. Department of Transportation. https://international.fhwa.dot.gov/pubs/pl09010/pl09010.pdf

Buchanan, J. M. (1975). A contractarian paradigm for applying economic theory. *The American Economic Review, 65*(2), 225–230.

Busch, N., & Givens, A. (2012). Public-private partnerships in homeland security: Opportunity and challenges. *Homeland Security Affairs, 8*(18), 1–24.

Cain, M. K., Zhang, Z., & Yuan, K. H. (2017). Univariate and multivariate skewness and kurtosis for measuring nonnormality: Prevalence, influence and estimation. *Behavior Research Methods, 49*(5), 1716–1735.

Campbell, M. (2016). Getting to grips with statistics: Understanding variables. *British Journal of Midwifery, 24*(10), 738–741.

Campbell, P., & Diseasa, D. (2014). *A Paradigm Shift for Public–Private Partnerships: Promising Practices for Public Officials and Private Companies Working Across Sectors.* University of Pennsylvania, Fels Institute of Government, Philadelphia.

Casady, C., Eriksson, K., Levitt, R. E., & Scott, W. R. (2018). Examining the state of public–private partnership (PPP) institutionalization in the United States. *The Engineering Project Organization Journal, 8*(1), 1–22.

Casady, C. B., Eriksson, K., Levitt, R. E., & Scott, W. R. (2020). (Re)defining public–private partnerships (PPPs) in the new public governance (NPG) paradigm: An institutional maturity perspective. *Public Management Review, 22*(2), 161–183.

Chan, A. P., Lam, P. T., Chan, D. W., Cheung, E., & Ke, Y. (2009). Potential obstacles to successful implementation of public–private partnerships in Beijing and the Hong Kong special administrative region. *Journal of Management in Engineering, 26*(1), 30–40.

Chasey, A., Maddex, W., & Bansal, A. (2012). Comparison of public–private partnerships and traditional procurement methods in North American highway construction. *Transportation Research Record, 2268*(1), 26–32.

Cohn, D. (2008). British Columbia's capital asset management framework: Moving from transactional to transformative leadership on public-private partnerships, or a "railroad job"? *Canadian Public Administration, 51*(1), 71–97.

Congressional Budget Office. (2018). *Public spending on transportation and water, 1956 to 2017.* https://www.cbo.gov/system/files/2018-10/54539-Infrastructure.pdf

Cook, R. D., & Weisberg, S. (1999). Graphs in statistical analysis: Is the medium the message? *The American Statistician, 53*(1), 29–37.

Cooper, B. C. (2005). *Riding the Transcontinental Rails: Overland Travel on the Pacific Railroad, 1865–1881.* Charlotte: Polyglot.

Corner, D. (2006). The United Kingdom private finance initiative: The challenge of allocating risk. *OECD Journal on Budgeting, 5*(3), 33–55.

Council on Foreign Relations (CFR). (2019). *The group of twenty.* https://www.cfr.org/backgrounder/group-twenty

Creswell, J. W. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). Los Angeles, CA: Sage.

CUTS Institute for Regulation & Competition–CIRC. (2013). *Case Study 14*. CUTS Institute for Regulation & Competition–CIRC: https://circ.in/economic-regulatory-issues/er-case-study-14-2

Dasgupta, S., Laplante, B., Meisner, C., & Wheeler, D. Y. (2007). *The impact of sea level rise on developing countries: A comparative analysis.* Washington, DC: World Bank, Policy Research Working Paper, WPS 4136.

Deep, A., Kim, J., & Lee, M. (2019). *Realizing the Potential of Public–Private Partnerships to Advance Asia's Infrastructure Development.* Mandaluyong, Philippines: Asian Development Bank.

Dollar, D., Hallward-Driemeier, M., & Mengistae, T. (2006). Investment climate and international integration. *World Development, 34*(9), 1498–1516.

Engel, E., Fischer, R., & Galetovic, A. (2011). *Public-Private Partnerships to Revamp U.S. Infrastructure.* Hamilton Policy Brief. Washington D.C.: Brookings Institution.

English, L. M. (2005). Using public–private partnerships to achieve value for money in the delivery of healthcare in Australia. *International Journal of Public Policy, 2*(1), 91–121.

English, L. M. (2006). Public private partnerships in Australia: An overview of their nature, purpose, incidence and oversight. *University of New South Wales Law Journal Forum, 12*(2), 2–9.

English, L., & Guthrie, J. (2003). Driving privately financed projects in Australia: What makes them tick? *Accounting, Auditing & Accountability Journal, 16*(3), 493–511.

European PPP Expertise Center. (2012). *United Kingdom—England PPP units and related institutional framework.* Luxembourg.

http://www.eib.org/attachments/epec/epec_uk_england_ppp_unit_and_related_institutional_framework_en.pdf

Federal Highway Administration. (2020a, November 21). *Project profile: Chicago Skyway Toll Road—Project profiles*. Center for Innovative Center: https://www.fhwa.dot.gov/ipd/project_profiles/il_chicago_skyway.aspx

Federal Highway Administration . (2020b, November 21). *Indiana Toll Road - Project Profiles*. Center for Innovative Finance Support: https://www.fhwa.dot.gov/ipd/project_profiles/in_indiana_toll.aspx

Fellows, R. F., & Liu, A. M. (2015). *Research Methods for Construction.* Hoboken, NJ: John Wiley & Sons.

Flinders, M. (2005). The politics of public–private partnerships. *The British Journal of Politics and International Relations, 7*(2), 215–239.

Floricel, S., & Miller, R. (2000). The strategic management of large engineering projects: Shaping institutions, risks, and governance. *Strategic Systems and Templates, 8*(1), 113–130.

Florida Department of Management Services. (2014). *Partnerships for Public Facilities and Infrastructure Act Guidelines Task Force– Final Report and Recommendations.* https://www.dms.myflorida.com/content/download/104626/592850/Final_Report_and_Recommendations_Partnership_for_Public_Facilities_and_Infrastructure_Act_Guidelines_Task_Force.pdf

Forrer, J., Kee, J. E., Newcomer, K., & Boyer, E. (2007). Public-private partnerships and the public accountability question. *Public Administration Review, 70*(3), 475–484.

Fxtop. (2020). *Currency converter*. Fxtop: https://fxtop.com/en/currency-converter.php

Garvin, M. (2007). America's infrastructure strategy: Drawing on history to guide the future [PPP White paper]. KPMG LLP and Stanford University. https://zdocs.tips/doc/crgp-kpmg-whitepaper-xm6yk74yk31v

Garvin, M. J. (2010). Enabling development of the transportation public–private partnership market in the United States. *Journal of Construction Engineering and Management, 136*(4), 402–411.

Garvin, M., & Bosso, D. (2008). Assessing the effectiveness of infrastructure public—Private partnership programs and projects. *Public Works Management & Policy, 13*(2), 162–178.

Grimsey, D., & Lewis, M. (2004). The governance of contractual relationships in public–private partnerships. *The Journal of Corporate Citizenship, 1*(15), 91–109.

Grimsey, D., & Lewis, M. (2007). *Public Private Partnerships: The Worldwide Revolution in Infrastructure Provision and Project Finance.* Cheltenham: Edward Elgar.

Grimshaw, D., Vincent, S., & Willmott, H. (2002). Going privately: Partnership and outsourcing in UK public services. *Public Administration, 80*(3), 475–502.

Heald, D. (2003). Value for money tests and accounting treatment in PFI schemes. *Accounting, Auditing & Accountability Journal, 16*(3), 342–371.

HM Treasury. (2000). *Public-Private Partnerships—The Government Approach.* London: The Stationery Office.

HM Treasury. (2006). *Value for Money Assessment Guidance.* London: UK Government.

HM Treasury. (2012). *Public Expenditure Statistical Analysis.* London: Treasury.

Hodge, G., & Greve, C. (2007). Public–: An international performance review. *Public Administration Review, 67*(3), 545–558.

Hodge, G., & Greve, C. (2009). PPPs: The passage of time permits a sober reflection. *Economic Affairs, 29*(1), 33–39.

Hodge, G., & Greve, C. (2010). Public–private partnerships: Governance scheme or language game? *Australian Journal of Public Administration, 69*(1), S8–S22.

Hodge, G. A., Greve, C., & Boardman, A. (2010). *International Handbook on Public–Private Partnerships.* Northampton, MA: Edward Elgar.

Hodges, R., & Mellett, H. (2012). The UK private finance initiative: An accounting retrospective. *The British Accounting Review, 44*(4), 235–247.

International Monetary Fund (IMF). (2020). *Inflation rate, average consumer prices*. International Monetary Fund–Data Mapper: https://www.imf.org/external/datamapper/PCPIPCH@WEO/OEMDC/ADVEC/WEOWORLD

Istrate, E., & Puentes, R. (2011). *Moving Forward on Public Private Partnerships: US and International Experience With Ppp Units.* Washington, DC: Brookings Institution.

Itakura, K. (2020). Evaluating the impact of the US–China trade war. *Asian Economic Policy Review, 15*(1), 77–93.

Jooste, S. F., Levitt, R., & Scott, D. (2011). Beyond "one size fits all": How local conditions shape PPP-enabling field development. *The Engineering Project Organization Journal, 1*(1), 11–25.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2011). The worldwide governance indicators: Methodology and analytical issues. *Hague Journal on the Rule of Law, 3*(2), 220–246.

Ke, Y. J., Wang, S. Q., & Chan, A. P. (2009). Public-private partnerships in China's infrastructure development: Lessons learnt. In *Proceedings of International Conference on Changing Roles: New Roles and New Challenges* (pp. 177–188). *Noordwijk aan Zee, The Netherlands*

Kim, J. H., Kim, J., Shin, S., & Lee, S. Y. (2011). *Public–Private Partnership Infrastructure Project: Case studies from the Republic of Korea.* Mandaluyong, Philippines: Asian Development Bank.

Kim, J. H. (2011). *Public Private Partnership in Korea.* Geneva: Economic Commision for Europe.

Kim, K. (2015). How PPP units can influence regional performance: Korea's experience [Blog post]. https://blogs.worldbank.org/ppps/how-national-ppp-units-can-influence-regional-performance-korea-s-experience

Koetse, M. J., & Rietveld, P. (2009). The impact of climate change and weather on transport: An overview of empirical findings. *Transportation Research Part D: Transport and Environment, 14*(3), 205–221.

Kokoski, M. (2000). Alternative CPI aggregations: Two approaches. *Monthly Labor Review, 12*(3), 31.

Kolk, A., Van Tulder, R., & Kostwinder, E. (2008). Business and partnerships for development. *European Management Journal, 26*(4), 262–273.

Lagle, E. (2019). Public-private partnerships and smart growth: A legislative tool kit for public-infrastructure projects. *Pace Environmental Law, 37*(1), 211–245.

Lam, P. T. (1999). A sectoral review of risks associated with major infrastructure projects. *International Journal of Project Management, 17*(2), 77–87.

Levitt, R. E., Scott, W. R., & Garvin, M. J. (Eds.). (2019). *Public–private Partnerships for Infrastructure Development: Finance, Stakeholder Alignment, Governance*. Northampton, MA: Edward Elgar.

Lodico, M. G., Spaulding, D. T., & Voegtle, K. H. (2006). *Methods in Educational Research: From Theory to Practice.* San Francisco, CA: Jossey-Bass.

Lourdes, T. C., Federico, I. S., Francisco Javier, C. M., & Casiano, M. D. (2018). Explaining success and failures in PPP transport projects: An econometric approach. *European Journal of Transport and Infrastructure Research, 18*(4), 569–583.

Loxley, J., & Loxley, S. (2010). *Public Service, Private Profits: The Political Economy Of Public–Private Partnerships in Canada.* Halifax: Fernwood.

Lu, Y. C., Wu, S., Chen, D. H., & Lin, Y. Y. (2000). BOT projects in Taiwan: financial modeling risk, term structure of net cash flows, and project at risk analysis. *The Journal of Structured Finance, 5*(4), 53–63.

Lucyshyn, W., Vitale, M., & Steinhoff, J. (2016). *Using public–private partnerships to reduce cost and enhance services.* http://www.kpmg-institutes.com/content/dam/kpmg/governmentinstitute/pdf/2017/aga-ppps.pdf

Macrotrends. (2020). *One year LIBOR rate–Historical chart*. Macrotrends: https://www.macrotrends.net/2515/1-year-libor-rate-historical-chart

Maguire, G., & Malinovitch, A. (2004). Development of PPPs in Victoria. *Australian Accounting Review, 14*(2), 27–33.

Mahalingam, A. T., Seddon, R. J., Santosh, V., & Srinivasan, S. (2011). *Creating an Enabling Ambient Environment for PPPs.* Chennai, India: IIT—Madras & Centre for Development Finance.

Maharjan, R. (2017). *Effects of Contract Procurement Factors on Performance of Transportation Projects* (Doctoral dissertation). University of Nevada, Las Vegas.

Martin, L. L. (2005). *The Challenge of Public Private Partnerships: Learning from International Experience.* Cheltenham, UK: Edward Elgar.

Martin, L., Lawther, W., Hodge, G., & Greve, C. (2013). Internationally recommended best practices in transportation financing public–private partnerships (P3s). *Public Administration Research*, *2*(2), 15–25.

Martin, L. (2016). Making sense of public–private partnerships (P3s). *Journal of Public Procurement, 16*(2), 191–207.

Maryland State Code. (2017). *State finance and procurement*. JUSTIA US Law: https://law.justia.com/codes/maryland/2017/state-finance-and-procurement/division-i/title-10a/subtitle-1/section-10a-101/

McBridge, J., Chatzky, A., & Siripurapu, A. (2020). *The national debt dilemma*. Council on Foreign Relations: https://www.cfr.org/backgrounder/national-debt-dilemma

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica, 71*(6), 1695–1725.

Millea, M., Wills, R., Elder, A., & Molina, D. (2018). What matters in college student success? Determinants of college retention and graduation rates. *Education,*

138(4), 309–322. https://www.ingentaconnect.com/content/prin/ed/2018/00000138/00000004/art00003

Monk, A. H., Levitt, R. E., Garvin, M. J., & South, A. G. (2019). Public–private partnerships for infrastructure delivery. In R. E. Levitt, M. J. Garvin, & W. R. Scott, *Public–Private Partnerships for Infrastructure Development, Chapter 1* (pp. 19–34). Cheltenham, UK: Edward Elgar.

Myrick, D. F. (1990). *New Mexico's Railroads: A Historical Survey.* Albuquerque, NM: University of New Mexico.

Nakamura, T. (2000). The PFI situation in Japan. *The Newsletter of the International Project Finance Association, 2*(1), 5–7.

Nardi, P. M. (2018). *Doing Survey Research: A Guide to Quantitative Methods.* New York, NY: Routledge.

National Center for Public Private Partnerships. (2015). *Definition of Public–Private Partnerships.* Moscow: National Public Private Partnerships Center.

New South Wales. (2020). *Awarded projects*. Retrieved from New South Wales Treasury: https://www.treasury.nsw.gov.au/projects-initiatives/public–private-partnerships/awarded-projects

Newman, J. (2013). *The Governance of Public–Private Partnerships: Success and Failure in the Transportation Sector* (Doctoral dissertation). Simon Fraser University, Arts & Social Sciences: Department of Political Science. Burnaby: Simon Fraser University Library.

Newman, & Perl, A. (2015). Partners in clime: Public private partnerships and British Columbia's capacity to pursue climate policy objectives. *Canadian Public Administration, 57*(2), 217–233.

Nwangwu, G. (2016). *Public Private Partnerships in Nigeria.* New York: Springer.

Opara, M., & Elloumi, F. (2017). The emergence of public–private partnerships (P3s) in Alberta: Lessons from the Anthony Henday highway. *Canadian Public Administration, 60*(2), 268–288.

Osborne, D., & Gaebler, T. (1992). *Reinventing Government: How the Entrepreneurial Spirit Is Transforming Government.* Boston, MA: Adison-Wesley.

Osei–Kyei, R., & Chan, A. P. (2016). Developing transport infrastructure in sub-Saharan Africa through public–private partnerships: Policy practice and implications. *Transport Reviews, 36*(2), 170–186.

P3 Spectrum. (2020). *Canadian P3 Projects*. Retrieved from P3 Spectrum: http://www.p3spectrum.ca/project/

Papajohn, D., Cui, Q., & Bayraktar, M. E. (2011). Public-private partnerships in US transportation: Research overview and a path forward. *Journal of Management in Engineering, 27*(3), 126–135. https://doi.org/10.1061/(asce)me.1943-5479.0000050.

Park, T. K. (1998). Private infrastructure development in Asia. *The Journal of Structured Finance, 4*(3), 25–33.

Parkland Institute. (2011). Unpacking Alberta's infrastructure spending: Real increases have been moderate. Parkland Institute: https://www.parklandinstitute.ca/unpacking_albertas_infrastructure_spending

Parliament of New South Wales. (2017). *Road tolling in New South Wales.* Legislative Council, Portfolio Committee #2. Sydney: NSW Legislative Council. https://www.parliament.nsw.gov.au/lcdocs/inquiries/2428/Road%20Tolling%20in%20New%20South%20Wales%20-%20Final%20Report.pdf

Partnership Victoria. (2010). *Project summary.* East Melbourne: Linking Melbourne Authority. https://www.dtf.vic.gov.au/sites/default/files/2018-01/The-Peninsula-Link-Project-Project-Summary.pdf

Plenary Group. (2018). *Gold Coast Light Rail*. Plenary Group: https://plenarygroup.com/projects/asia-pacific/gold-coast-light-rail

Pradhan, R. P. (2019, December). Investigating the causal relationship between transportation infrastructure, financial penetration and economic growth in G-20 countries. *Research in Transportation Economics, 78*(1), 100766.

Preston, C. (2020). *Transportation facility definition*. Law Insider: https://www.lawinsider.com/dictionary/transportation-facility

Pruett, P. S., & Absher, B. (2015). Factors influencing retention of developmental education students in community colleges. *Delta Kappa Gamma Bulletin, 81*(4), 32–40.

Quiggin, J. (2004). Risk, PPPs and the public sector comparator. *Australian Accounting Review, 14*(33), 51–61.

Railway Technology. (2018). Uijeongbu light rail transit. https://www.railway-technology.com/projects/uijeongbu-light-rail-transit/

Raymaekers, J., & Rousseeuw, P. J. (2021). Transforming variables to central normality. *Machine Learning, 3*(1), 1–23.

Rodríguez-Pose, A., & Wilkie, C. (2017). Revamping local and regional development through place-based strategies. *Cityscape, 19*(1), 151–170.

Rondinelli, D. (2002). *Public-private partnerships.* In *Handbook on Development Policy and Management* (pp. 381) Cheltenham, UK: Edward Elgar.

Sandfort, J., & Milward, H. B. (2008). Collaborative service provision in the public sector. In J. Sandfort, & H. B. Milward, *The Oxford handbook of inter-organizational relations, chapter 6* (pp. 147–174). Oxford, UK: Oxford University.

Schwab, K. (2008). Global corporate citizenship: Working with governments and civil society. *Foreign Affairs, 87*(1), 107–118.

Schwartz, R., Gregory, I., & Thévenin, T. (2011). Spatial history: Railways, uneven development, and population change in France and Great Britain, 1850–1914. *Journal of Interdisciplinary History, 42*(1), 53–88.

Seitanidi, M. M., Koufopoulos, D. N., & Palmer, P. (2010). Partnership formation for change: Indicators for transformative potential in cross sector social partnerships. *Journal of Business Ethics, 94*(1), 139–161.

Selsky, J. W., & Parker, B. (2005). Cross-sector partnerships to address social issues: Challenges to theory and practice. *Journal of Management, 31*(6), 849–873.

Sengupta, R., Mukherjee, S., & Gupta, M. (2015). Financing for infrastructure investment in G-20 countries. *National Institute of Public Finance and Policy Working Paper, 144*, 1–45.

Shen, J. Y., Wang, S. Q., & Qiang, M. S. (2005). Political risks and sovereign risks in Chinese BOT/PPP projects: A case study. *Chinese Businessman Investment and Finance, 1*(2), 50–53.

Siemiatycki, M. (2015). Public-private partnerships in Canada: Reflections on twenty years of practice. *Canadian Public Administration, 58*(3), 343–362.

St. Louis FED. (2020). FED economic data–Gross domestic product. Federal Reserve Bank of St. Louis: https://fred.stlouisfed.org/searchresults/?st=Gross%20Domestic%20Product

Stein, S. W. (1994). Build-operate-transfer (BOT)-A re-evaluation. *International Construction Law Review, 2*(2), 101–113.

Surowiecki, J. (2016, April 11). System overload. The New Yorker: https://www.newyorker.com/magazine/2016/04/18/inside-americas-infrastructure-problem

Tamošaitienė, J., Sarvari, H., Chan, D. W., & Cristofaro, M. (2021). Assessing the barriers and risks to private sector participation in infrastructure construction projects in developing countries of Middle East. *Sustainability, 13*(1), 153–162.

Thakur, S., & Lahiry, S. (2019). Research ethics in the modern era. *Indian Journal of Dermatology, Venereology & Leprology, 85*(4), 351–354.

Thomas, N., & Thomas, A. V. (2017). Regression modelling for prediction of construction cost and duration. *Applied Mechanics and Materials, 857*(5), 195–199.

Thompson, S. (2012). Credit rating and project finance default: An important risk management instrument. *Bulletin, 1*(8), 10.

Thurmaier, K. M., & Willoughby, K. G. (2001). *Policy and Politics in State Budgeting.* New York City: M.E. Sharpe.

Tsamboulas, D., Verma, A., & Moraiti, P. (2013). Transport infrastructure provision and operations: Why should governments choose private–public partnership? *Research in Transportation Economics, 38*(1), 122–127.

Tunnel Talk. (2013). Australia suffers toll concession failures. Tunnel Talk: https://www.tunneltalk.com/Discussion-Forum-16Jul13-Australia-PPP-toll-tunnel-crisis.php

U.S. Department of Transportation. (2010). *Public-Private Partnerships Concessions for Highway Projects: A Primer.* Federal Highway Administration (FHWA), Office of Innovative Program Delivery. Waschington DC: FHWA. https://www.fhwa.dot.gov/ipd/pdfs/p3/p3_concession_primer.pdf

U.S. Department of Transportation . (2014). *P3 Defined.* www.transportation.gov/buildamerica/p3

U.S. Department of Transport. (2018). *State P3 Legislation*. Federal Highway Administration–Center for Innovative Finance Support: https://www.fhwa.dot.gov/ipd/p3/legislation/

U.S. Department of Transportation. (2020). Project profiles. Federal Highway Administration Center for Innovative Finance Support: https://www.fhwa.dot.gov/ipd/project_profiles/

U.S. Government Accountability Office. (2021). *America's Fiscal Future: Understanding the Debt.* https://www.gao.gov/americas_fiscal_future?t=federal_debt

United Kingdom Government. (2018). Private finance initiative and private finance 2 projects: 2017 summary data. United Kingdom Government: https://www.gov.uk/government/publications/private-finance-initiative-and-private-finance-2-projects-2017-summary-data

Vining, A., & Boardman, A. (2008). Public-private partnerships in Canada: Theory and evidence. *Canadian Public Administration, 51*(1), 9–44.

Virginia Department of Transportation. (2019). *Completed P3 Projects*. Office of Public-Private Partnerships: https://www.p3virginia.org/categories/completed-p3-projects/

Virginia Law. (1995). *Code of Virginia: § 33.2-1800. Definitions*. Virginia Law: https://law.lis.virginia.gov/vacode/title33.2/chapter18/section33.2-1800/

Waheduzzaman, W. (2019). Challenges in transitioning from new public management to new public governance in a developing country context. *International Journal of Public Sector Management, 32*(7), 689–705.

Wang, S. Q., Tiong, R. L., Ting, S. K., & Ashley, D. (2000). Evaluation and management of foreign exchange and revenue risks in China's BOT projects. *Construction Management & Economics, 18*(2), 197–207.

White House. (2021a). *President Biden announces support for the bipartisan infrastructure framework.* Washington, DC: White House. https://www.whitehouse.gov/briefing-room/statements-releases/2021/06/24/fact-sheet-president-biden-announces-support-for-the-bipartisan-infrastructure-framework/

White House. (2021b). *President Biden to Sign Support for the Bipartisan Infrastructure Investment and Jobs Act Monday.* Washington, DC: White House. https://www.whitehouse.gov/briefing-room/statements-releases/2021/11/10/president-biden-to-sign-bipartisan-infrastructure-investment-and-jobs-act-monday/

White House. (2021c). The American jobs plan. Washington, DC: White House. https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/31/fact-sheet-the-american-jobs-plan/

World Bank. (2020). Private participation in infrastructure (PPI). Infrastructure Finance, PPPs & Guarantees: https://ppi.worldbank.org/en/customquery

World Bank Group. (2020). *Worldwide Governance Indicators Project*. Worldwide Governance Indicators: https://info.worldbank.org/governance/wgi/

World Population Review. (2020a). Capitalist countries 2020. World Population Review: https://worldpopulationreview.com/country-rankings/capitalist-countries

World Population Review. (2020b). GDP ranked by country 2020. World Population Review: https://worldpopulationreview.com/countries/countries-by-gdp/

Yeo, I., & Johnson, R. A. (2000, December). A new family of power transformations to improve normality or symmetry. *Biometrika, 87*(4), 954–959.

Yoo, S. K. (2010). Korea's case of public private partnerships for infrastructure development. Seoul: Korea's Ministry of Strategy and Finance. https://www.unescap.org/sites/default/files/rok.pdf

APPENDIX A: Institutional Review Board Exemption

Institutional Review Board (IRB)
For the Protection of Human Research Participants

PROTOCOL EXEMPTION REPORT

Protocol Number: 04192-2021

Responsible Researcher(s): Sotayo Sowemimo

Supervising Faculty: Dr. Gerald Merwin

Project Title: *Revamping America's Infrastructure: A Global Study of Private Sector Participation in Transport-Related Public-Private Partnerships*

INSTITUTIONAL REVIEW BOARD DETERMINATION:

This research protocol is **Exempt** from Institutional Review Board (IRB) oversight under Exemption **Category 2.** Your research study may begin immediately. If the nature of the research project changes such that exemption criteria may no longer apply, please consult with the IRB Administrator (irb@valdosta.edu) before continuing your research.

ADDITIONAL COMMENTS:

- *Upon completion of the research study collected data must be securely maintained (locked file cabinet, password protected computer, etc.) and accessible only by the researcher for a minimum of 3 years. At the end of the required time, collected data must be permanently destroyed.*

☒ ***If this box is checked, please submit any documents you revise to the IRB Administrator at irb@valdosta.edu to ensure an updated record of your exemption.***

Elizabeth Ann Olphie *06.21.2021*

Elizabeth Ann Olphie, IRB Administrator

Thank you for submitting an IRB application.

Please direct questions to irb@valdosta.edu or 229-253-2947.

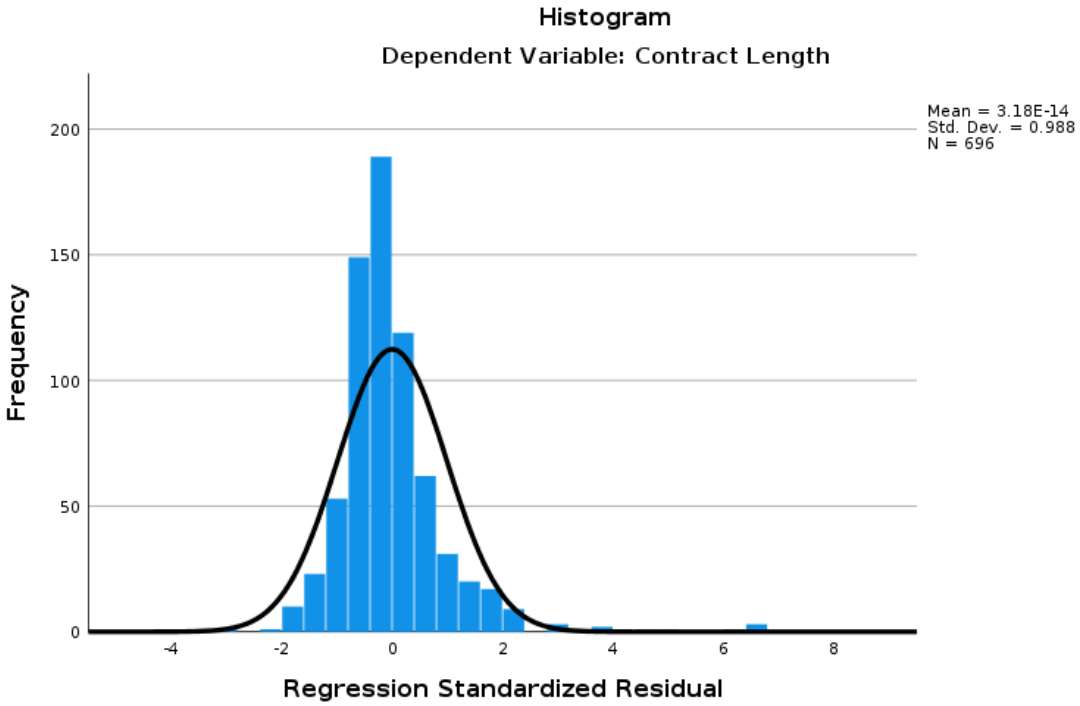
Revised: 06.02.16

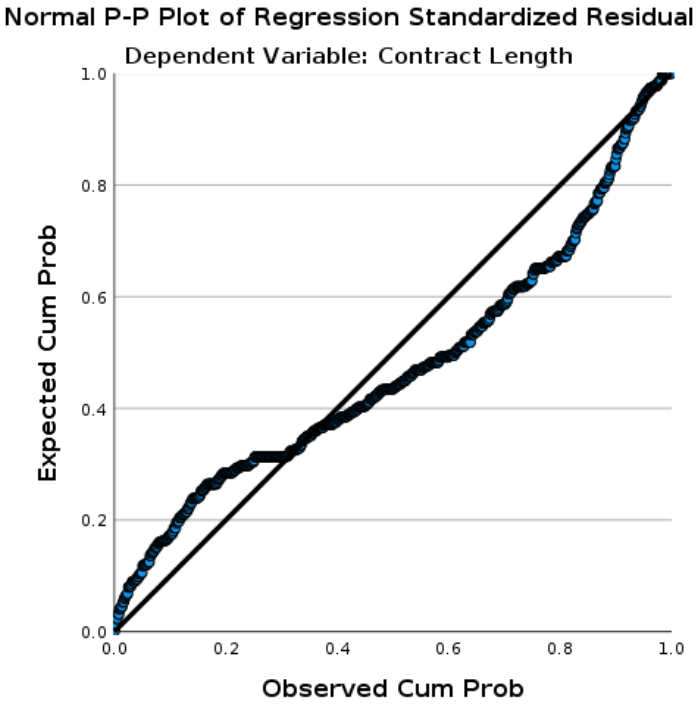
APPENDIX B: Regression Diagnostic Figures

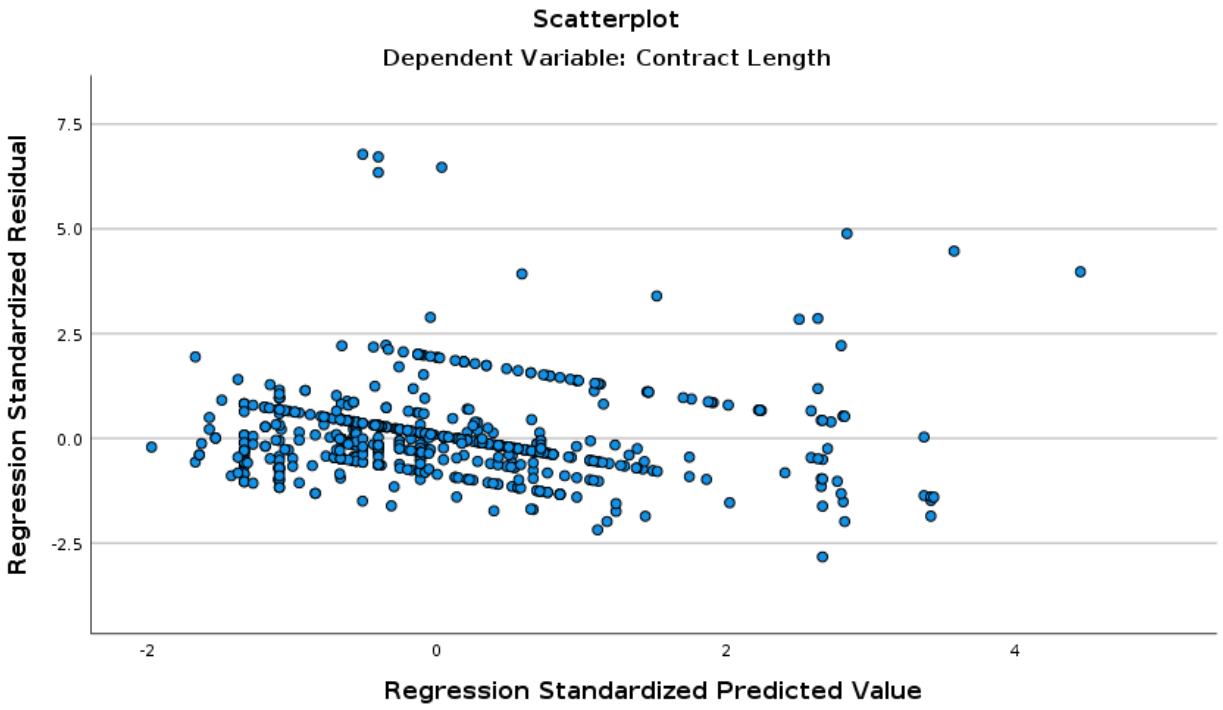
Appendix B presents all statistics created for assumptions testing and diagnostic purposes. Normality of the regression standardized residuals was found, indicating total investment, and total investment adjusted for inflation were not normally distributed, hence, these variables needed to be transformed in order for this assumption to be upheld. The Johnson family of transformations (Yeo & Johnson, 2000) was applied to this measure in order to achieve this, with the original measure having a very high degree of positive kurtosis.

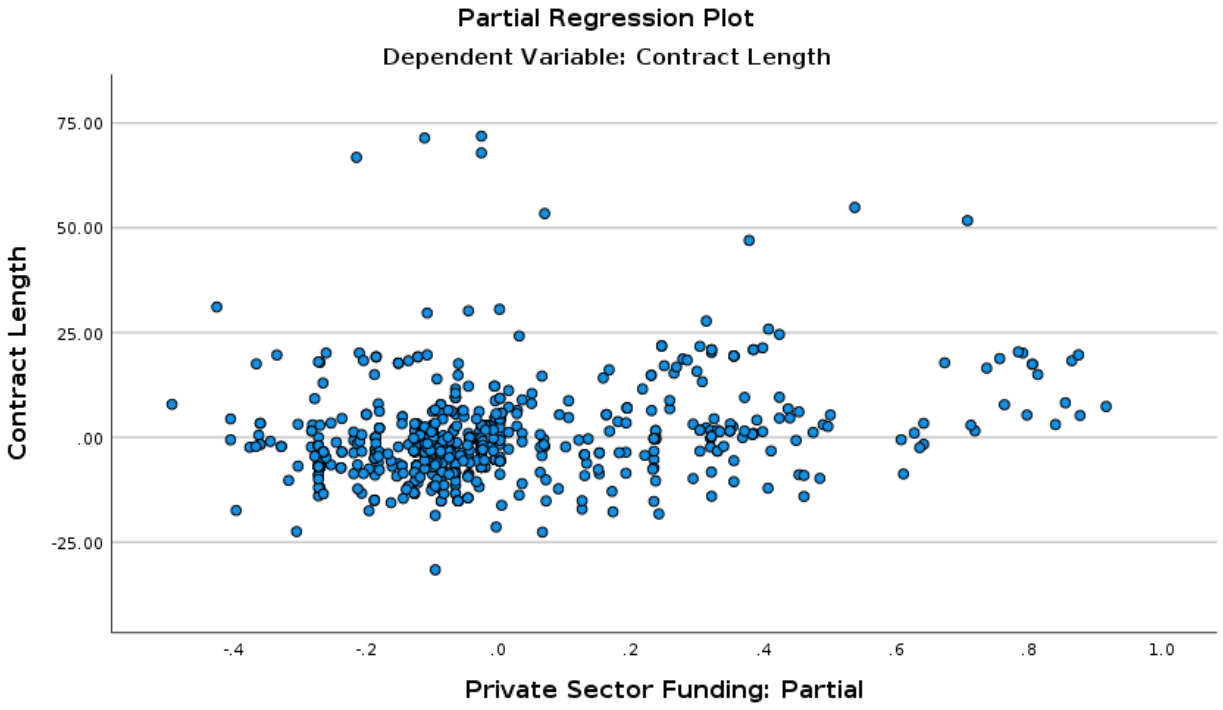
In addition, the scatterplots of the regression standardized residuals alongside the regression standardized predicted values failed to indicate the presence of heteroscedasticity. Partial regression plots indicated linearity with several outlying cases deleted prior to the regression analyses being conducted.

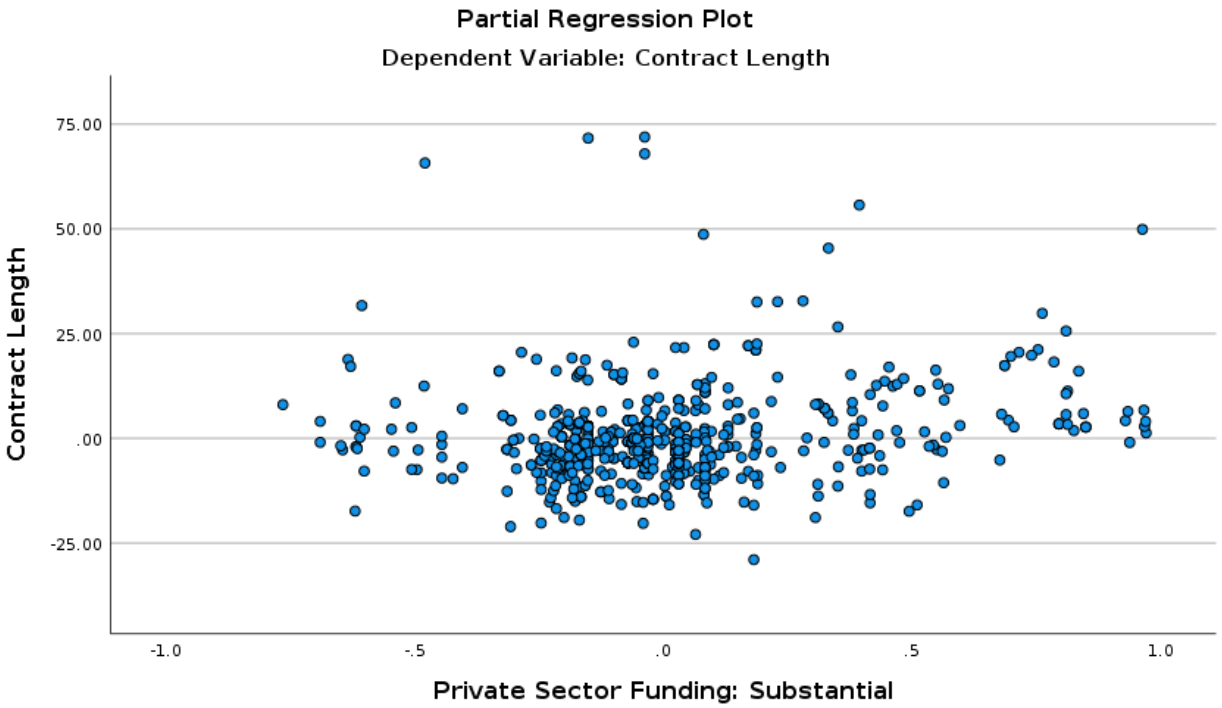
Regression 1 Diagnostic Figures

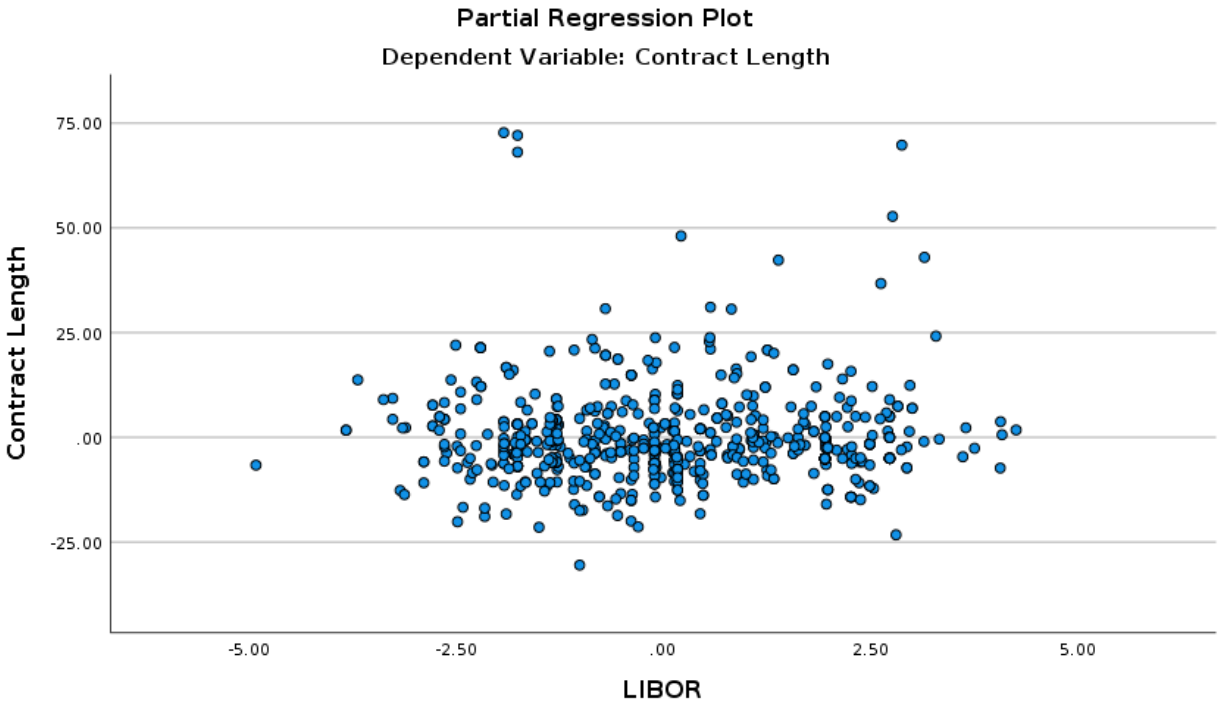


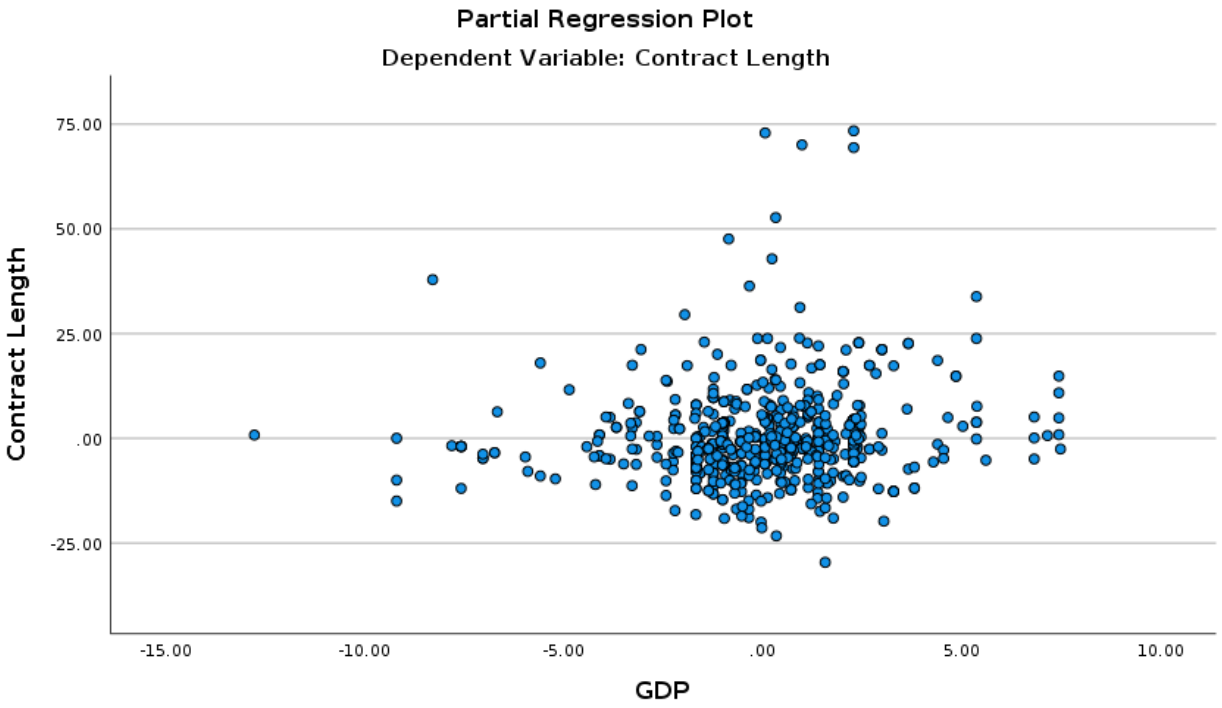


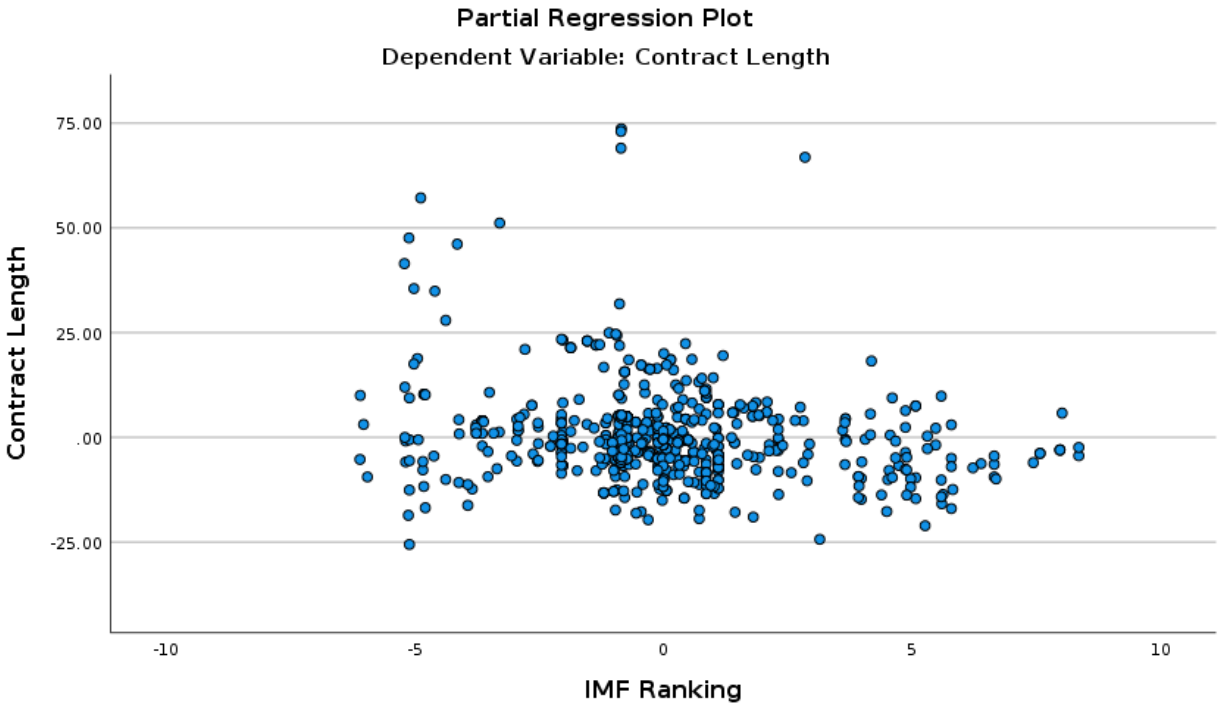

Scatterplot
Dependent Variable: Contract Length
Regression Standardized Residual
7.5
5.0
2.5
0.0
-2.5
-2
0
2
4
Regression Standardized Predicted Value

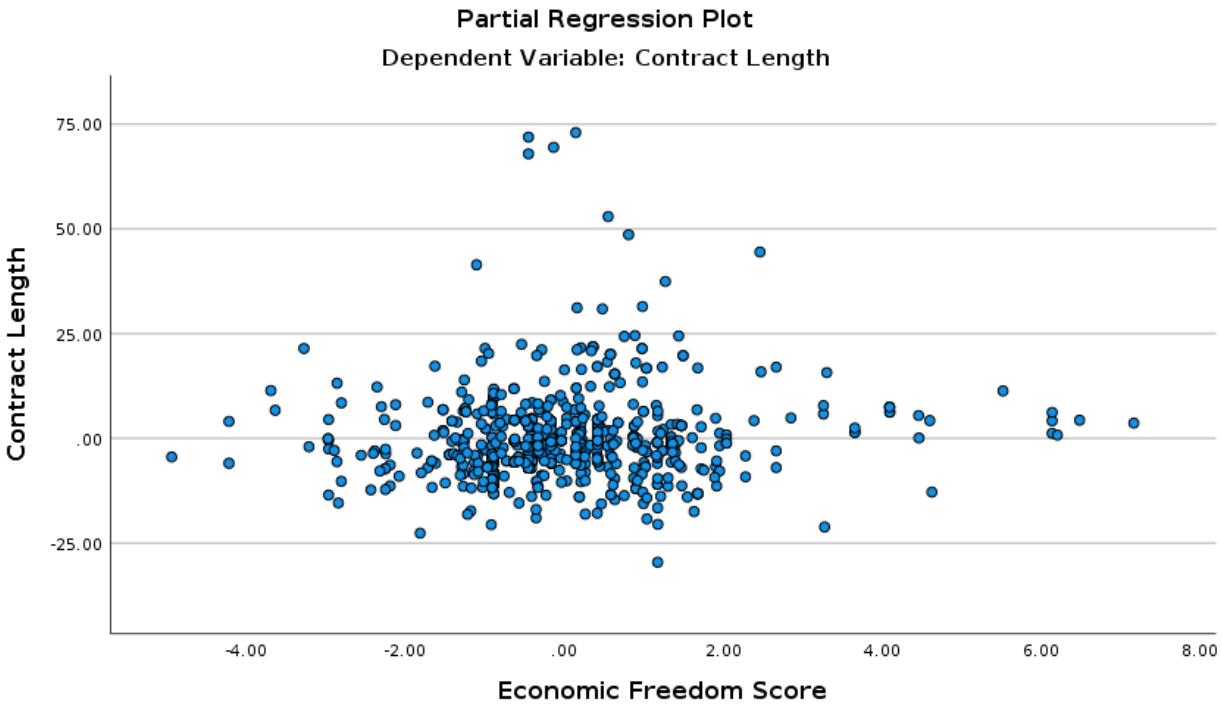

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.4
-.2
.0
.2
.4
.6
.8
1.0
Private Sector Funding: Partial

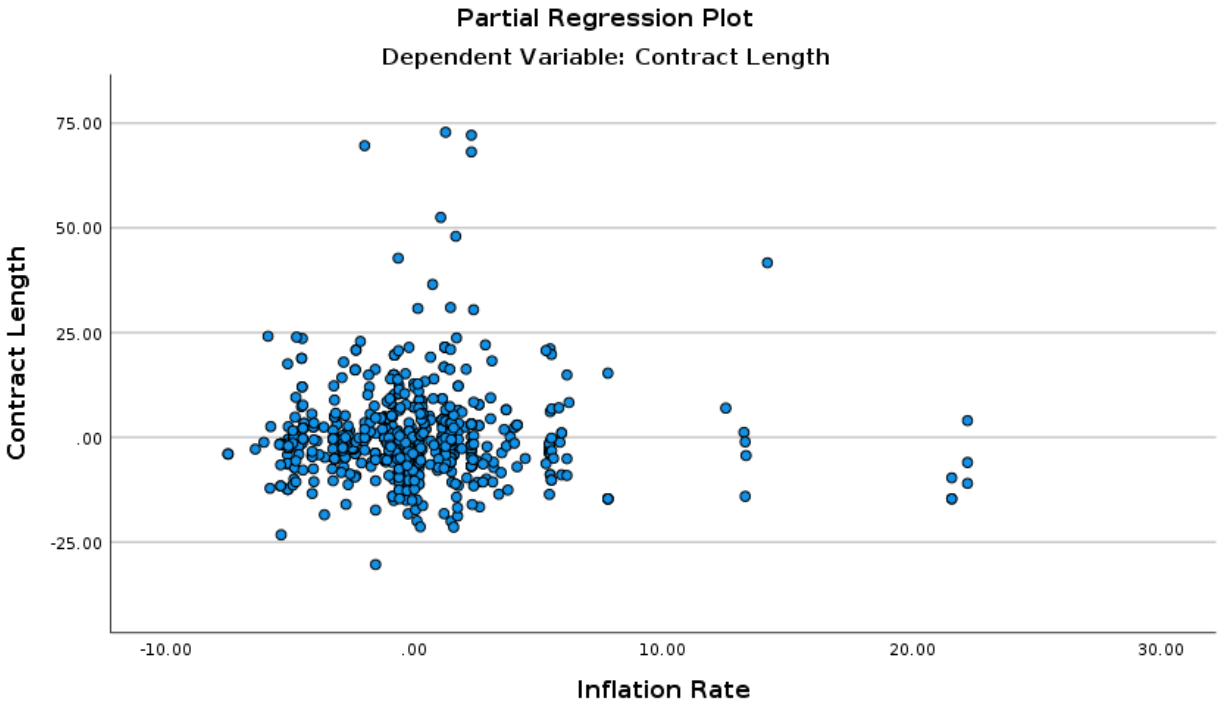

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-1.0
-.5
.0
.5
1.0
Private Sector Funding: Substantial

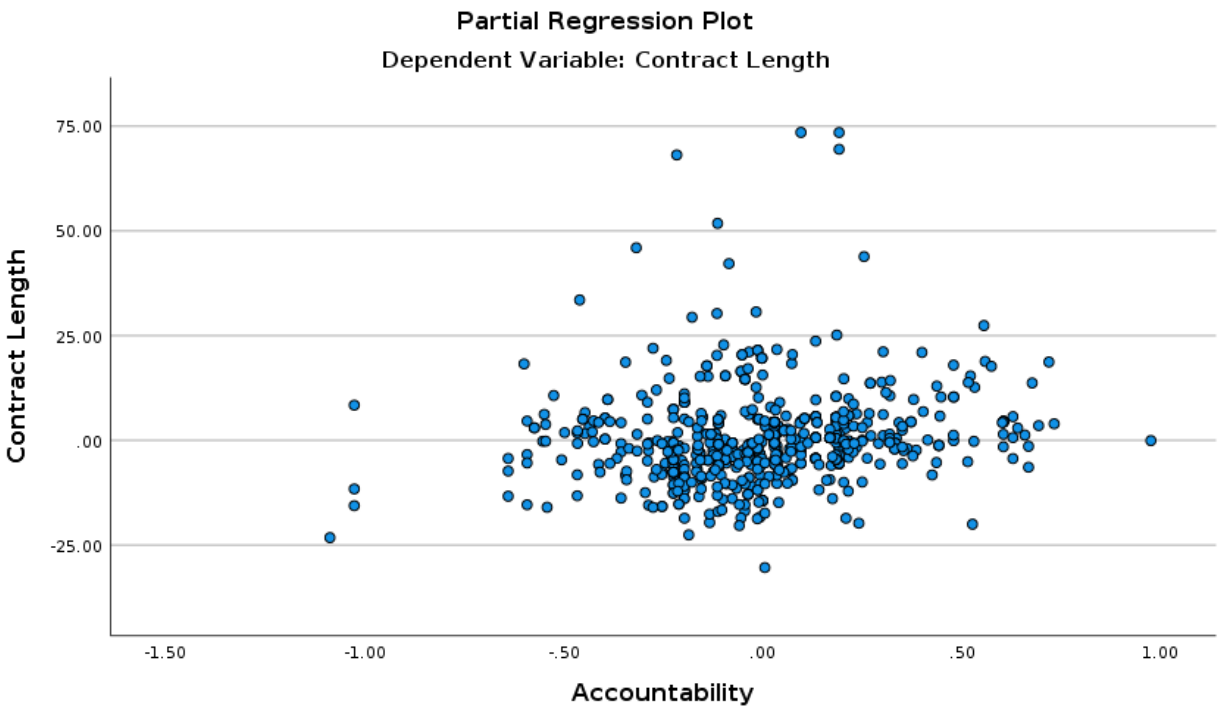

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-5.00
-2.50
.00
2.50
5.00
LIBOR

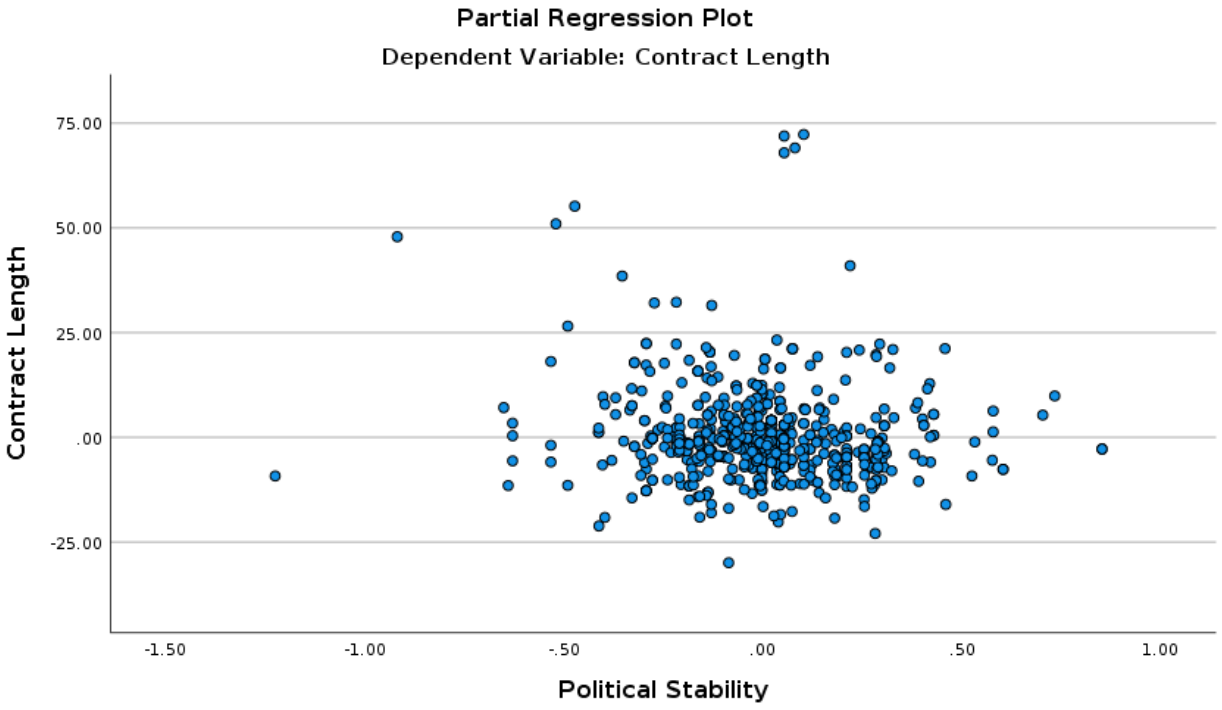

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-15.00
-10.00
-5.00
.00
5.00
10.00
GDP

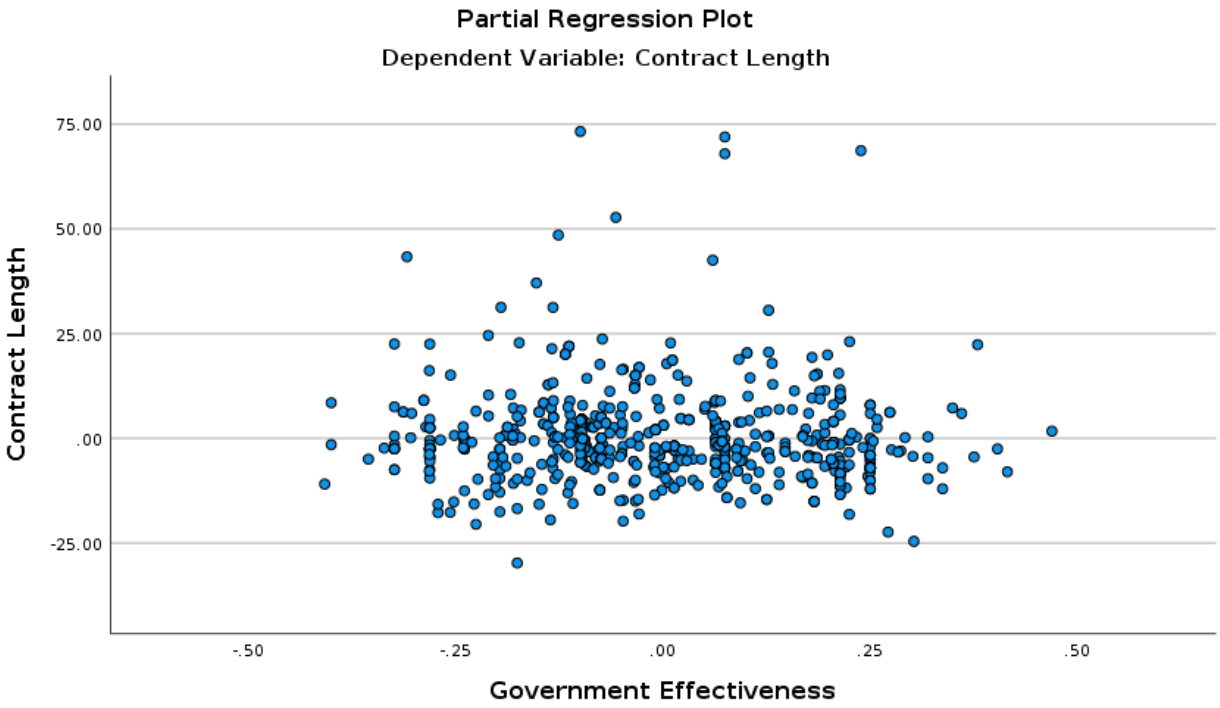

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-10
-5
0
5
10
IMF Ranking

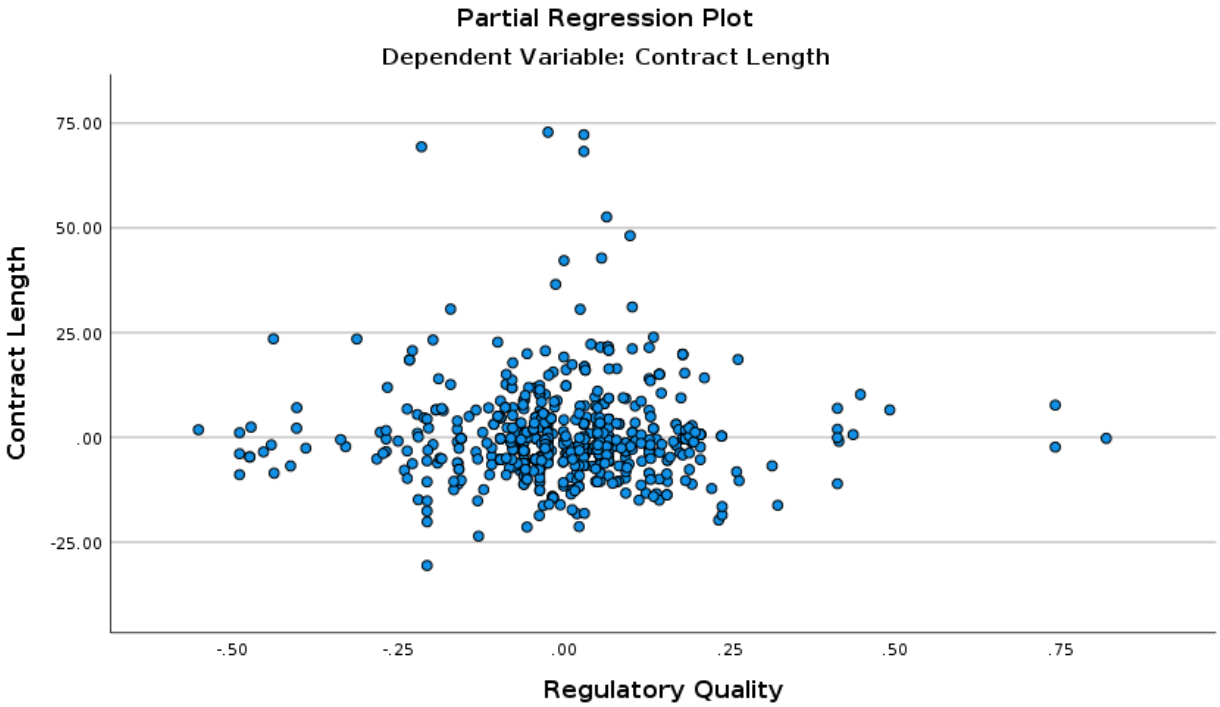

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-4.00
-2.00
.00
2.00
4.00
6.00
8.00
Economic Freedom Score

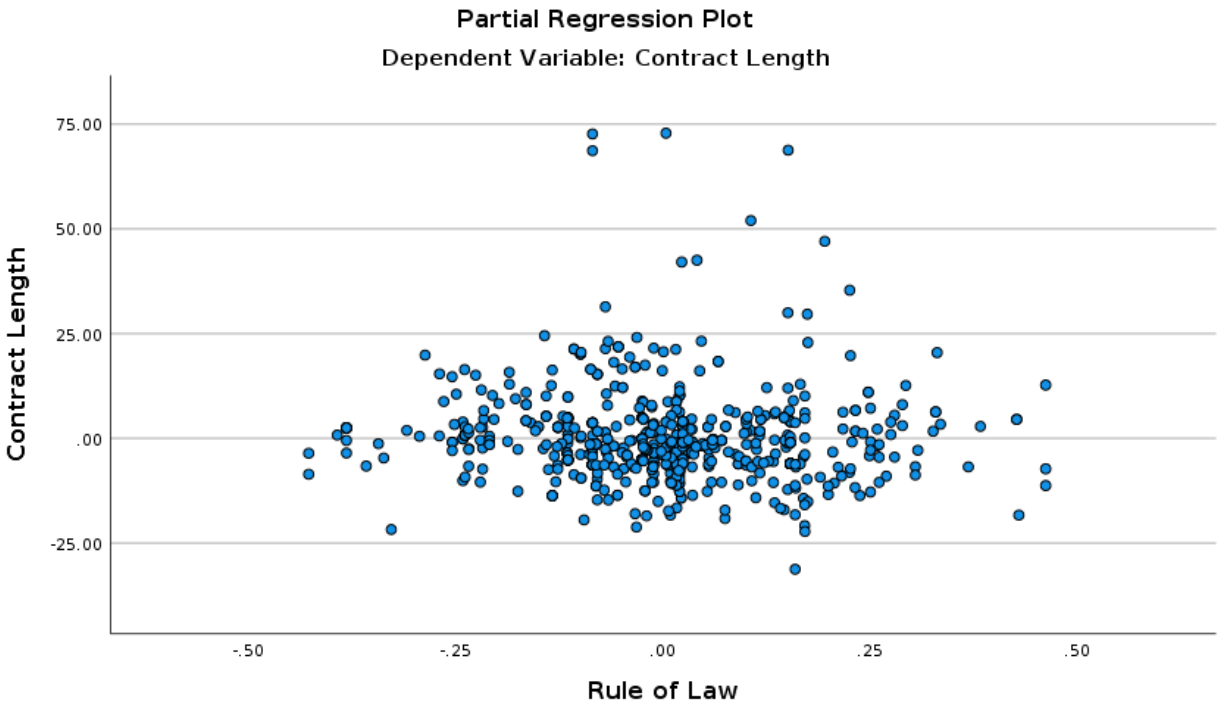

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-10.00
.00
10.00
20.00
30.00
Inflation Rate

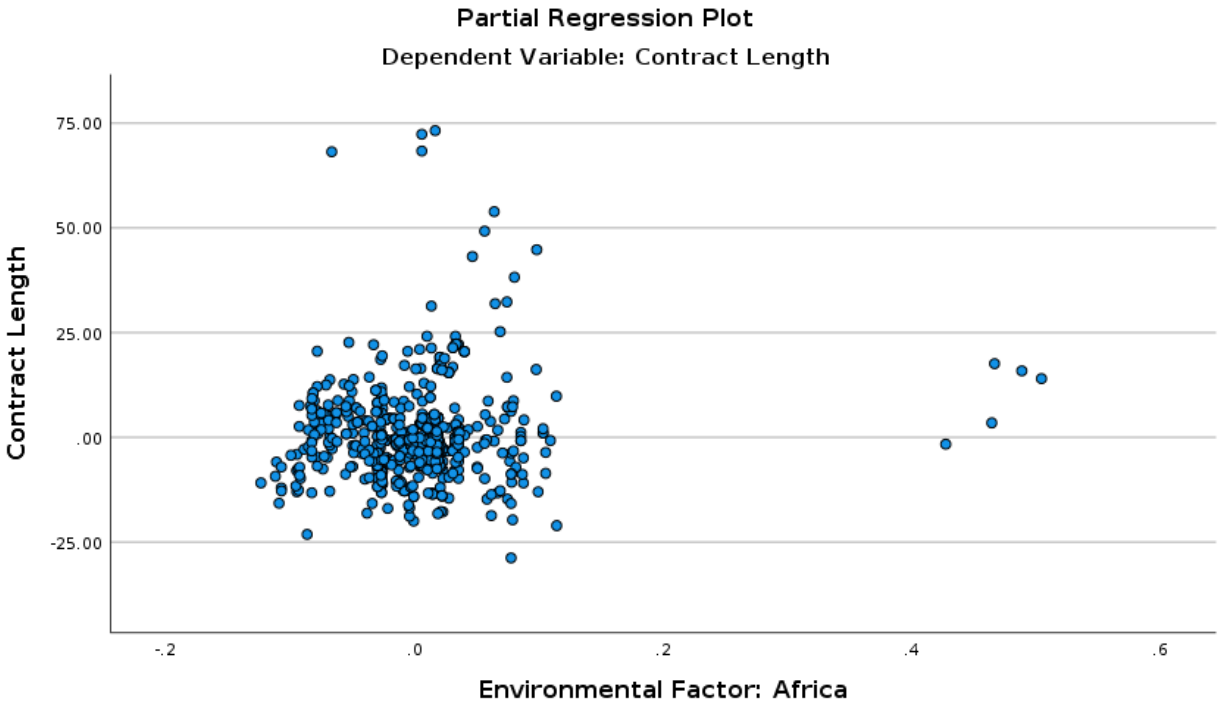

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-1.50
-1.00
-.50
.00
.50
1.00
Accountability

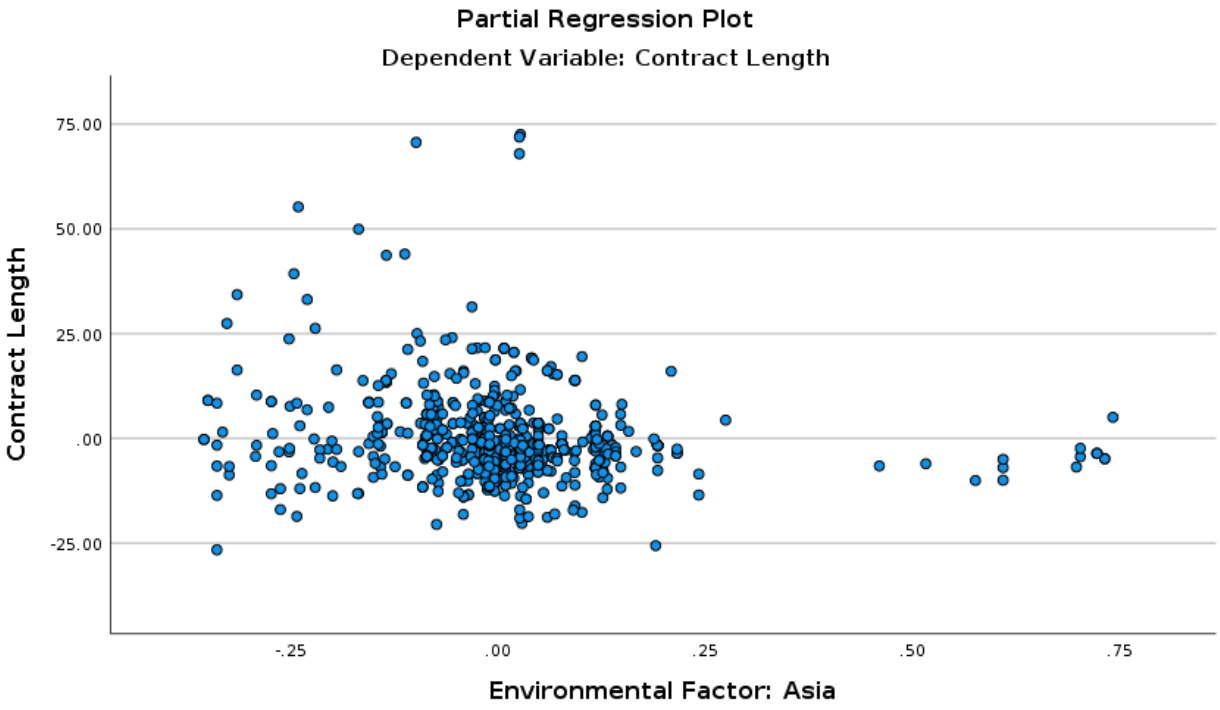

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-1.50
-1.00
-.50
.00
.50
1.00
Political Stability

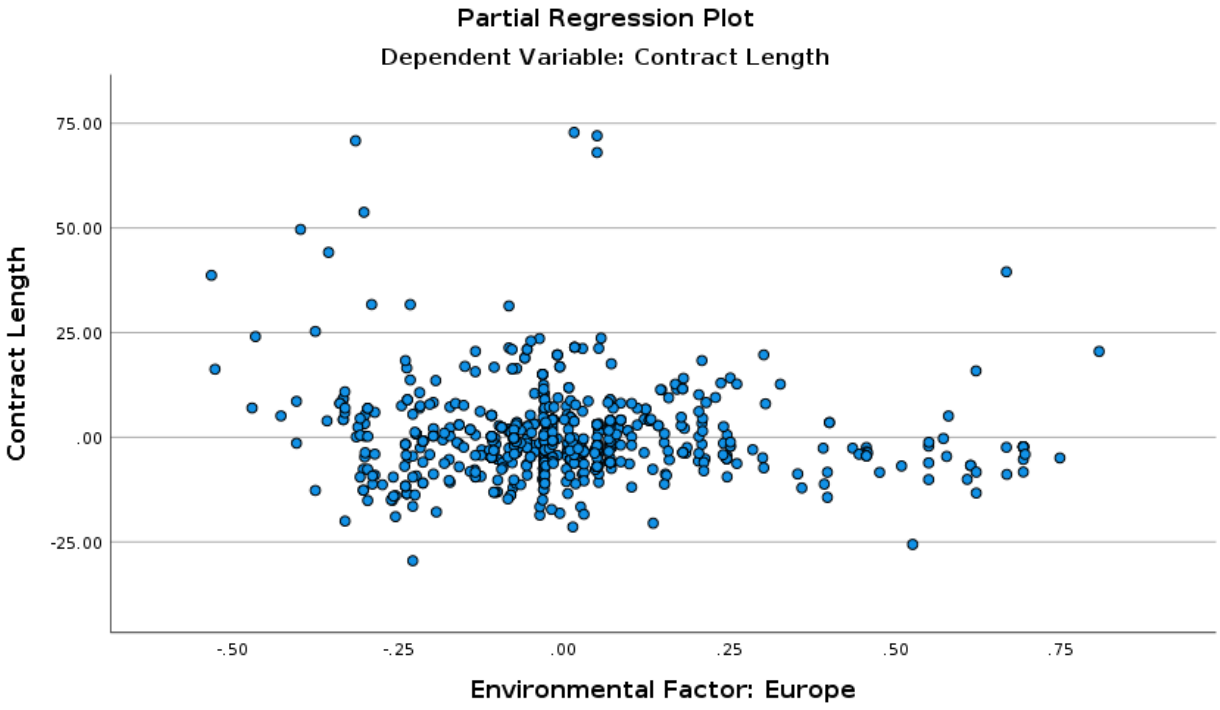

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.50
-.25
.00
.25
.50
Government Effectiveness

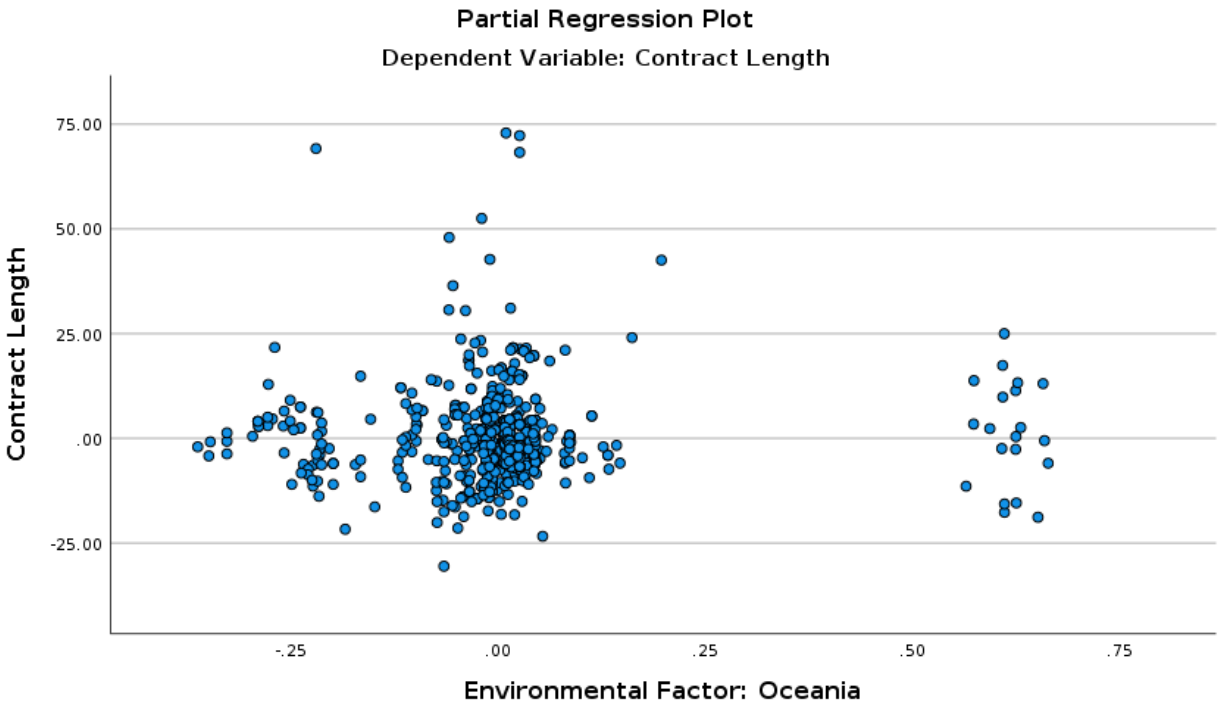

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.50
-.25
.00
.25
.50
.75
Regulatory Quality

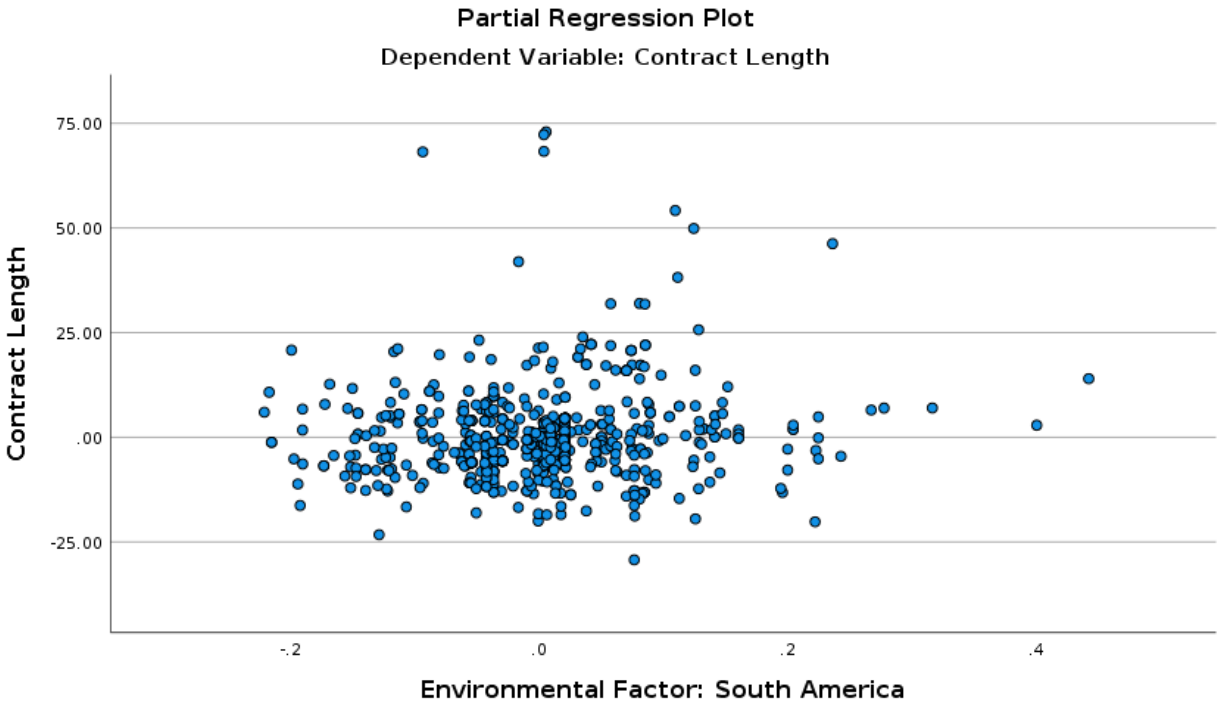

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.50
-.25
.00
.25
.50
Rule of Law


Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.2
.0
.2
.4
.6
Environmental Factor: Africa

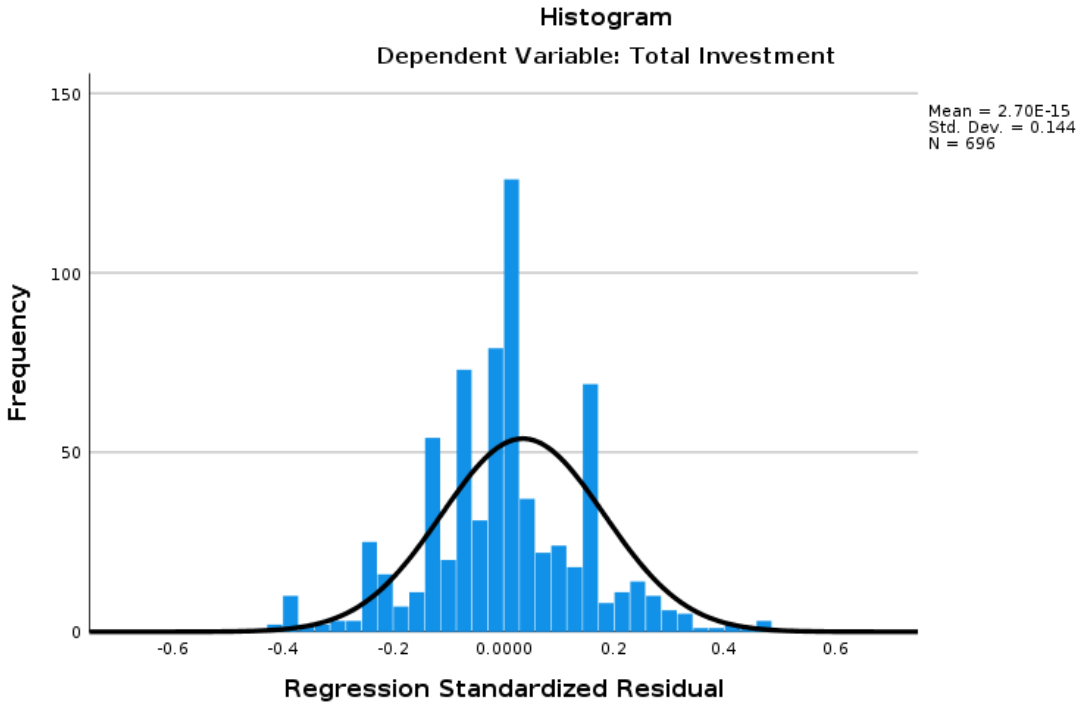

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.25
.00
.25
.50
.75
Environmental Factor: Asia

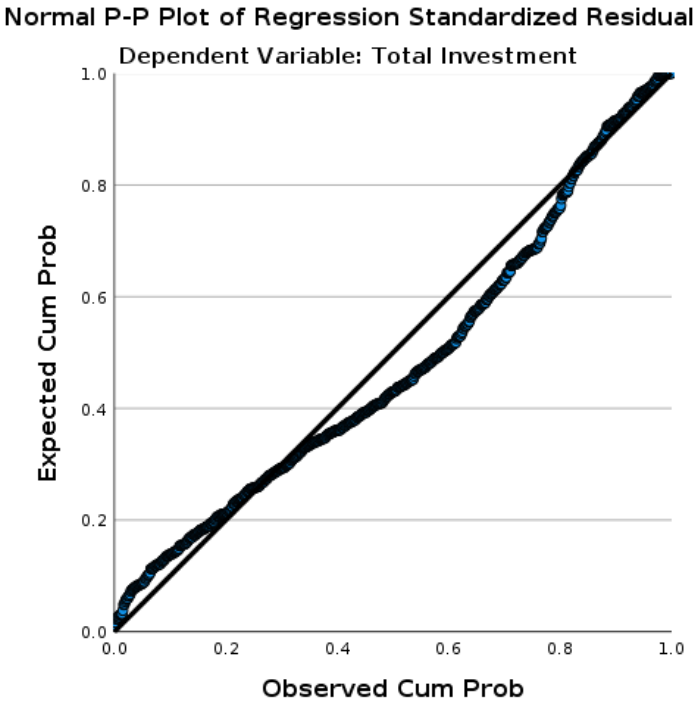

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.50
-.25
.00
.25
.50
.75
Environmental Factor: Europe

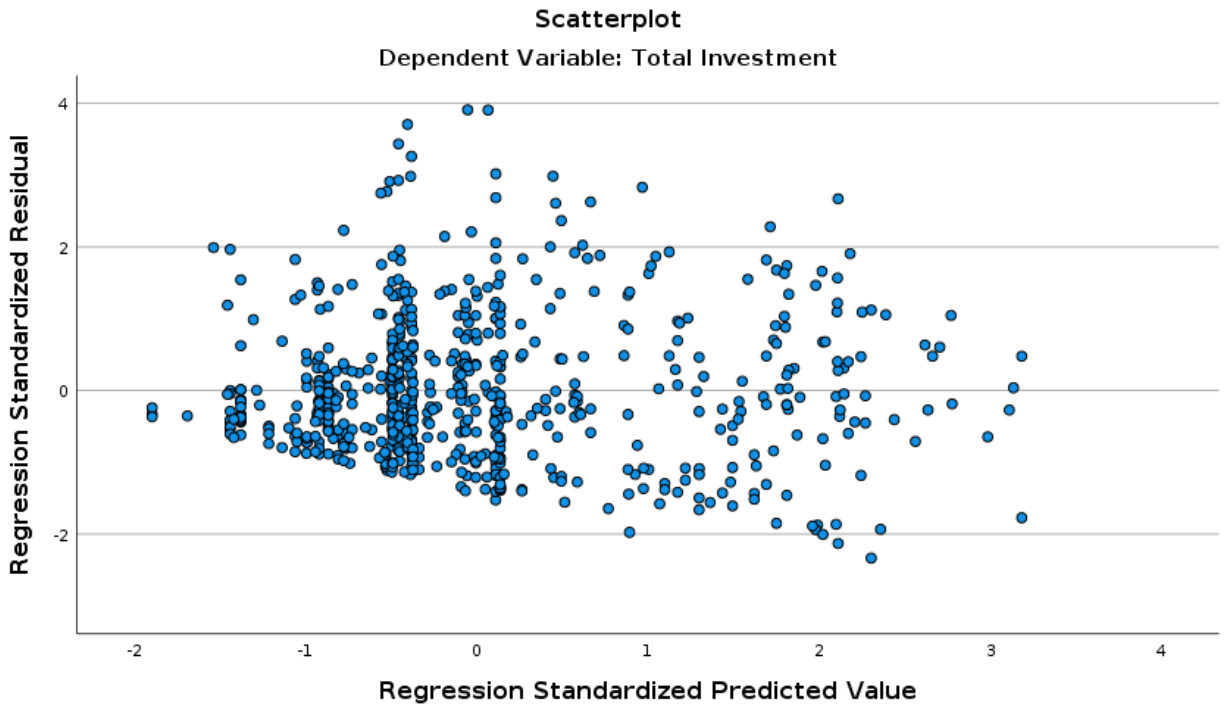

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.25
.00
.25
.50
.75
Environmental Factor: Oceania

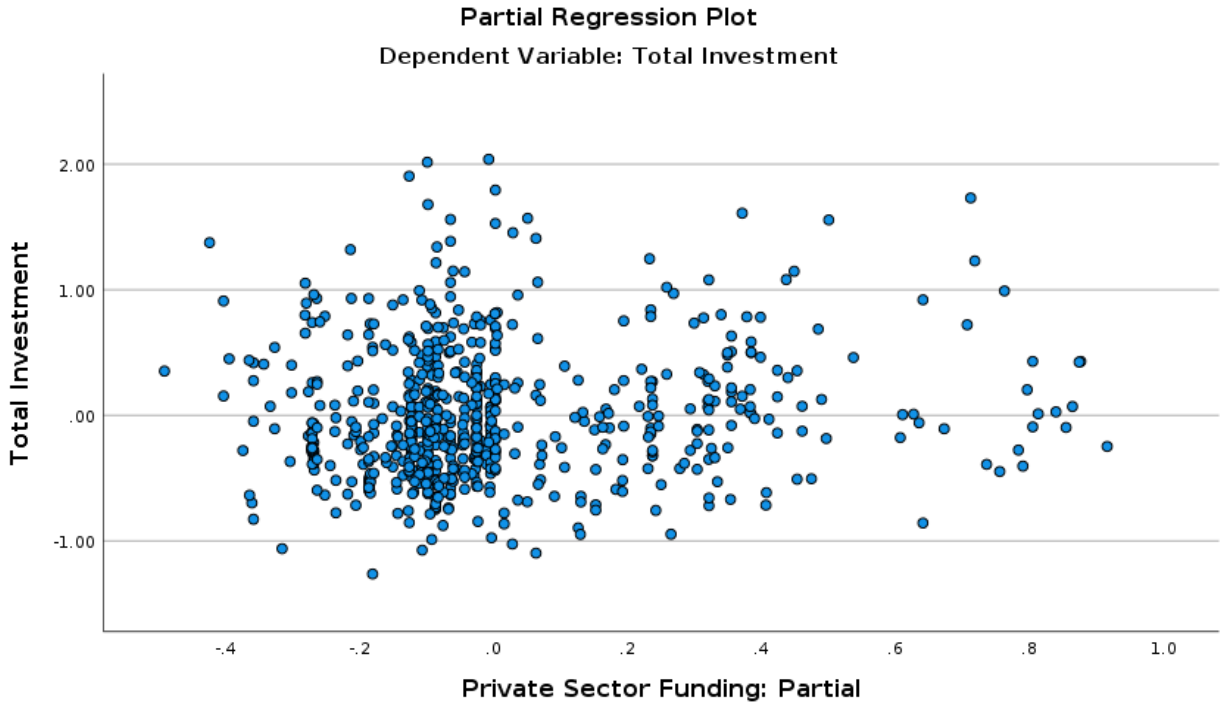

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.2
.0
.2
.4
Environmental Factor: South America

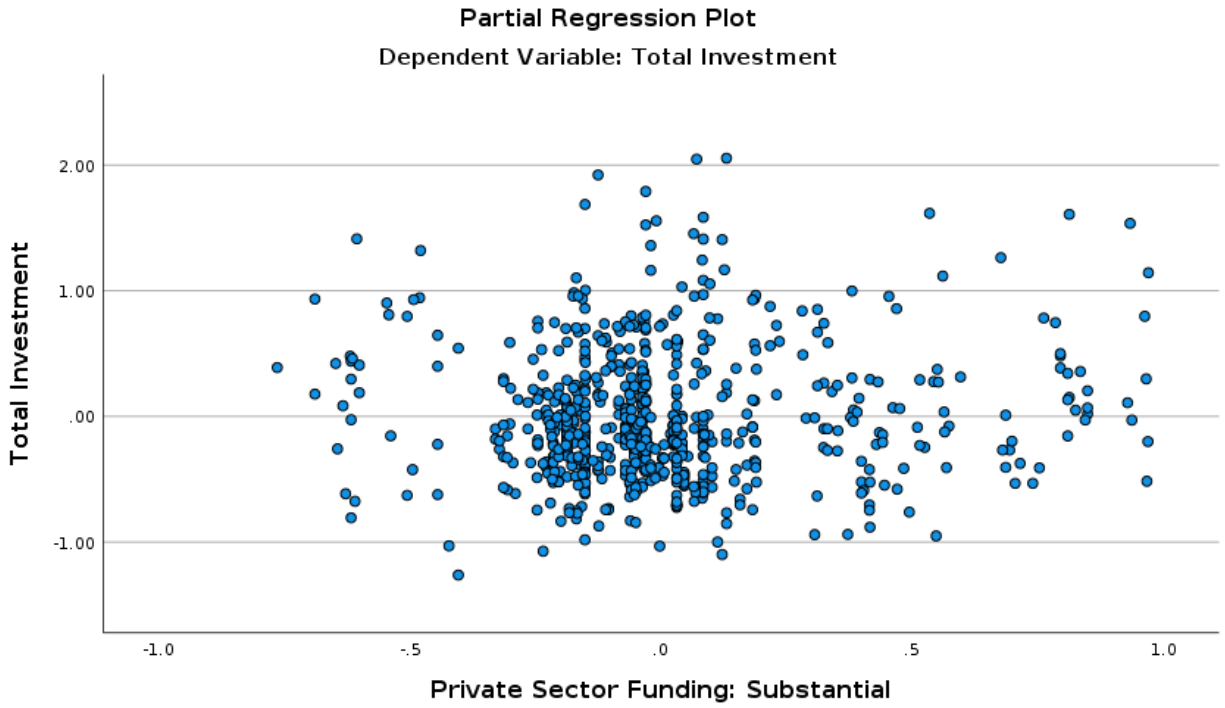
Regression 2 Diagnostic Figures

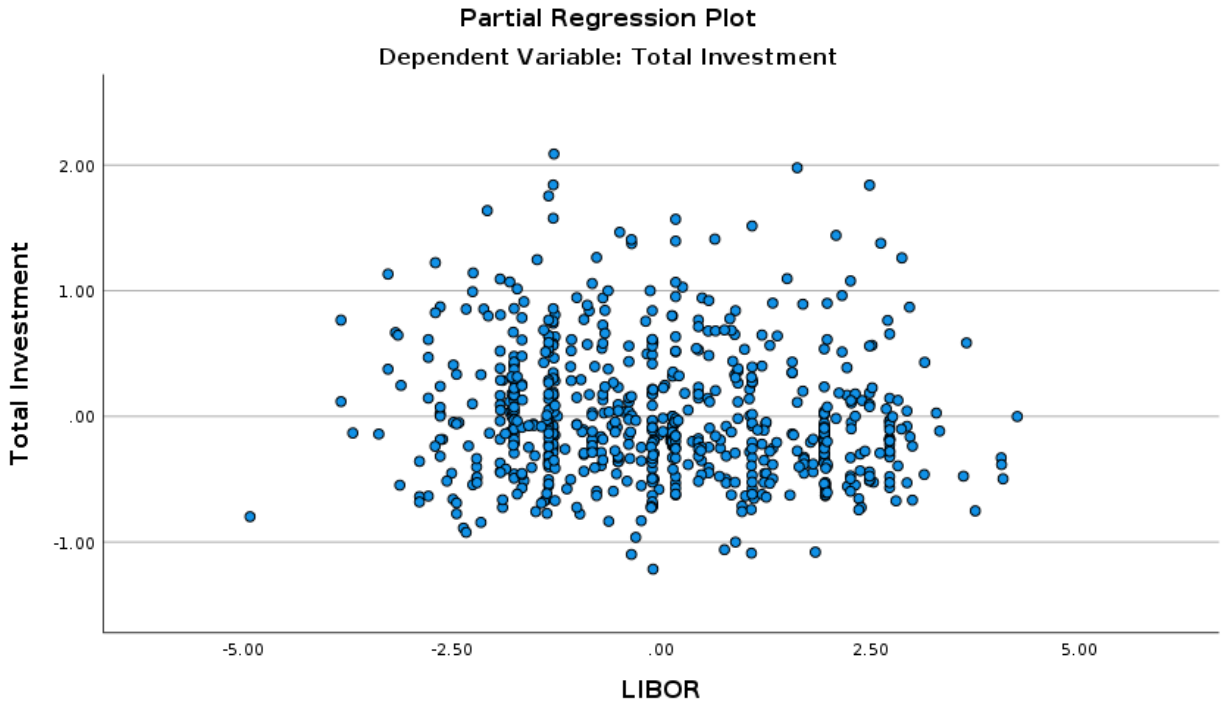


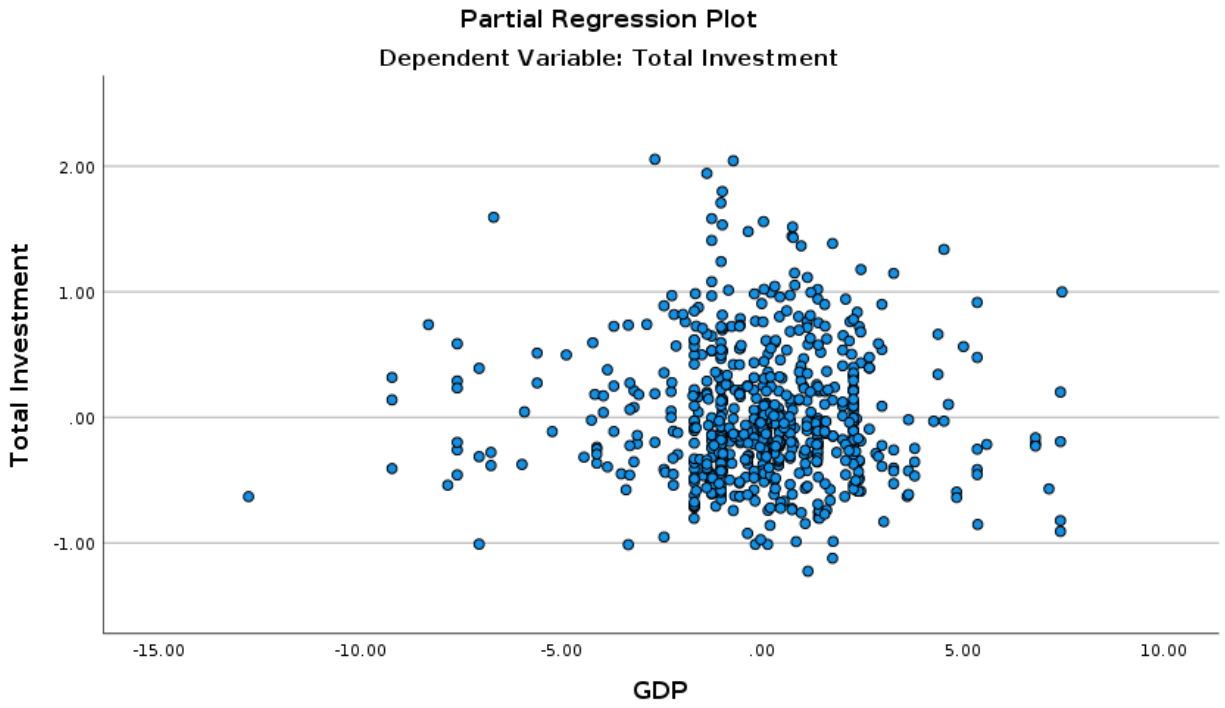


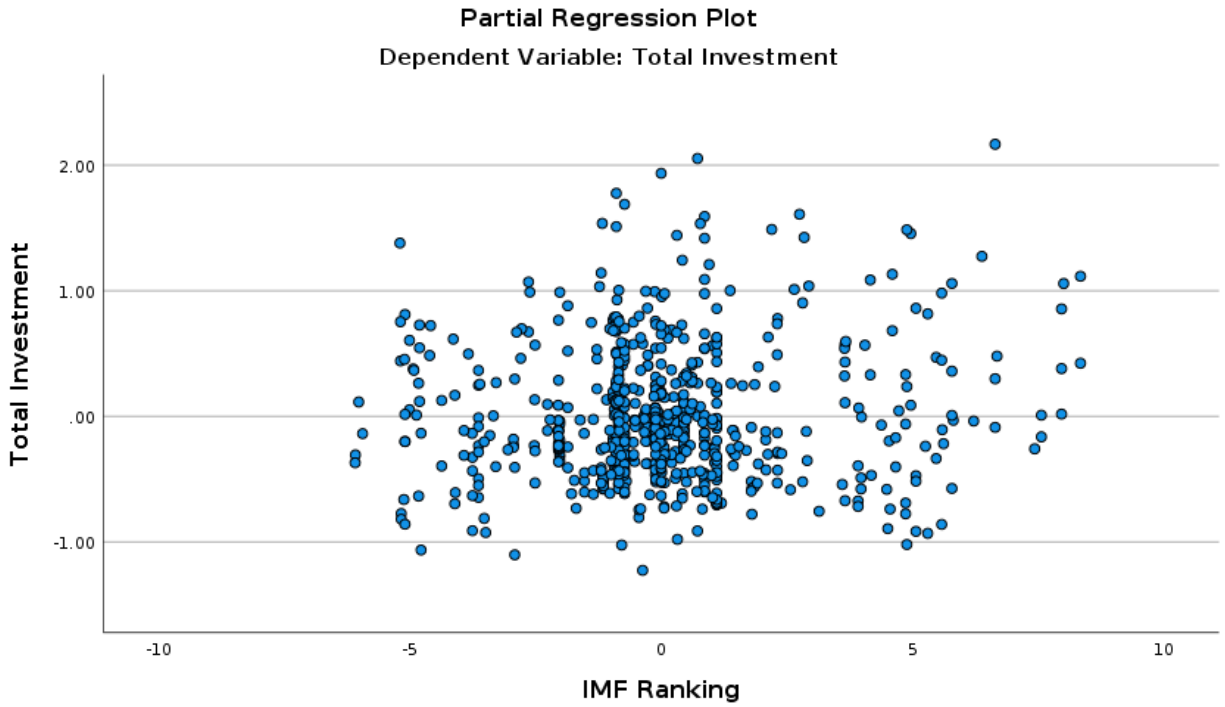

Scatterplot
Dependent Variable: Total Investment
Regression Standardized Residual
Regression Standardized Predicted Value
4
2
0
-2
-2
-1
0
1
2
3
4

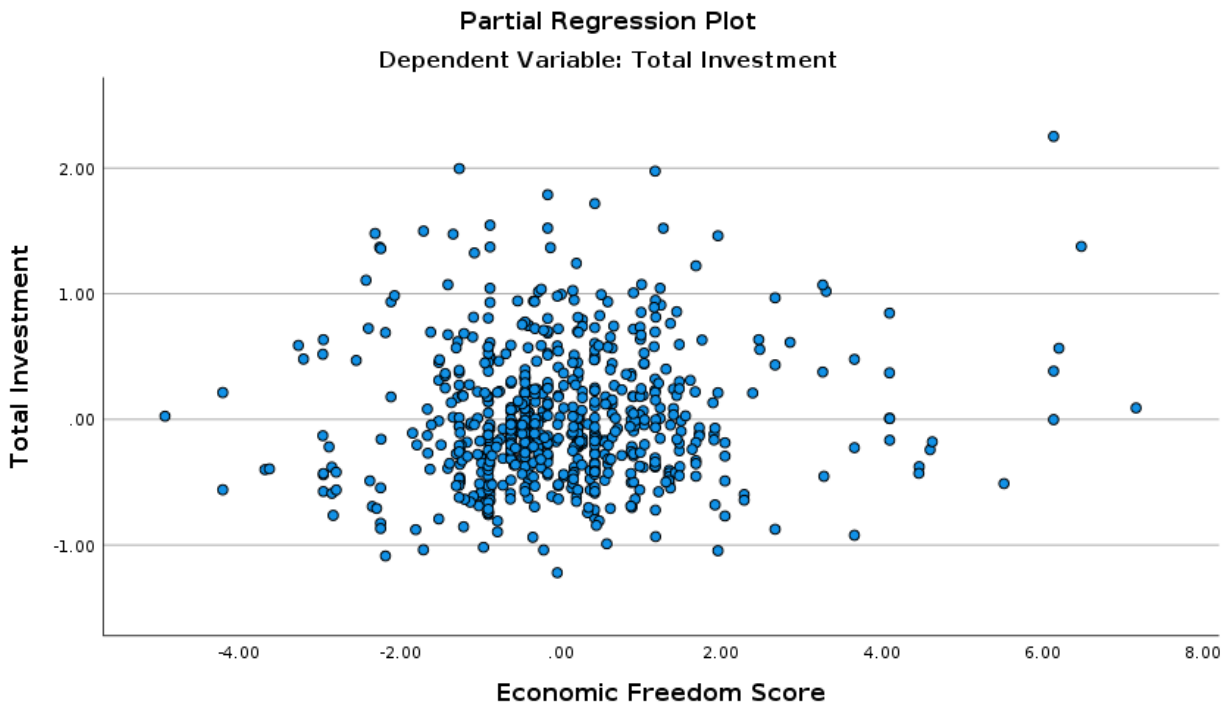

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
Private Sector Funding: Partial
2.00
1.00
.00
-1.00
-.4
-.2
.0
.2
.4
.6
.8
1.0

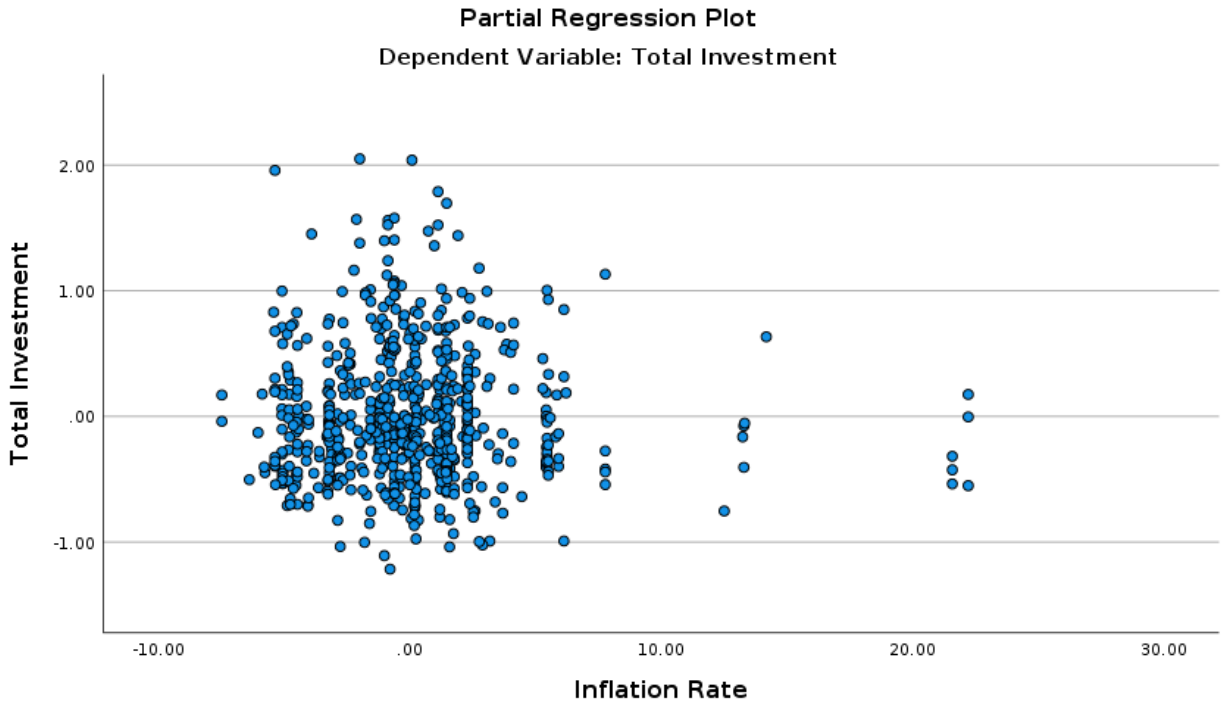

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-1.0
-.5
.0
.5
1.0
Private Sector Funding: Substantial

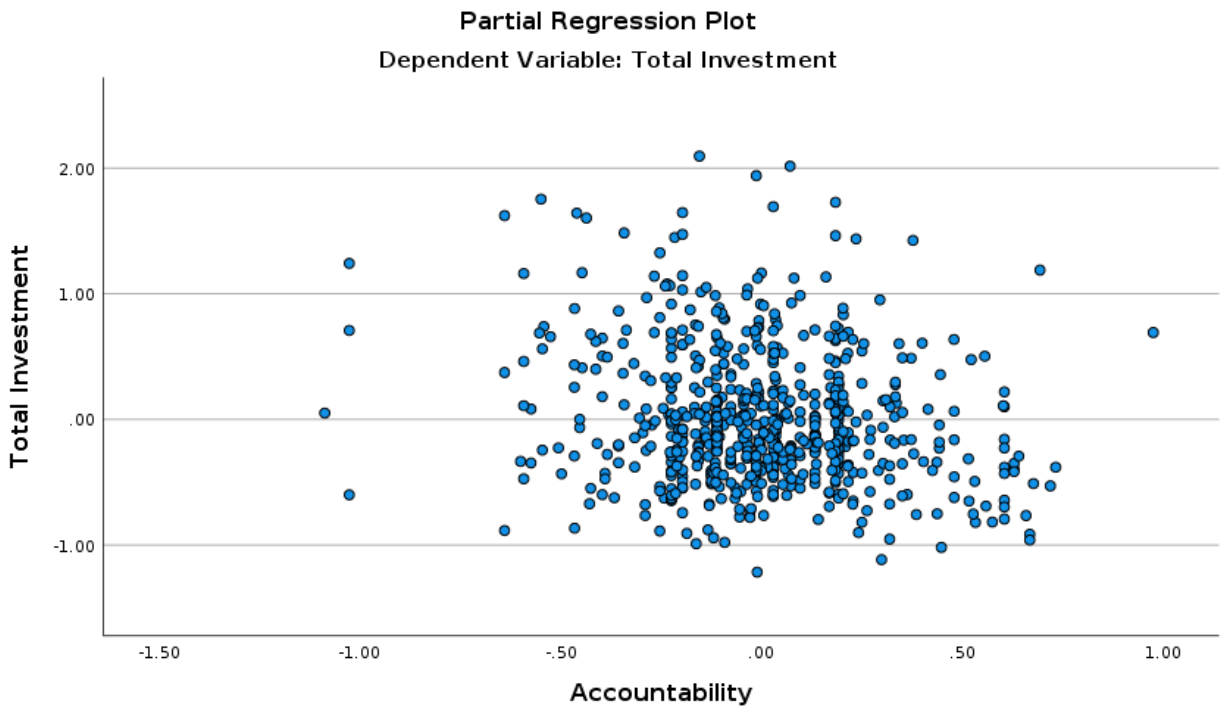

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-5.00
-2.50
.00
2.50
5.00
LIBOR

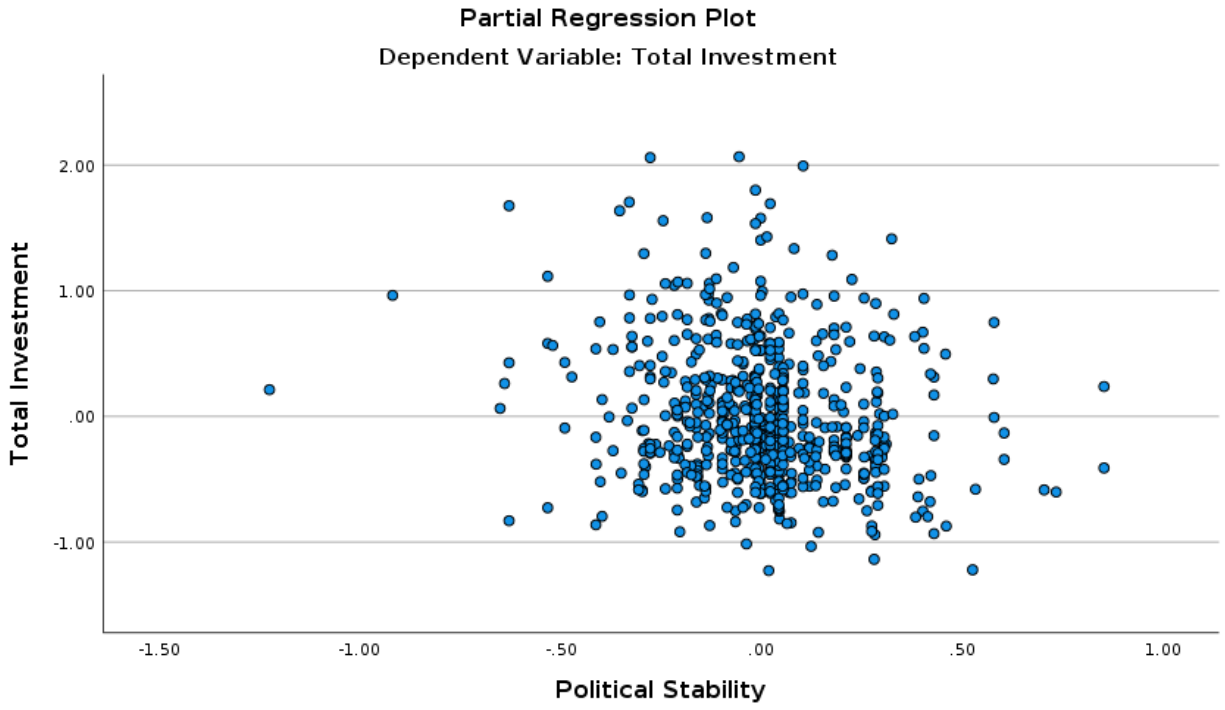

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-15.00
-10.00
-5.00
.00
5.00
10.00
GDP

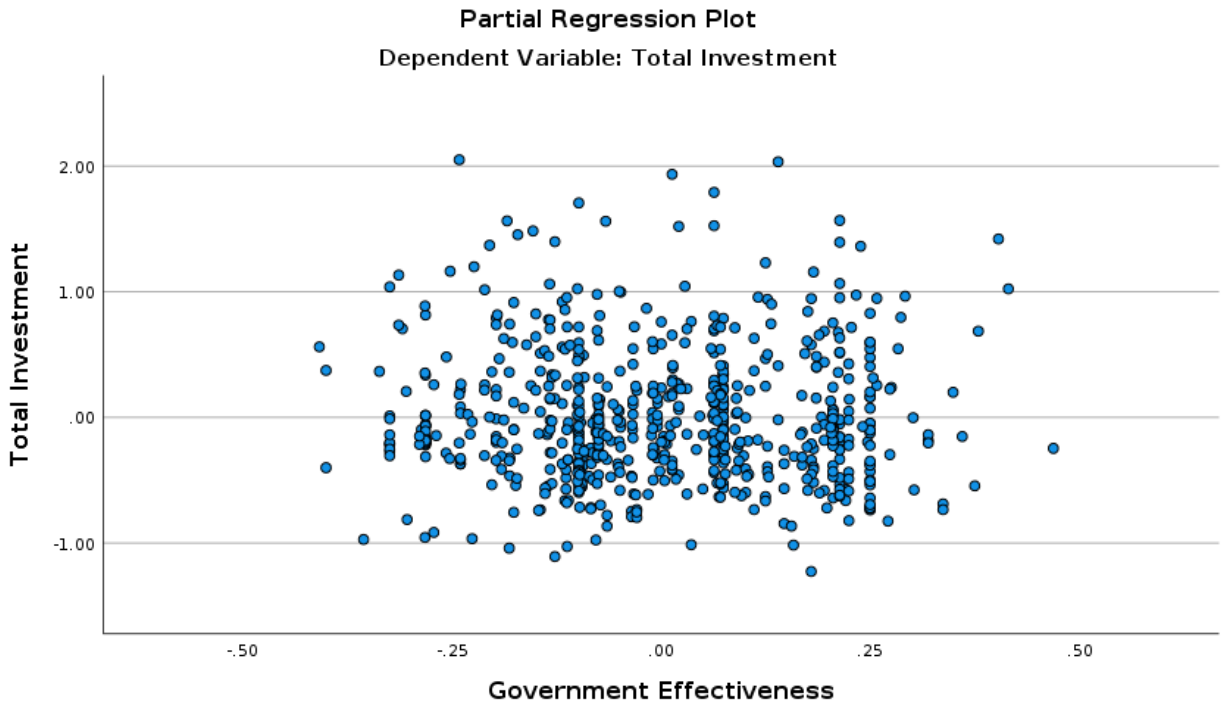

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-10
-5
0
5
10
IMF Ranking

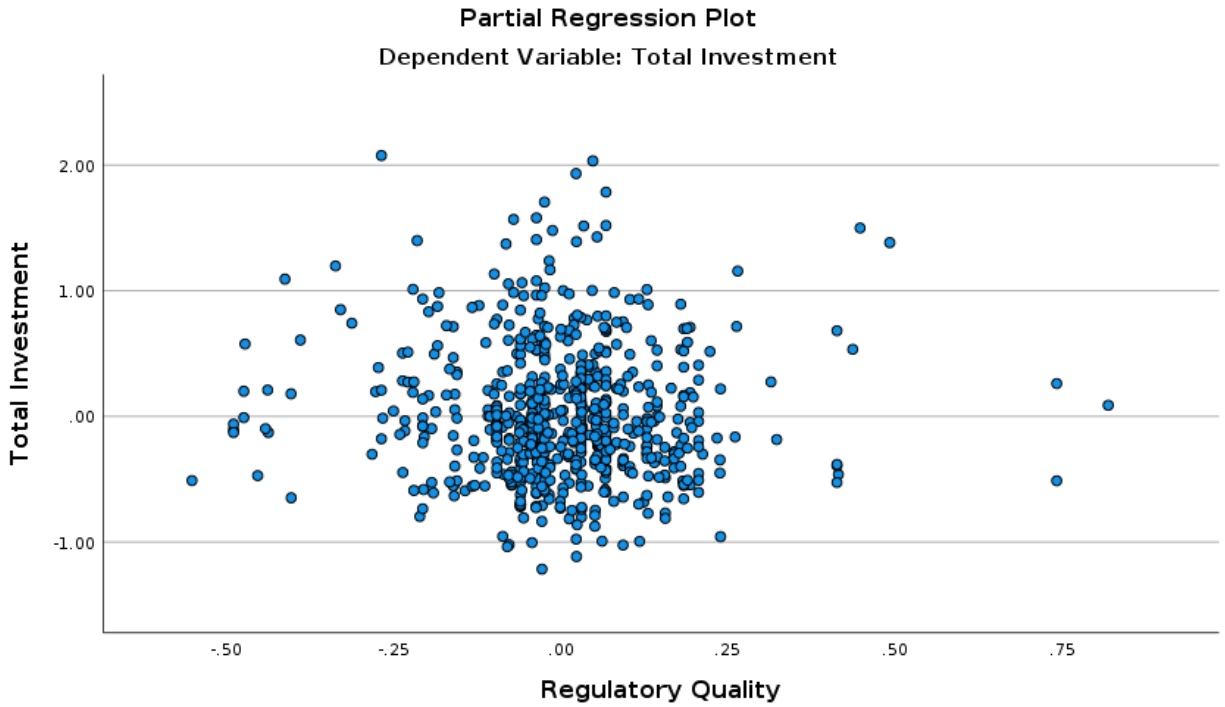

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-4.00
-2.00
.00
2.00
4.00
6.00
8.00
Economic Freedom Score

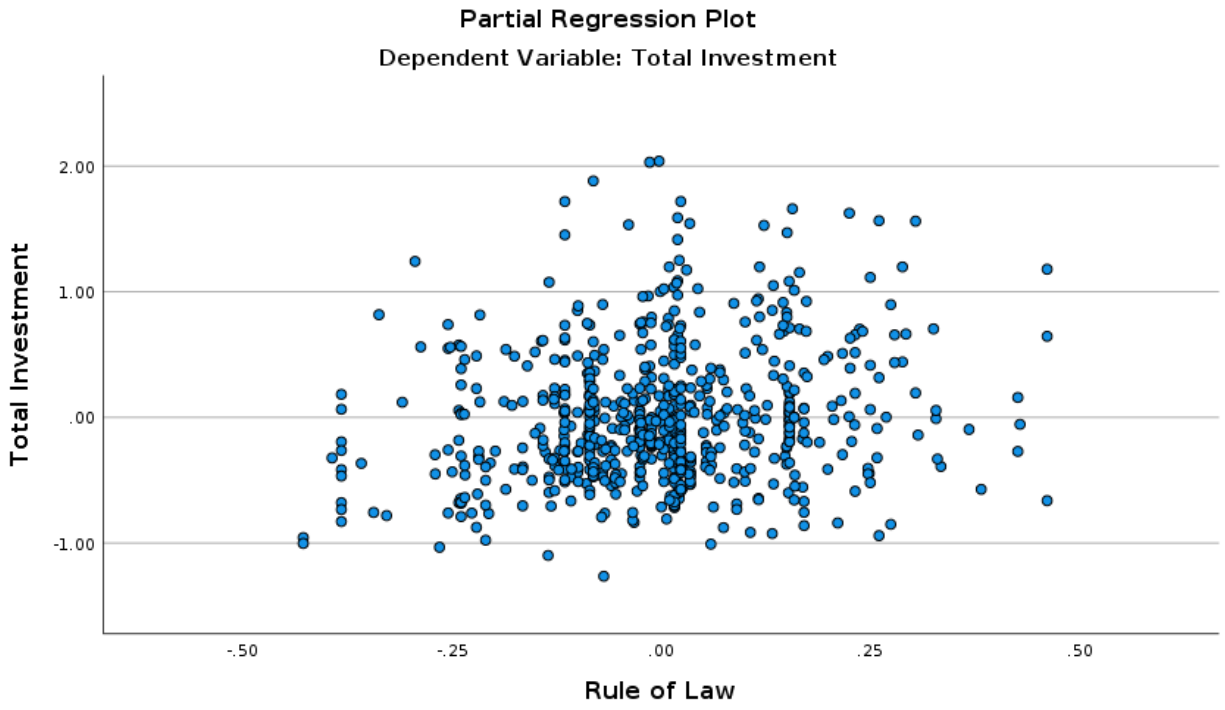

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-10.00
.00
10.00
20.00
30.00
Inflation Rate

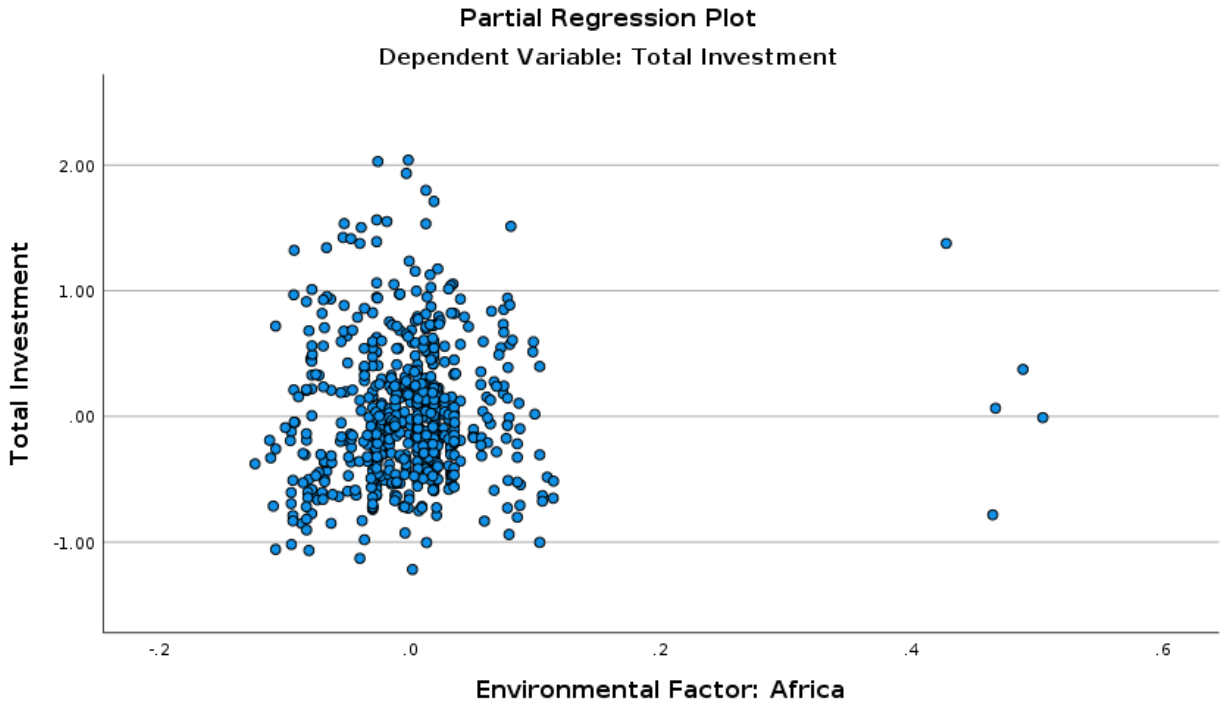

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-1.50
-1.00
-.50
.00
.50
1.00
Accountability

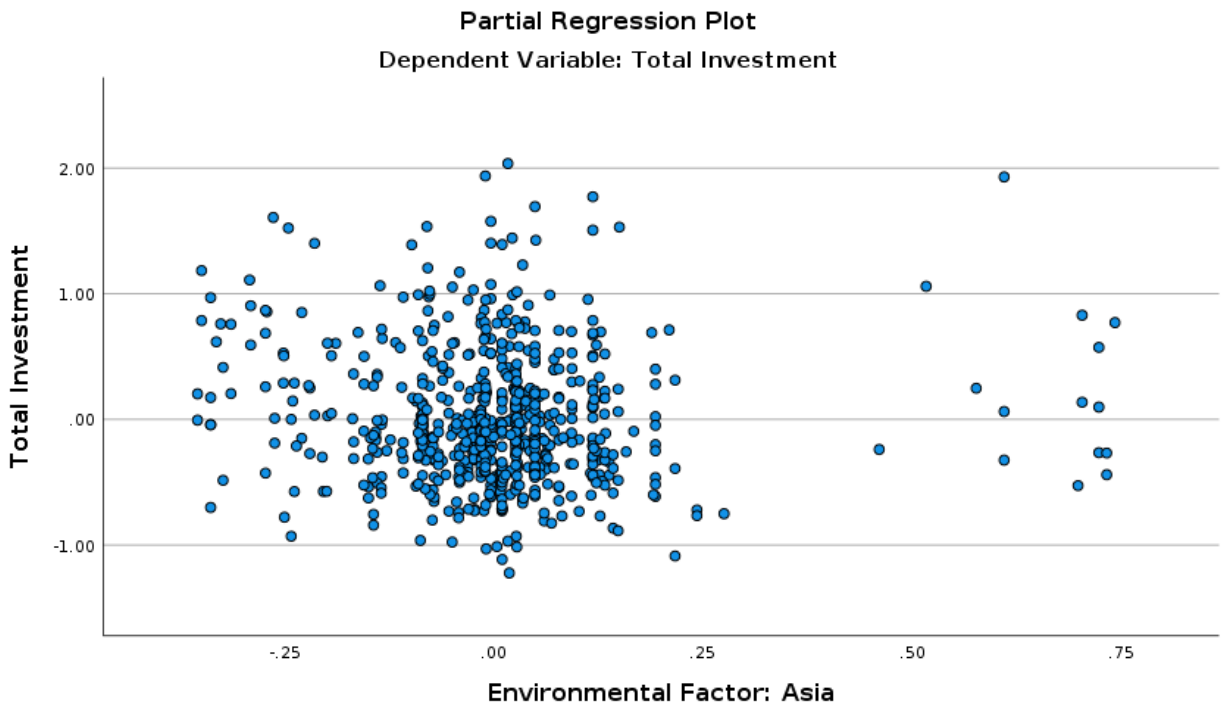

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-1.50
-1.00
-.50
.00
.50
1.00
Political Stability

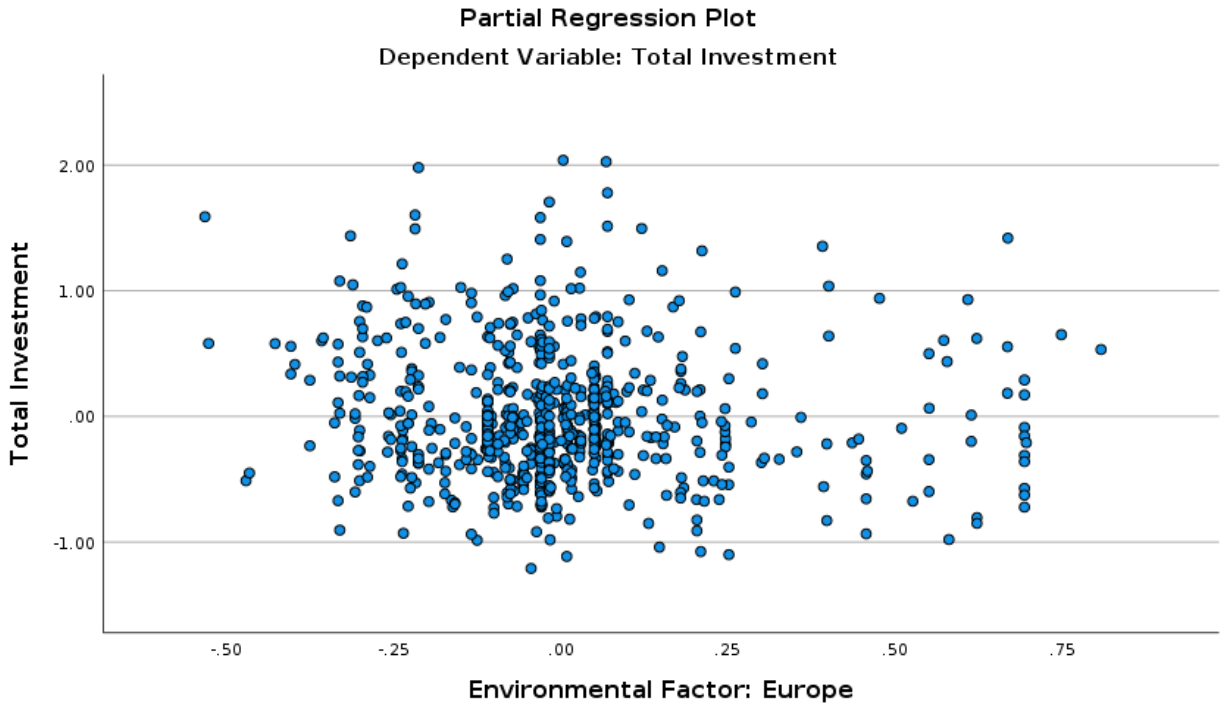

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-.50
-.25
.00
.25
.50
Government Effectiveness

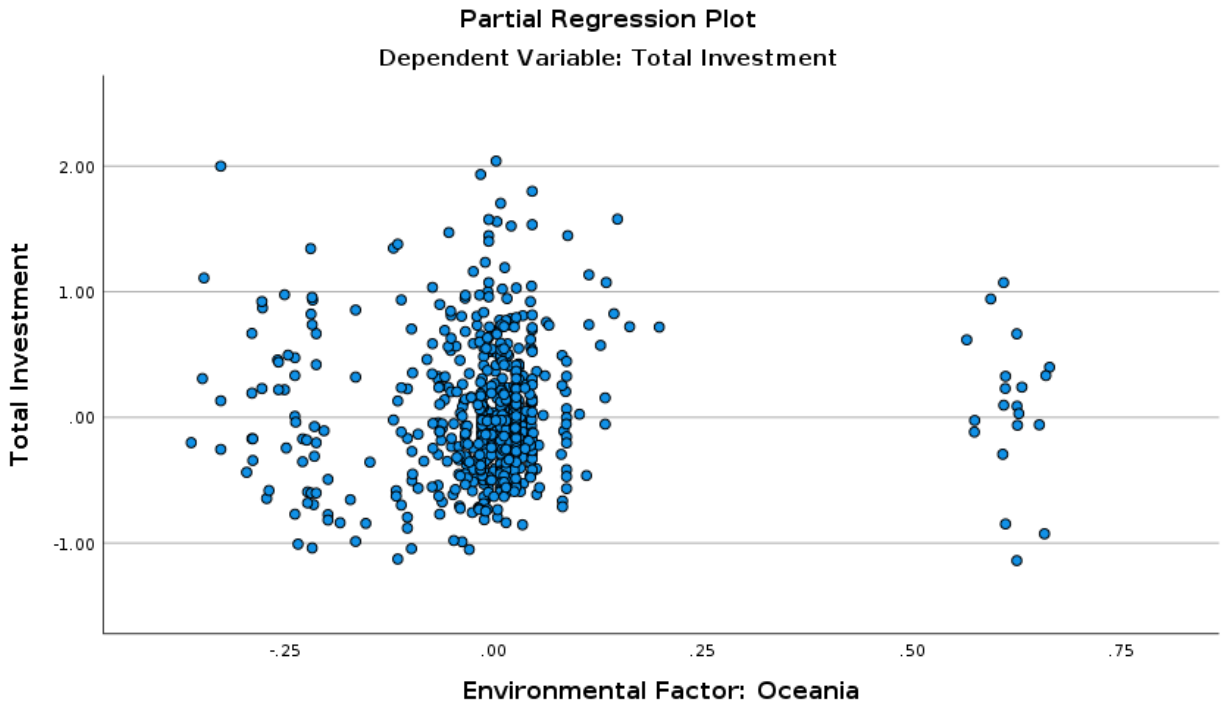

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-.50
-.25
.00
.25
.50
.75
Regulatory Quality

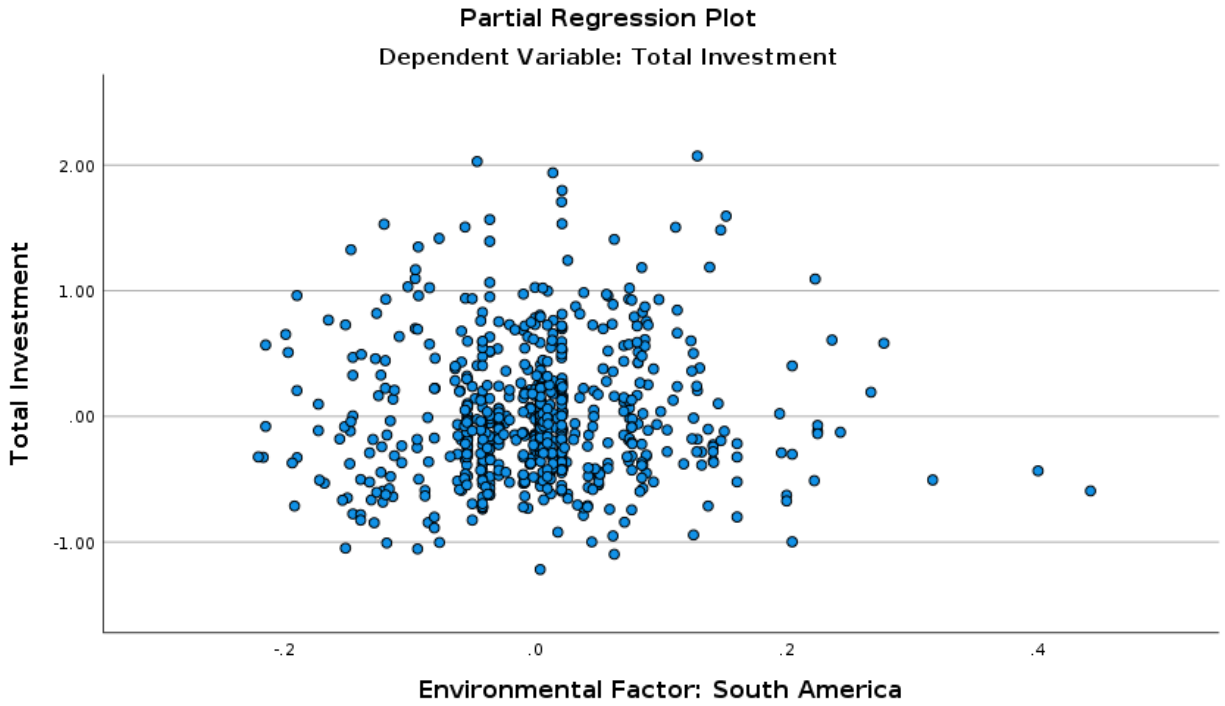

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-.50
-.25
.00
.25
.50
Rule of Law


Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-.2
.0
.2
.4
.6
Environmental Factor: Africa

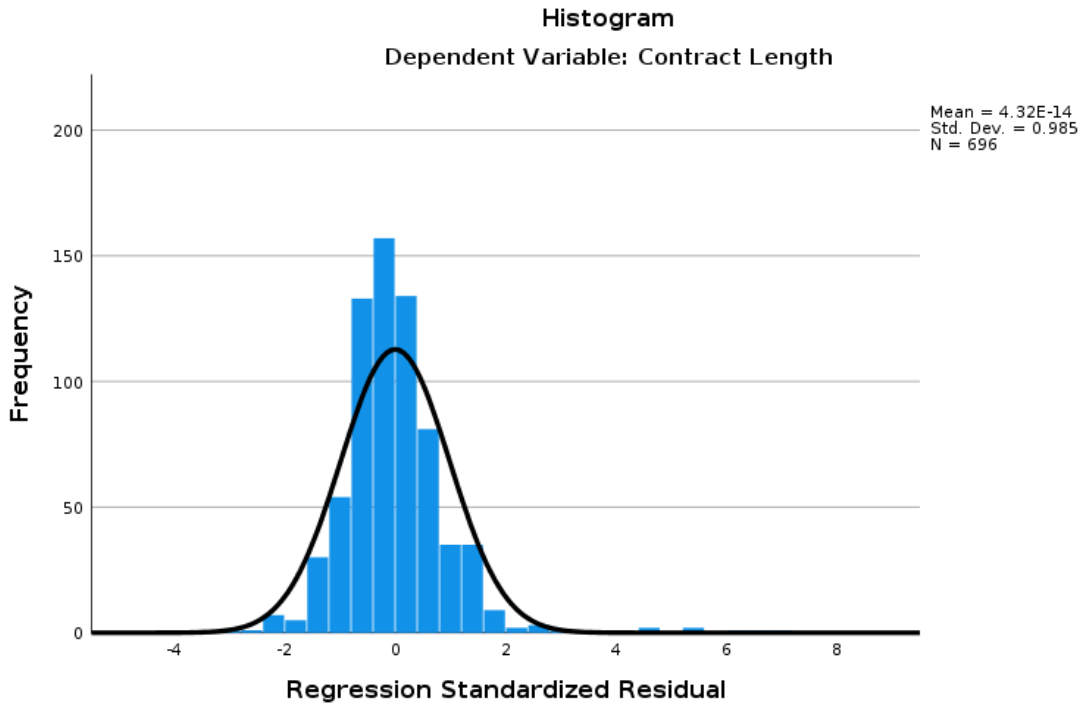

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-.25
.00
.25
.50
.75
Environmental Factor: Asia

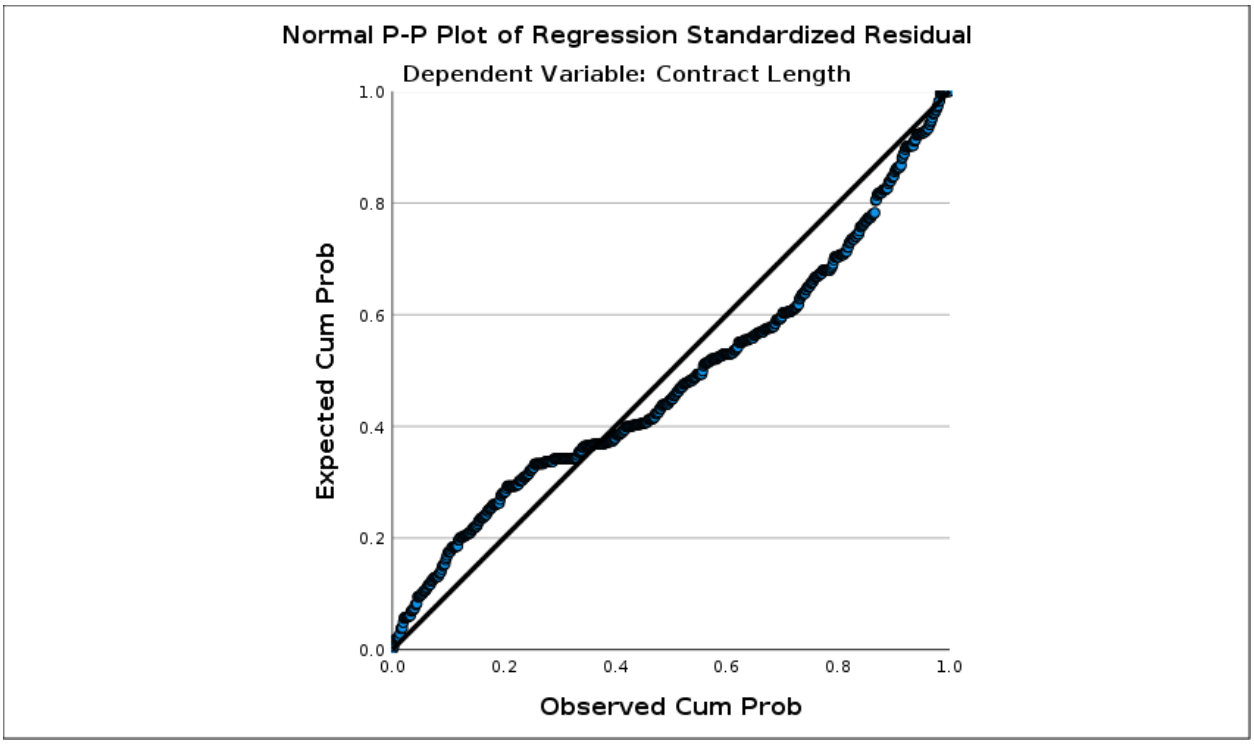

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-.50
-.25
.00
.25
.50
.75
Environmental Factor: Europe

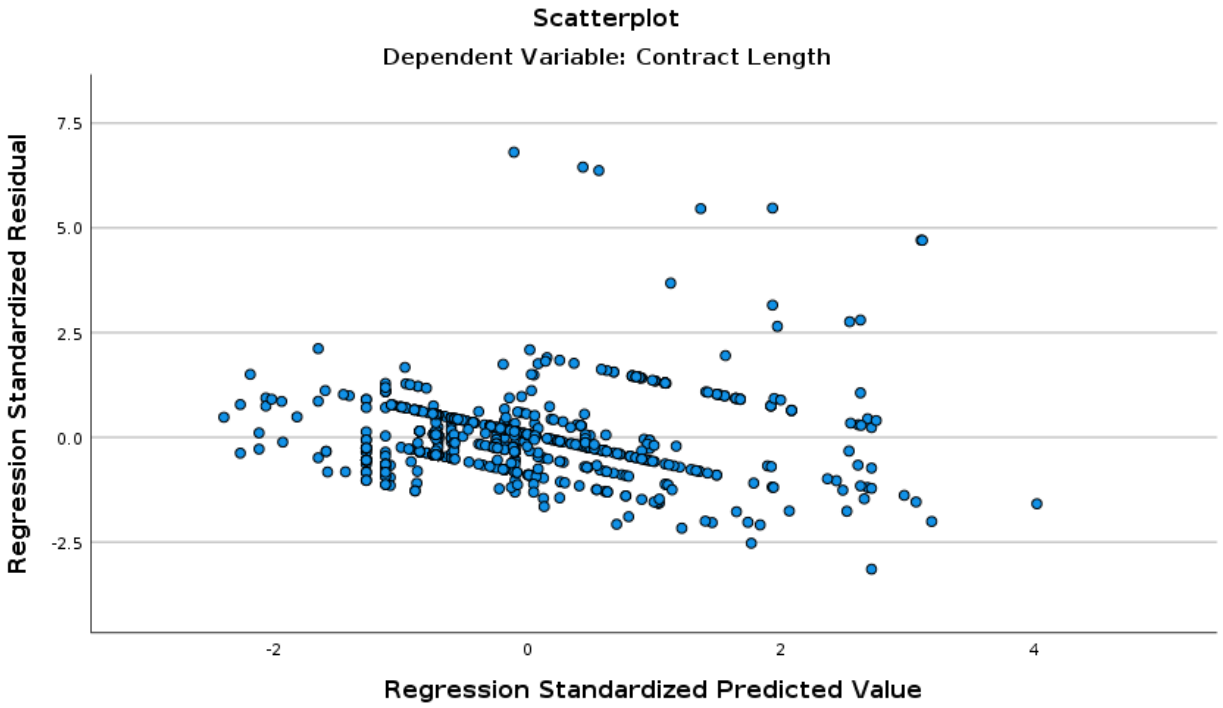

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-.25
.00
.25
.50
.75
Environmental Factor: Oceania

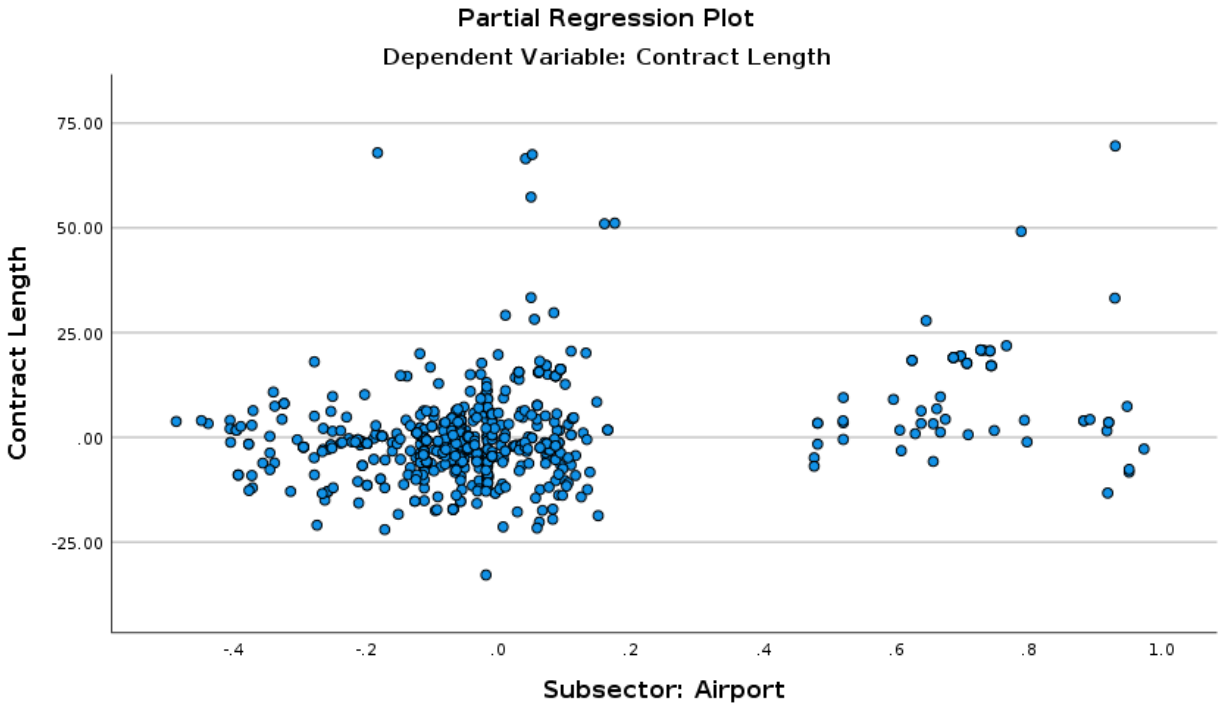

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-.2
.0
.2
.4
Environmental Factor: South America

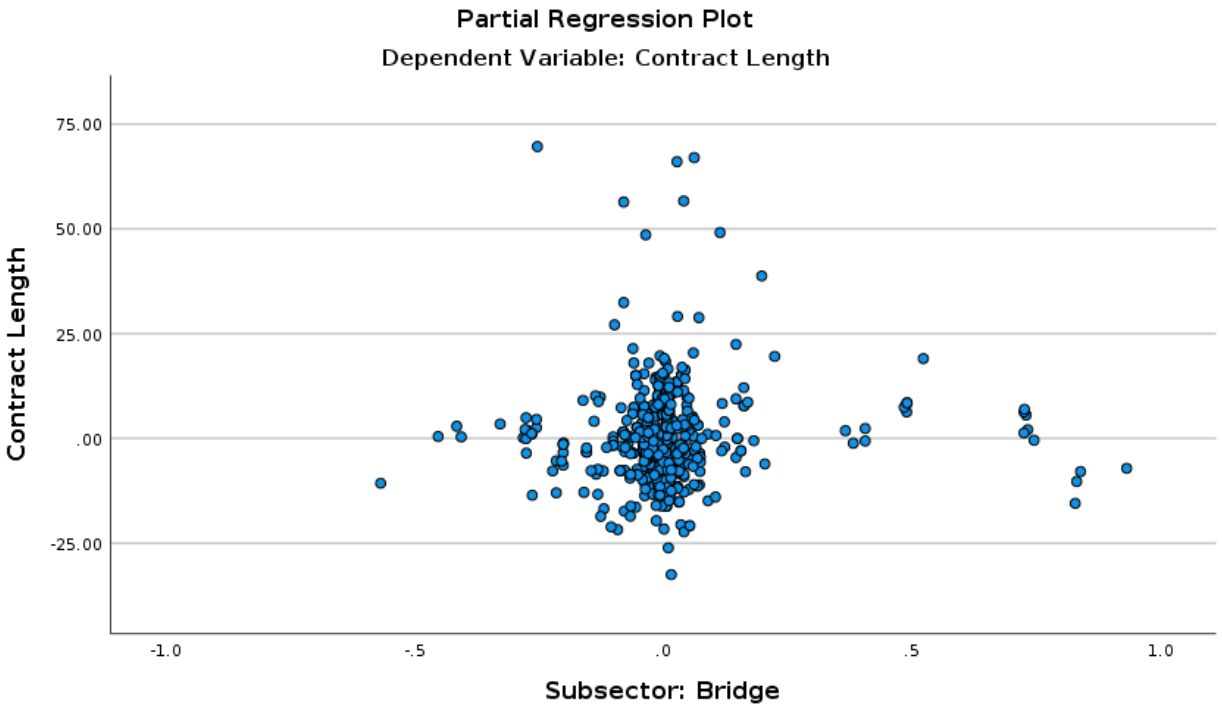
Regression 3 Diagnostic Figures

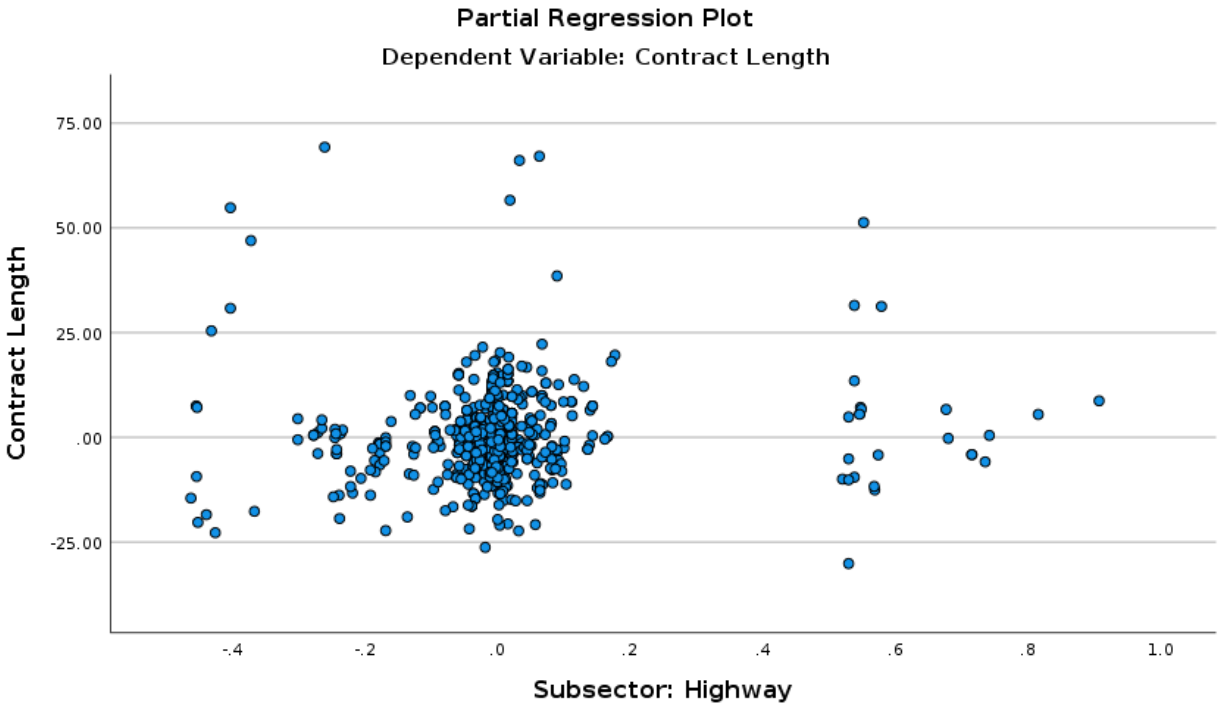


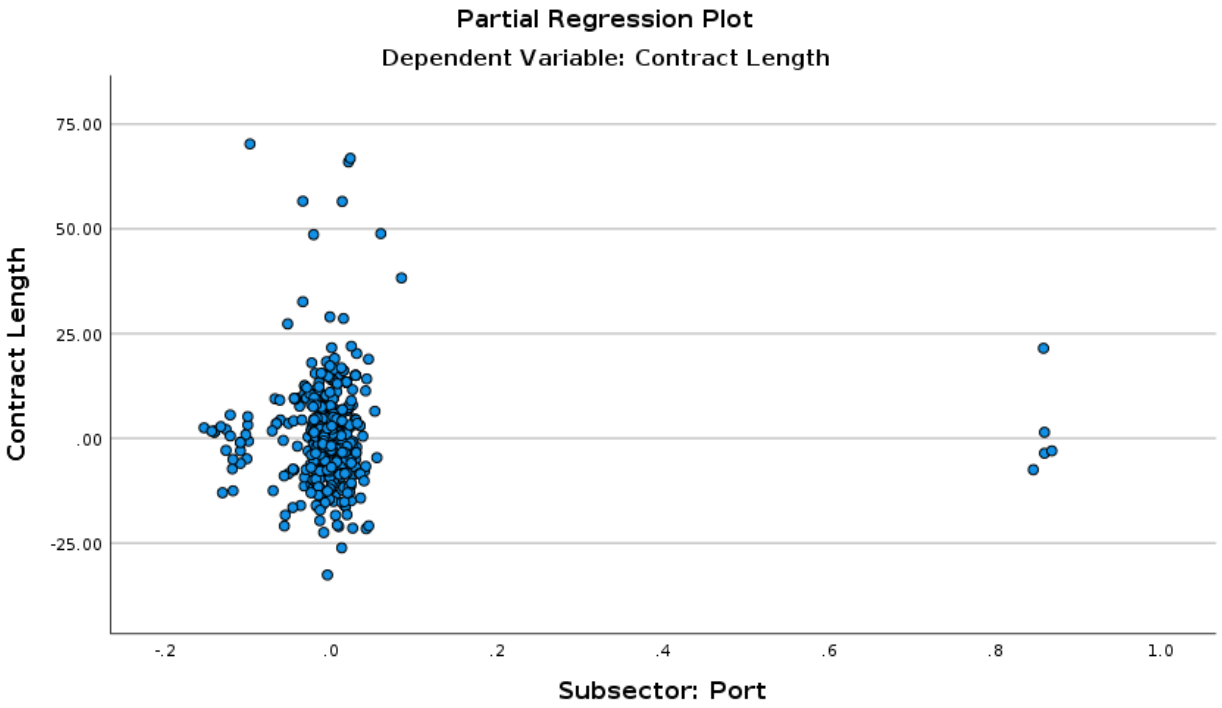


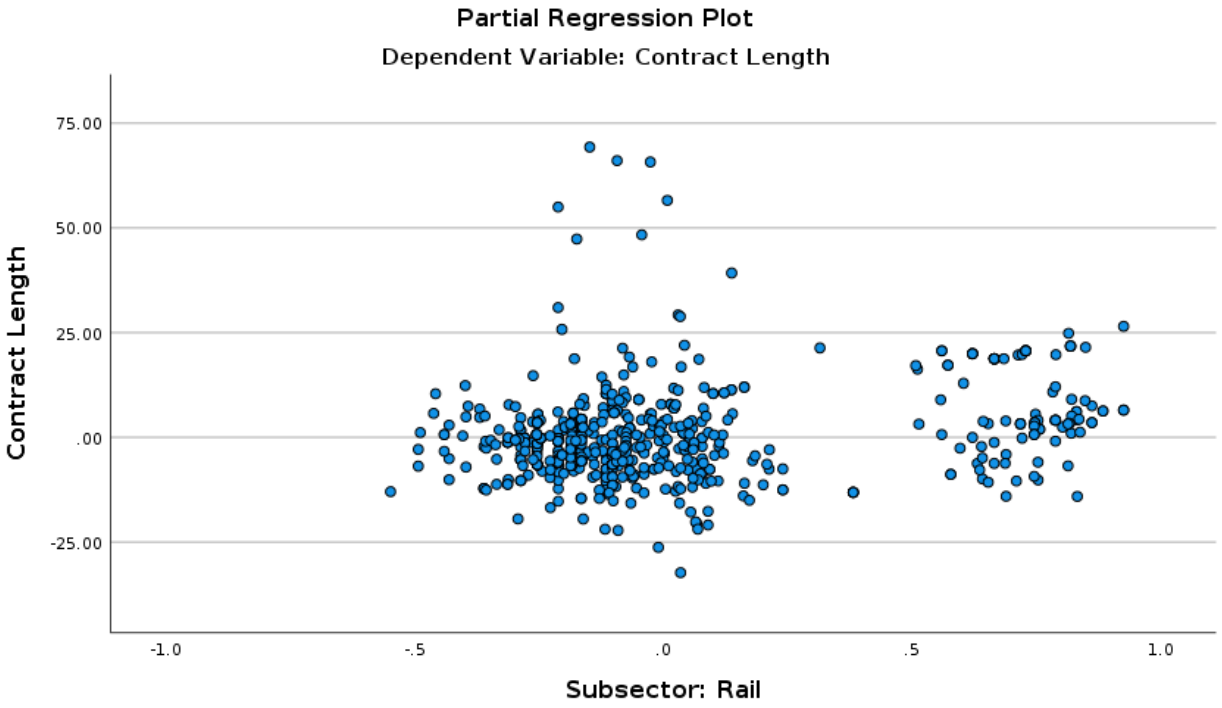

Scatterplot
Dependent Variable: Contract Length
Regression Standardized Residual
7.5
5.0
2.5
0.0
-2.5
-2
0
2
4
Regression Standardized Predicted Value

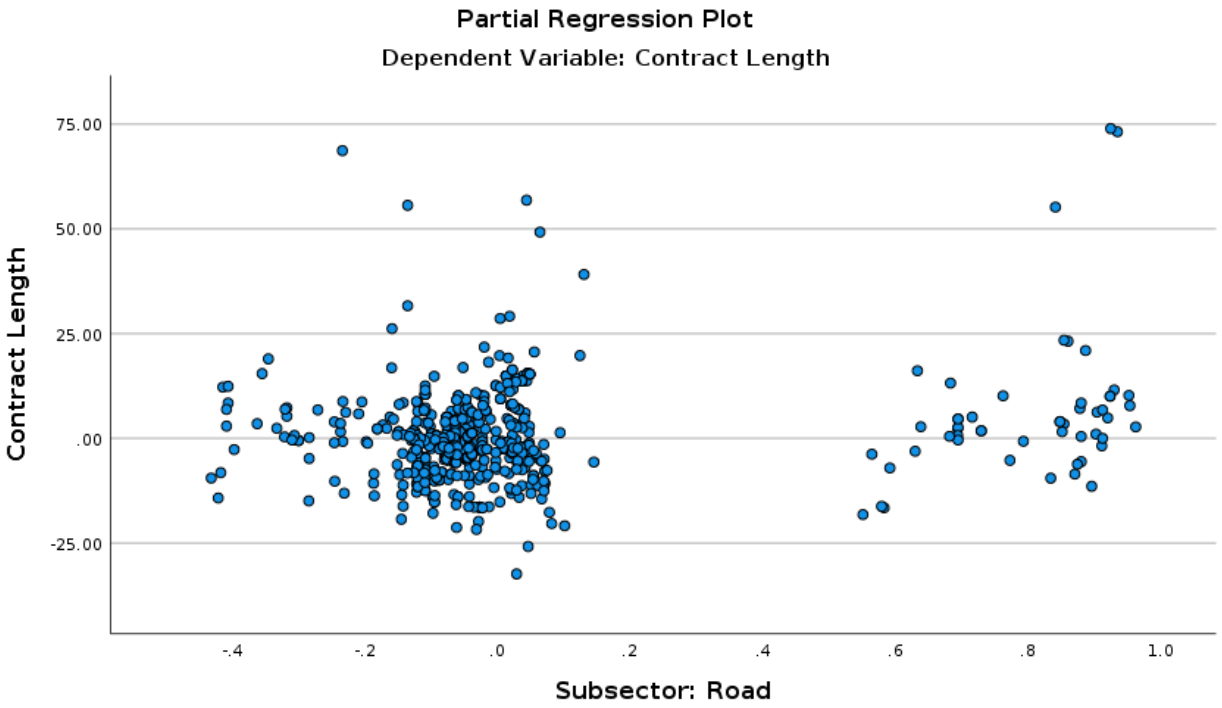

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.4
-.2
.0
.2
.4
.6
.8
1.0
Subsector: Airport

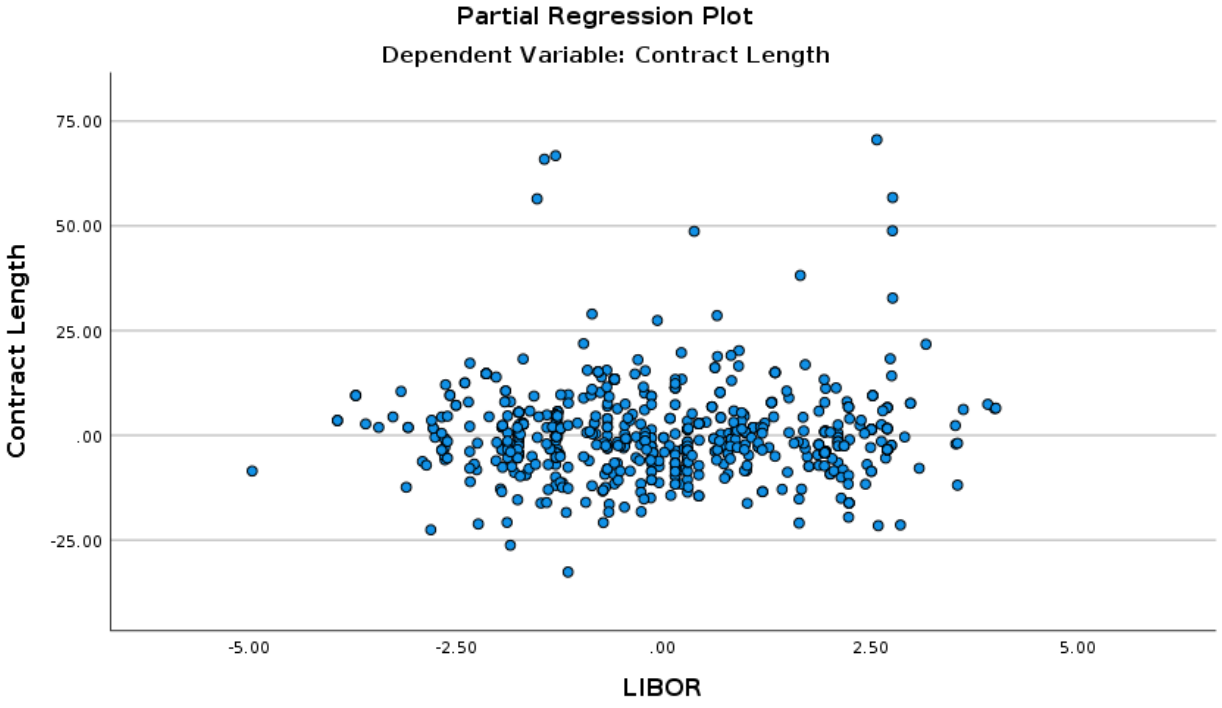

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-1.0
-.5
.0
.5
1.0
Subsector: Bridge

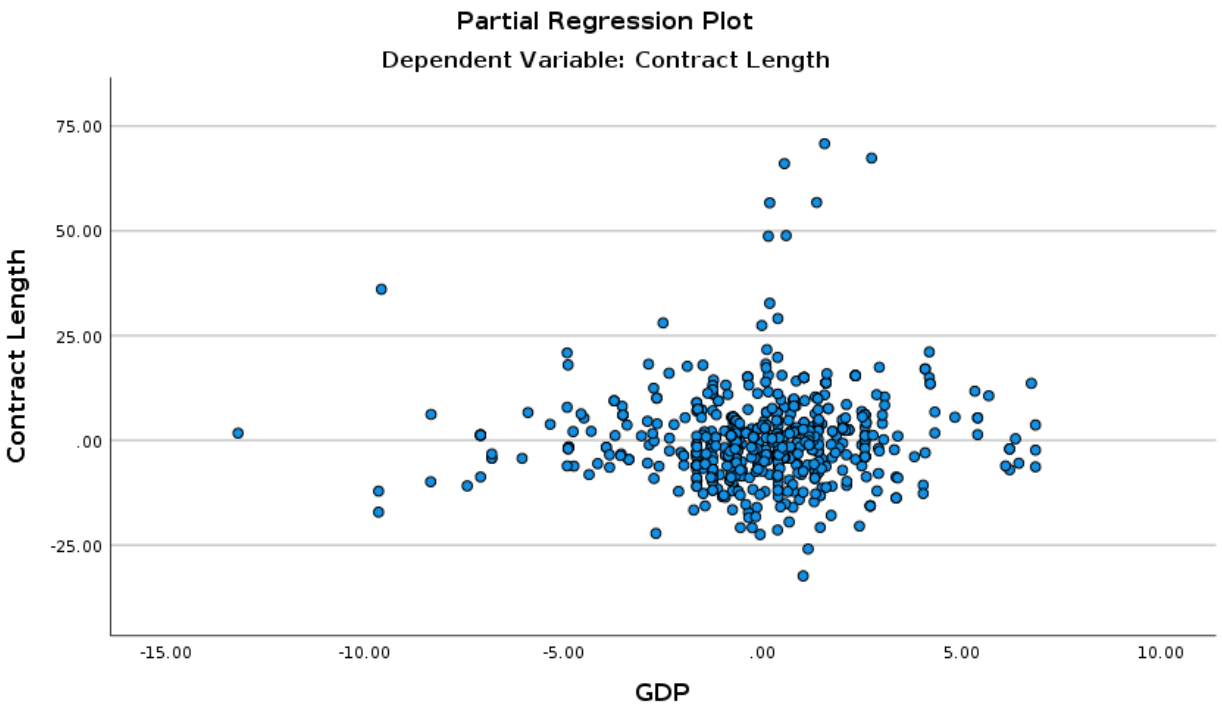

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.4
-.2
.0
.2
.4
.6
.8
1.0
Subsector: Highway

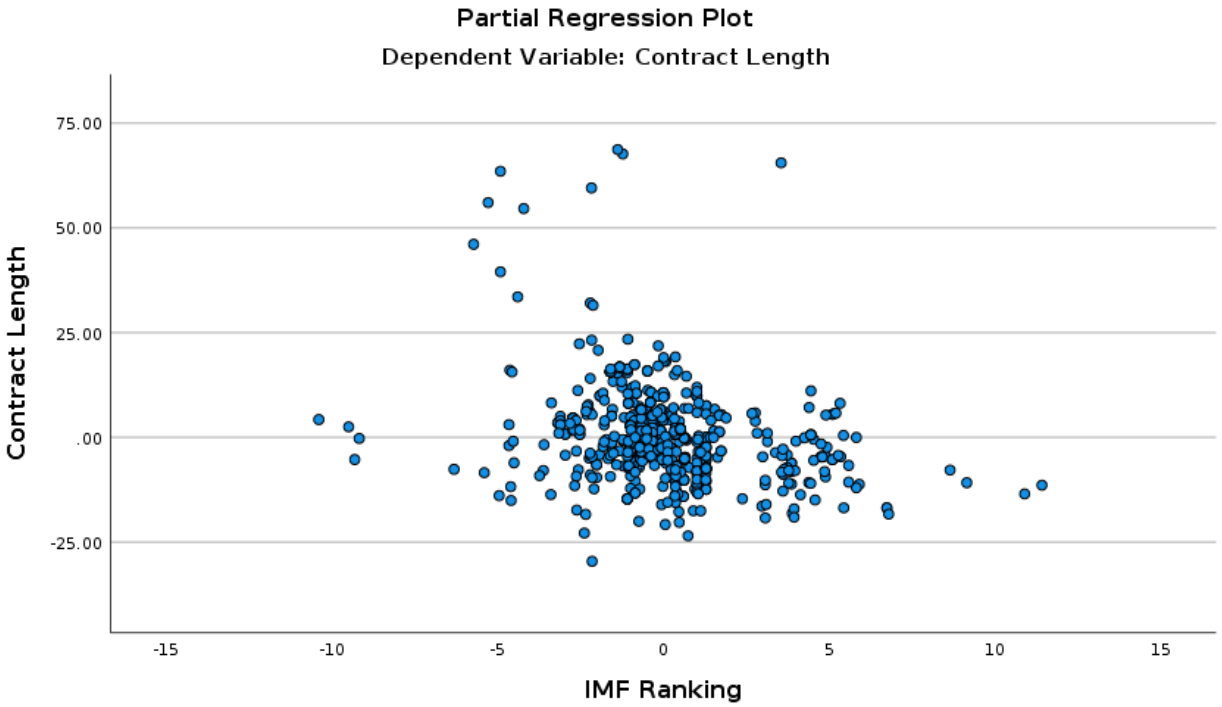

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.2
.0
.2
.4
.6
.8
1.0
Subsector: Port

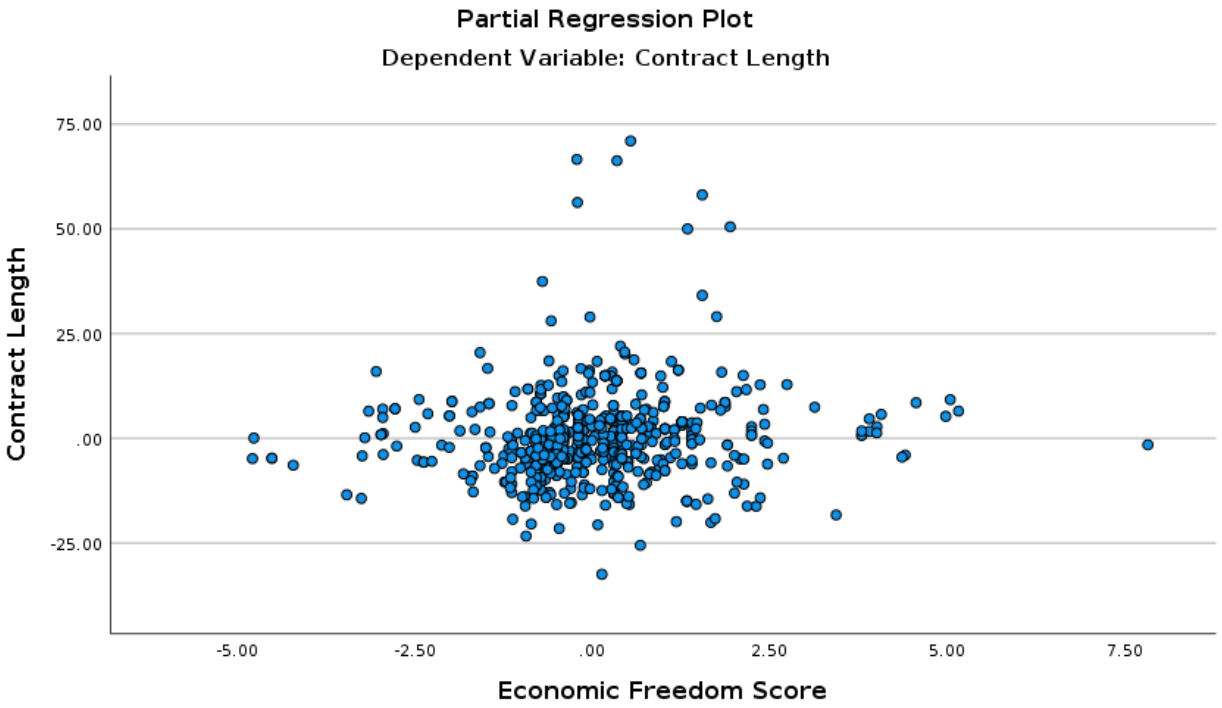

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-1.0
-.5
.0
.5
1.0
Subsector: Rail

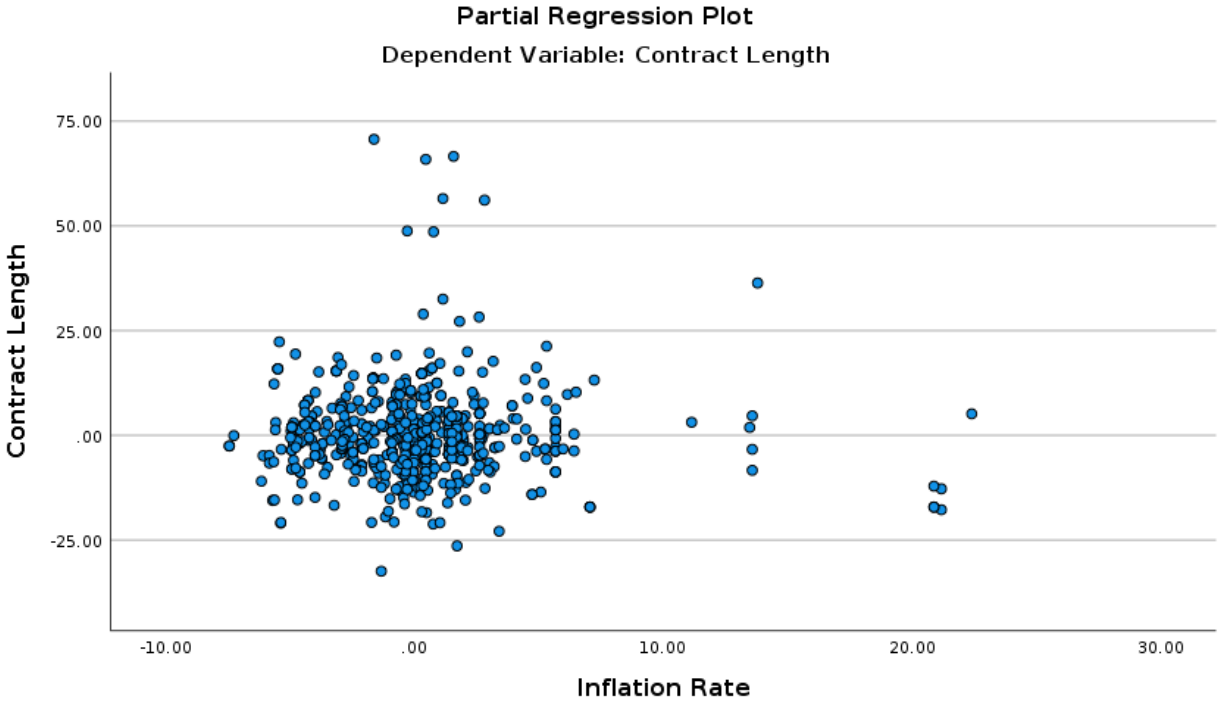

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.4
-.2
.0
.2
.4
.6
.8
1.0
Subsector: Road

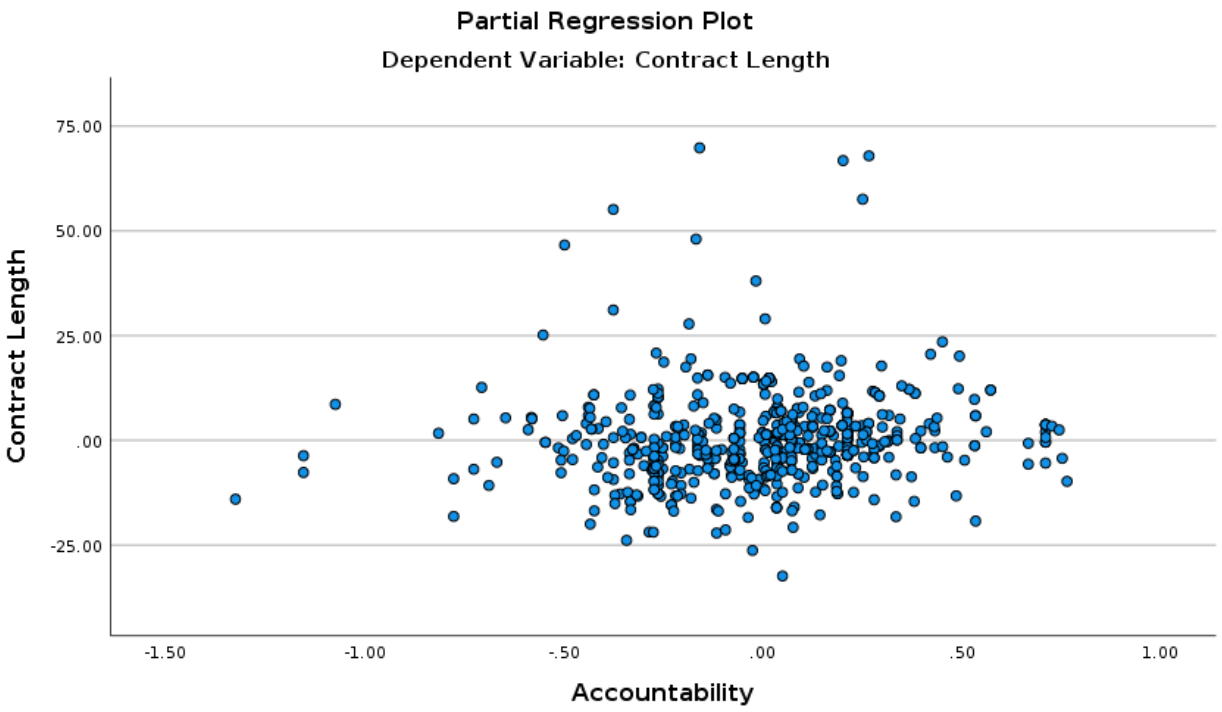

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-5.00
-2.50
.00
2.50
5.00
LIBOR

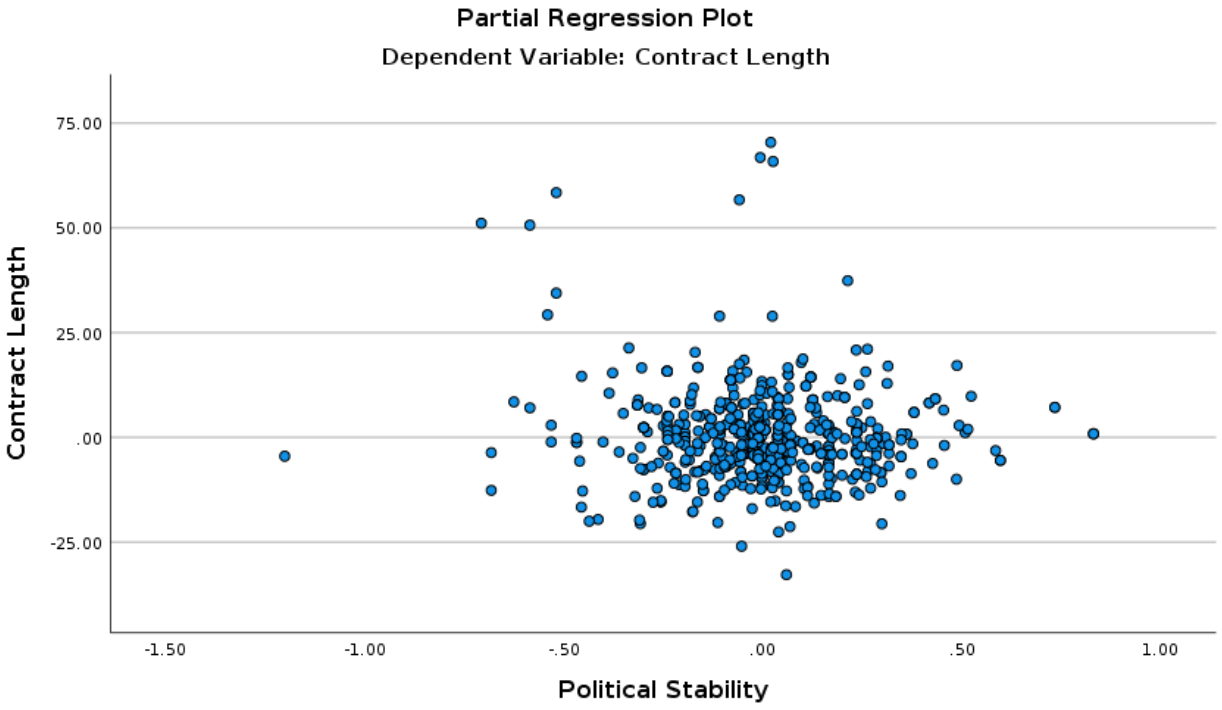

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-15.00
-10.00
-5.00
.00
5.00
10.00
GDP

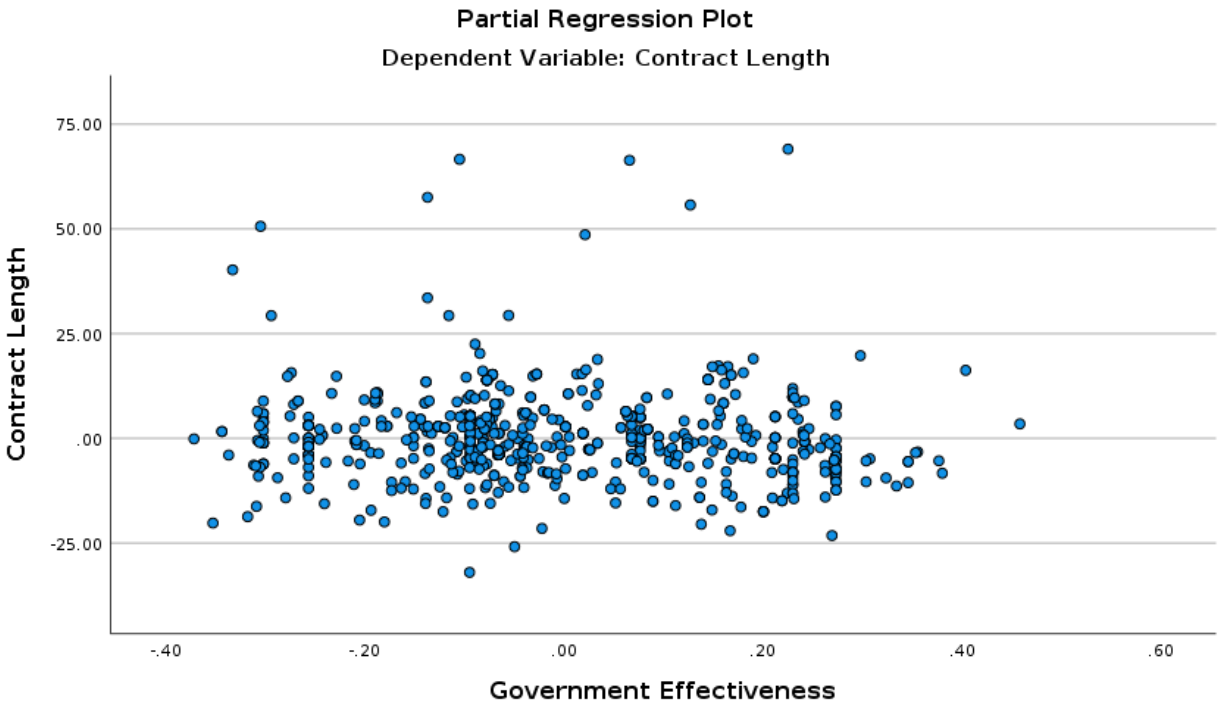

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-15
-10
-5
0
5
10
15
IMF Ranking

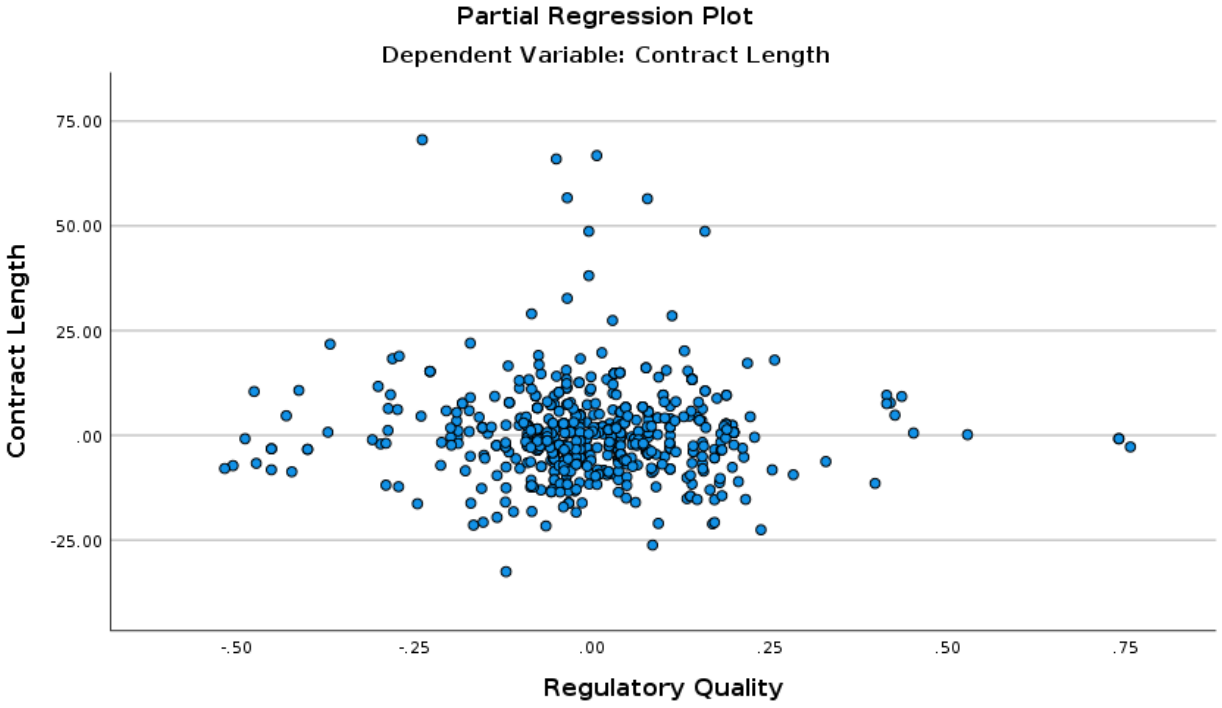

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-5.00
-2.50
.00
2.50
5.00
7.50
Economic Freedom Score

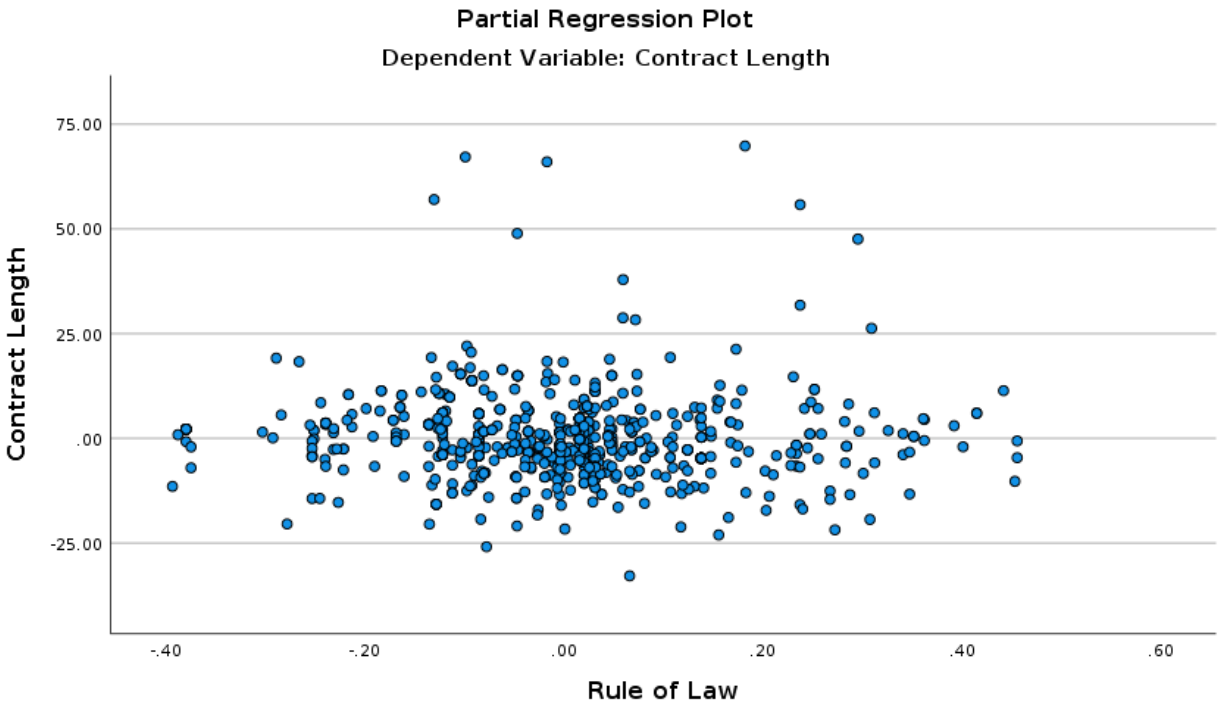

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-10.00
.00
10.00
20.00
30.00
Inflation Rate

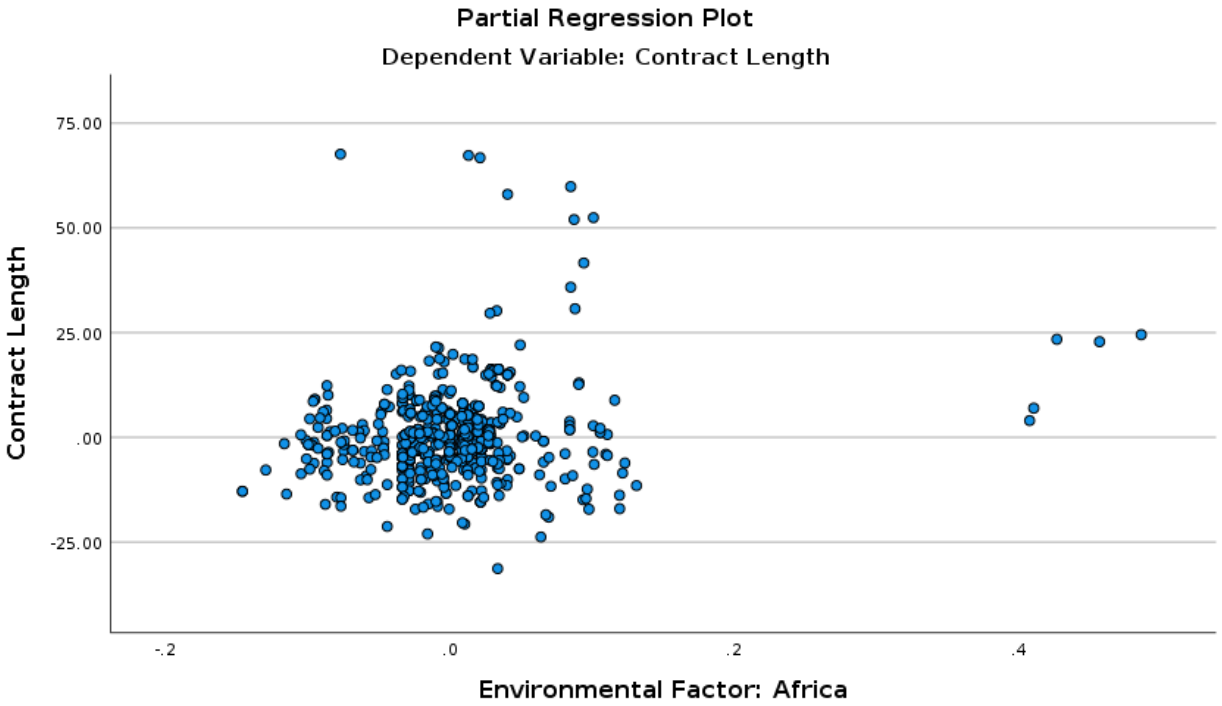

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-1.50
-1.00
-.50
.00
.50
1.00
Accountability

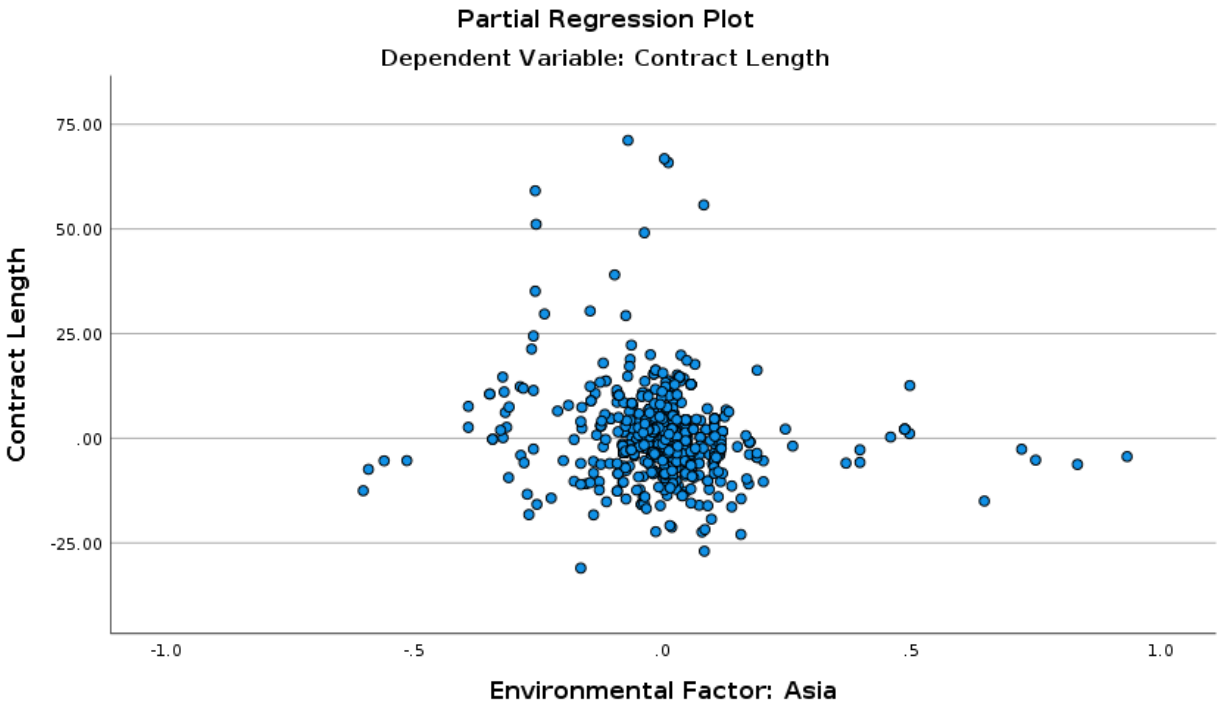

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-1.50
-1.00
-.50
.00
.50
1.00
Political Stability

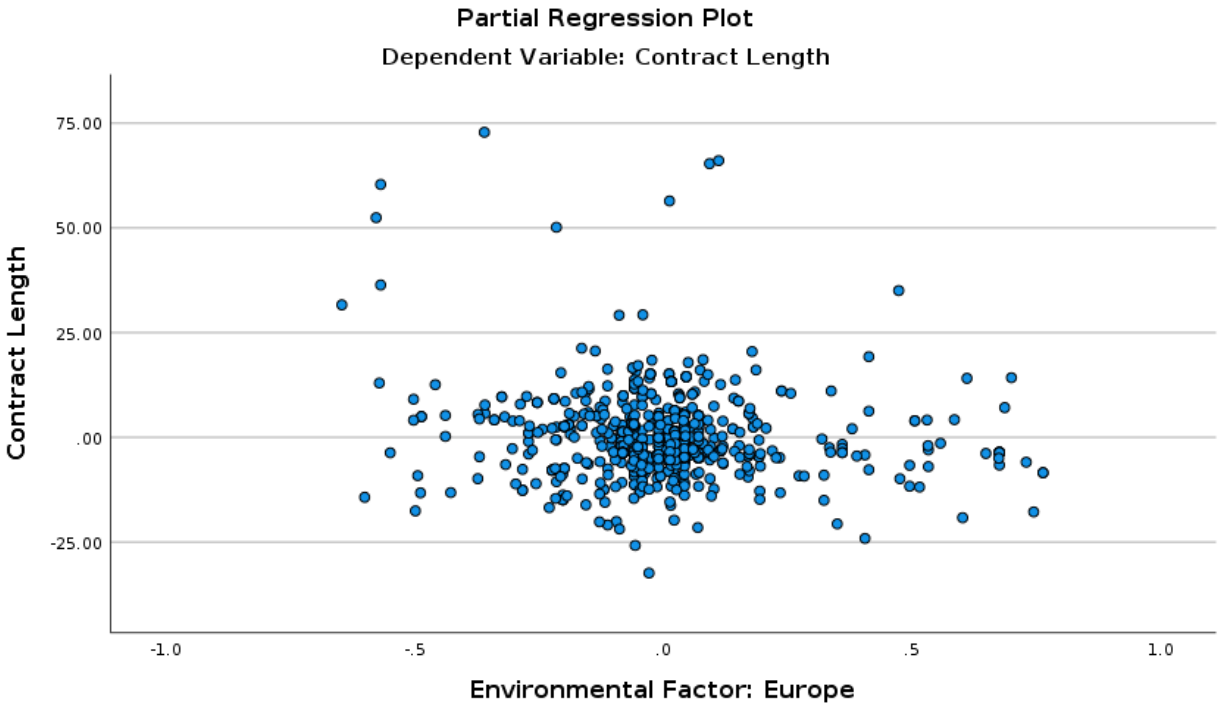

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.40
-.20
.00
.20
.40
.60
Government Effectiveness

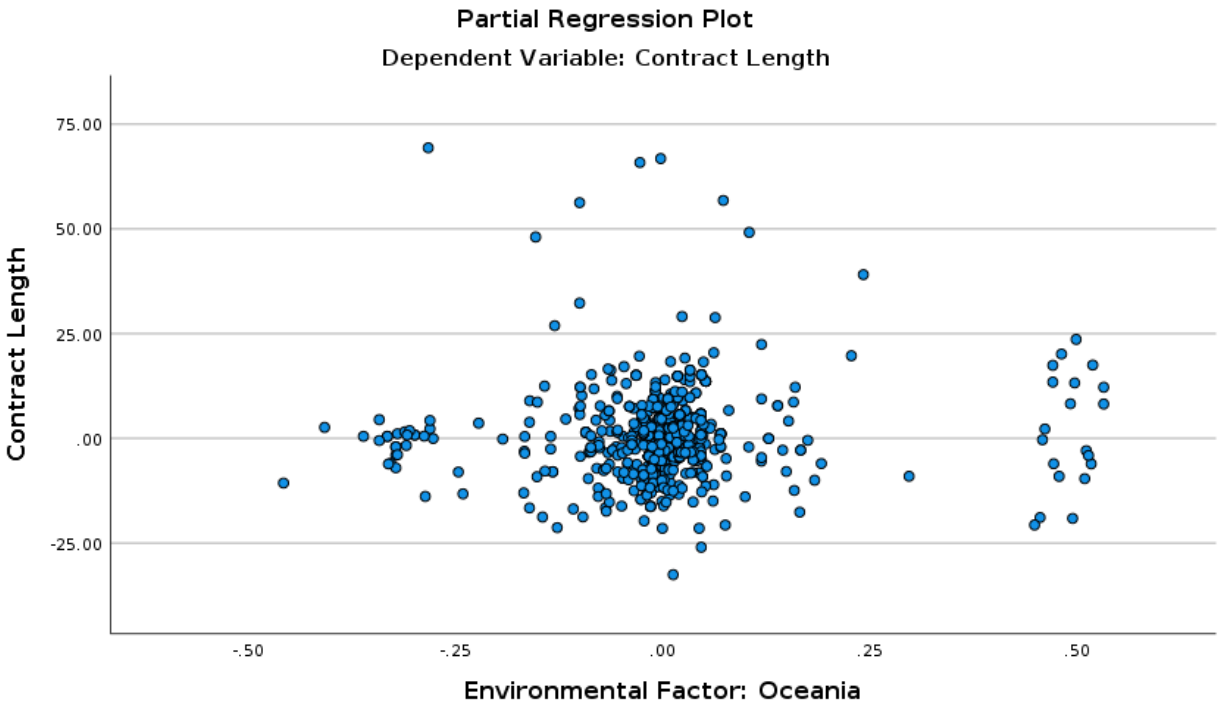

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.50
-.25
.00
.25
.50
.75
Regulatory Quality

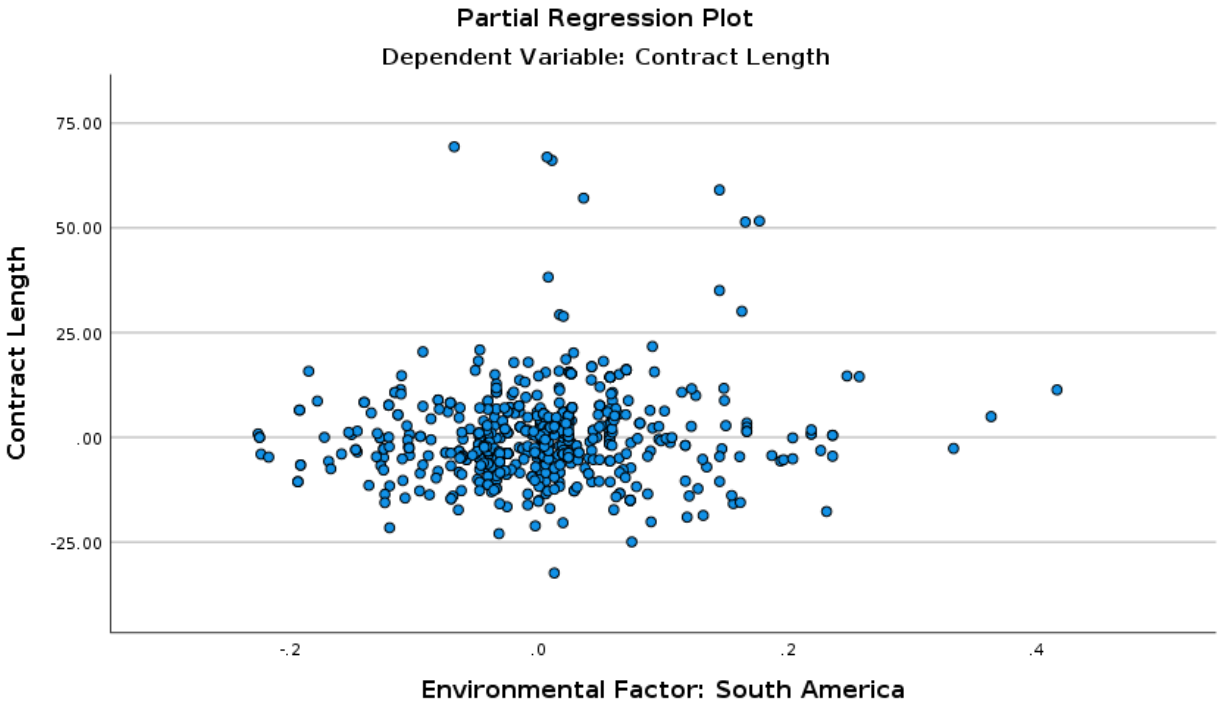

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.40
-.20
.00
.20
.40
.60
Rule of Law


Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.2
.0
.2
.4
Environmental Factor: Africa

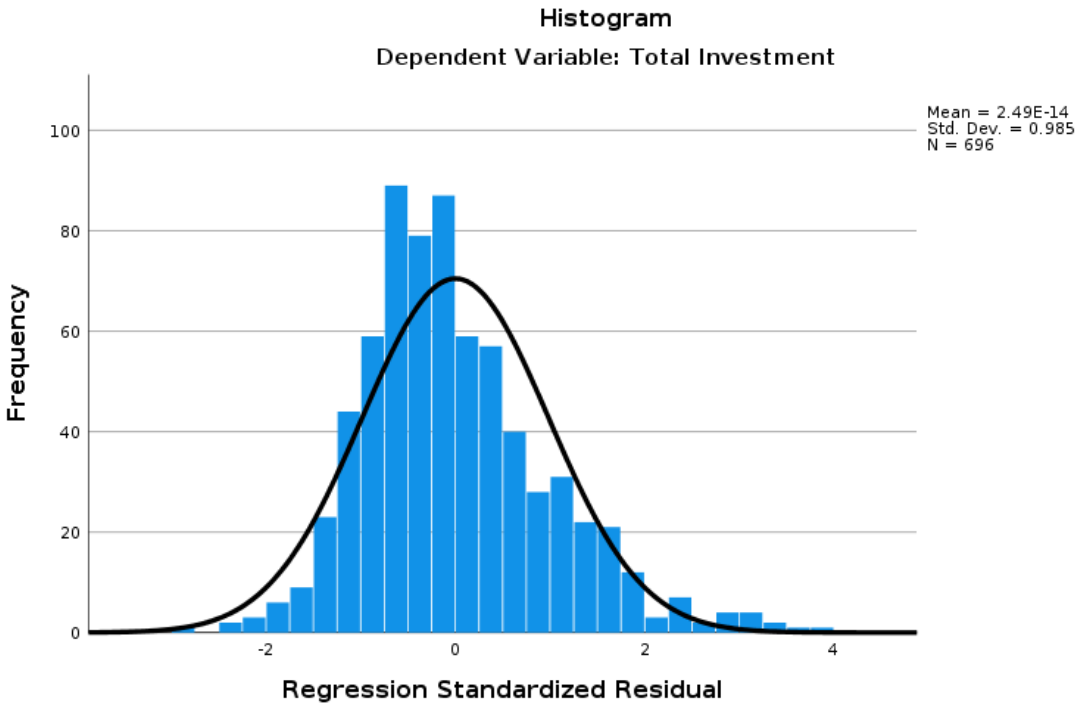

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-1.0
-.5
.0
.5
1.0
Environmental Factor: Asia

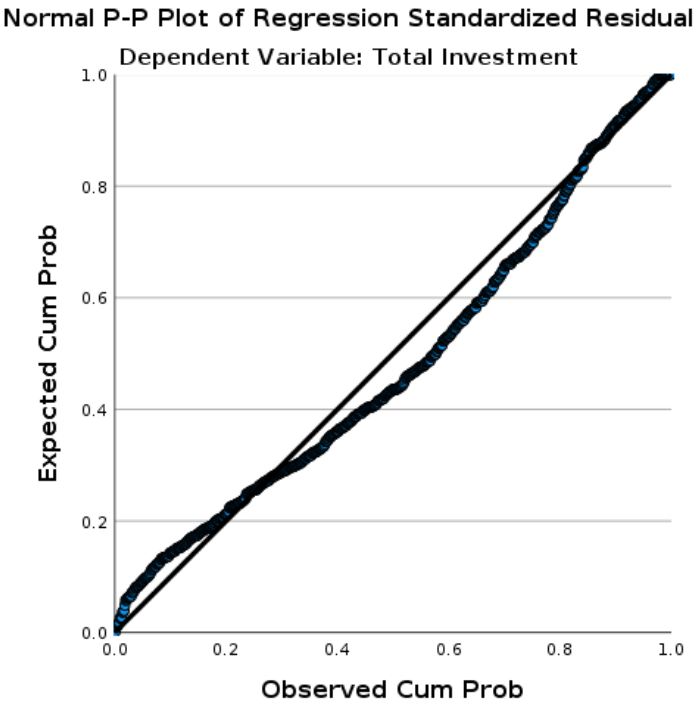

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-1.0
-.5
.0
.5
1.0
Environmental Factor: Europe

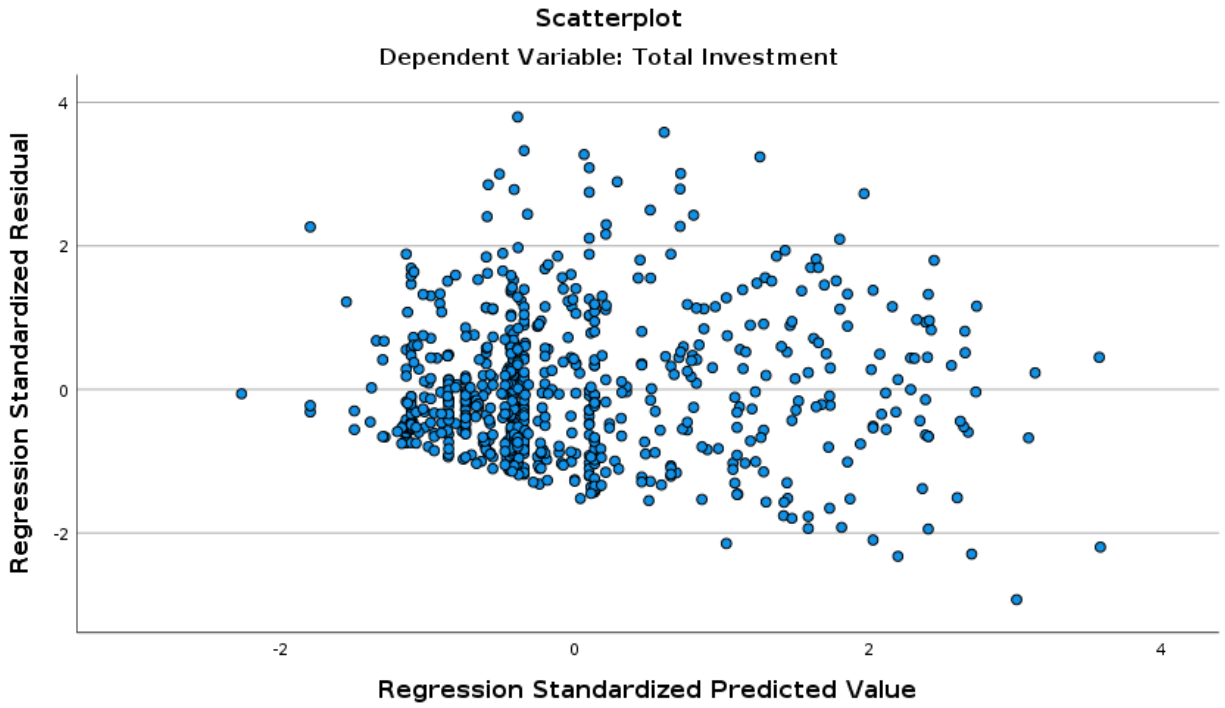

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.50
-.25
.00
.25
.50
Environmental Factor: Oceania

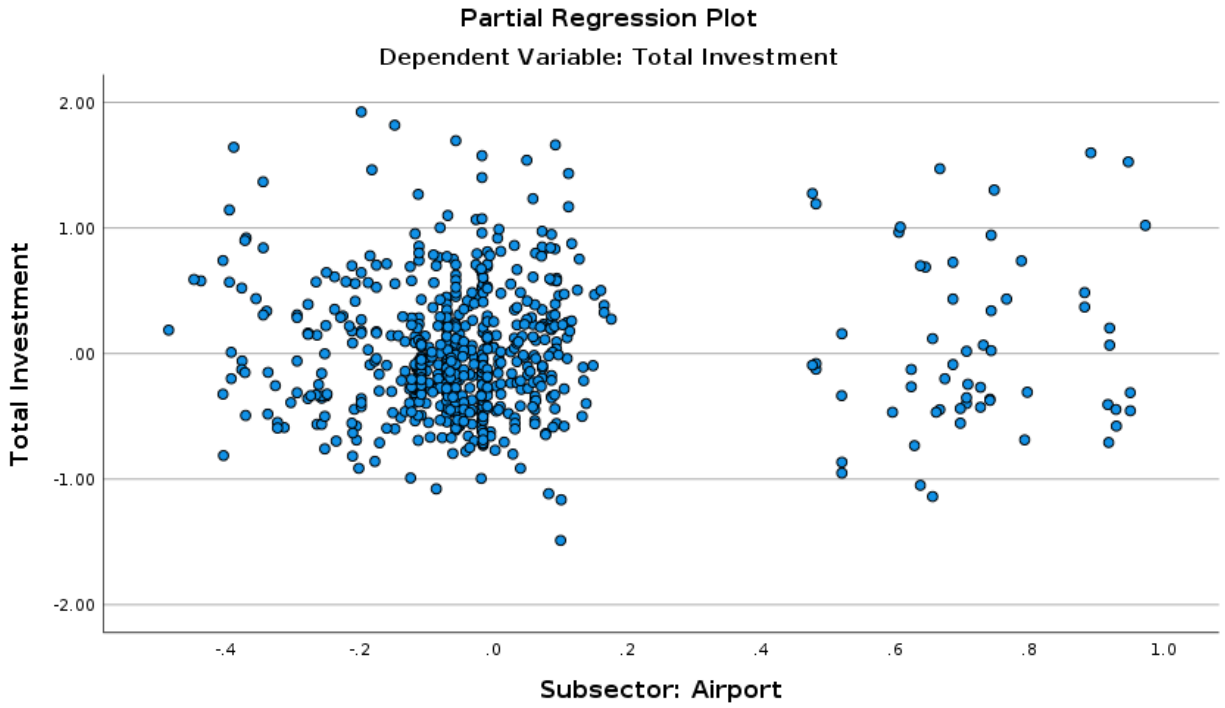

Partial Regression Plot
Dependent Variable: Contract Length
Contract Length
75.00
50.00
25.00
.00
-25.00
-.2
.0
.2
.4
Environmental Factor: South America

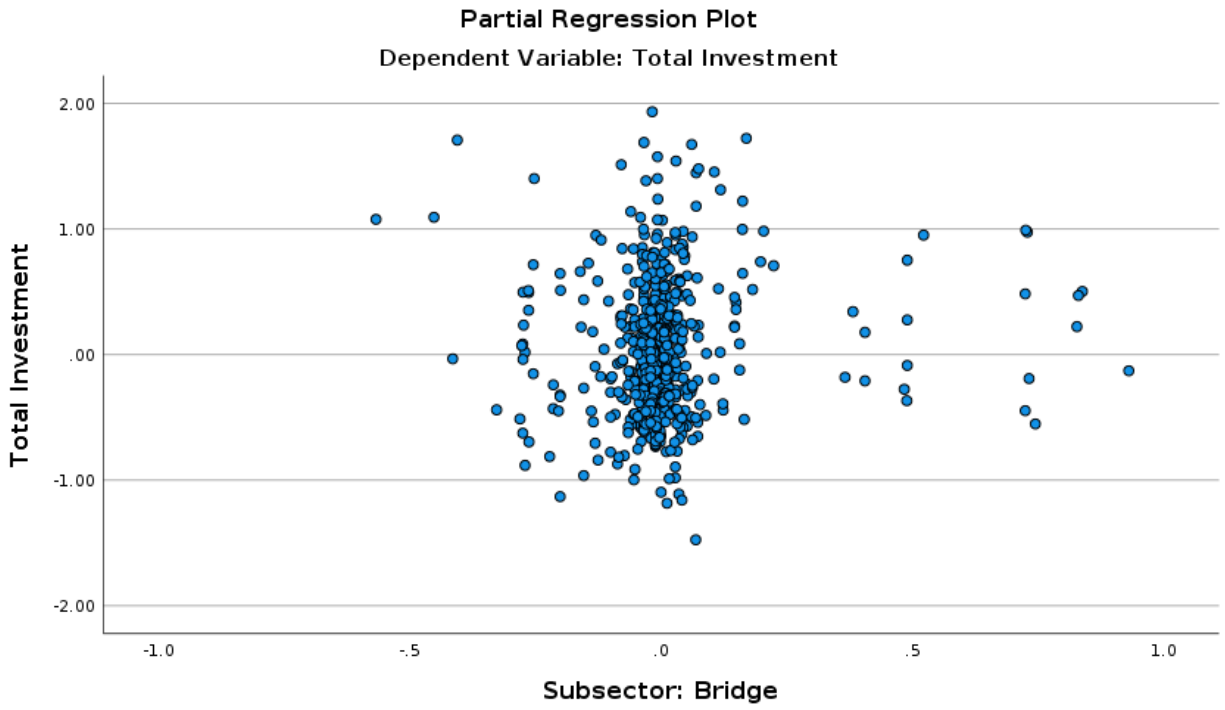
Regression 4 Diagnostic Figures

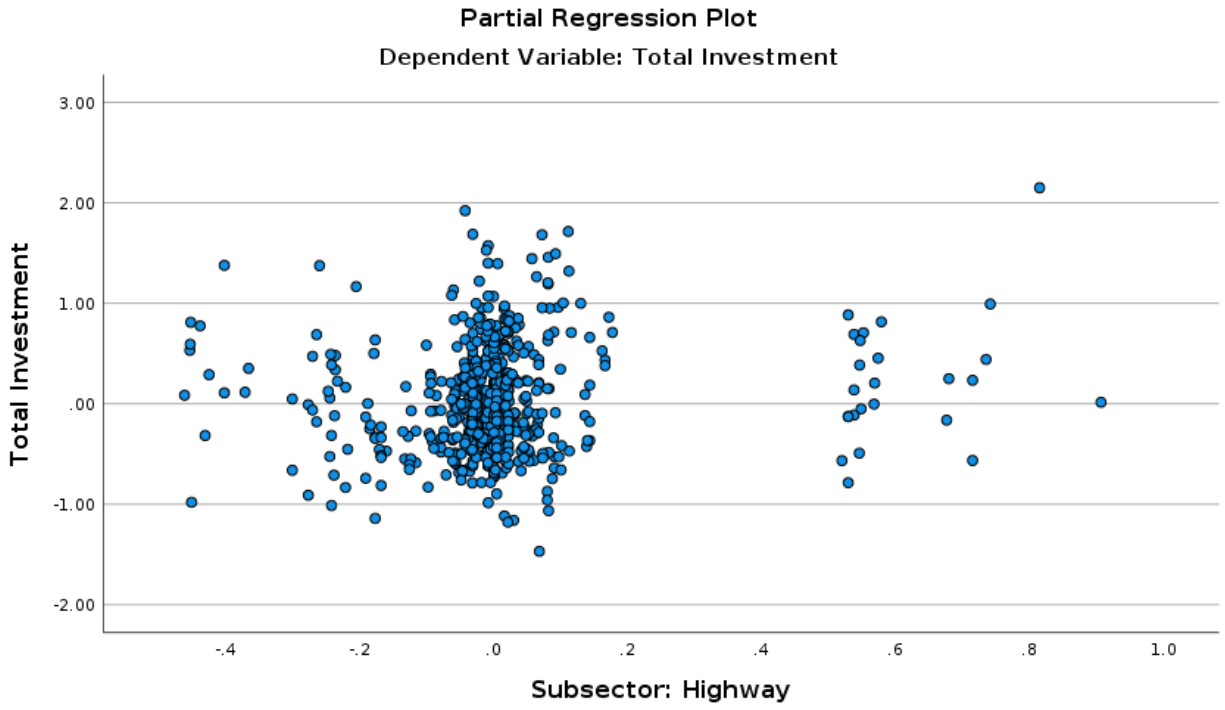


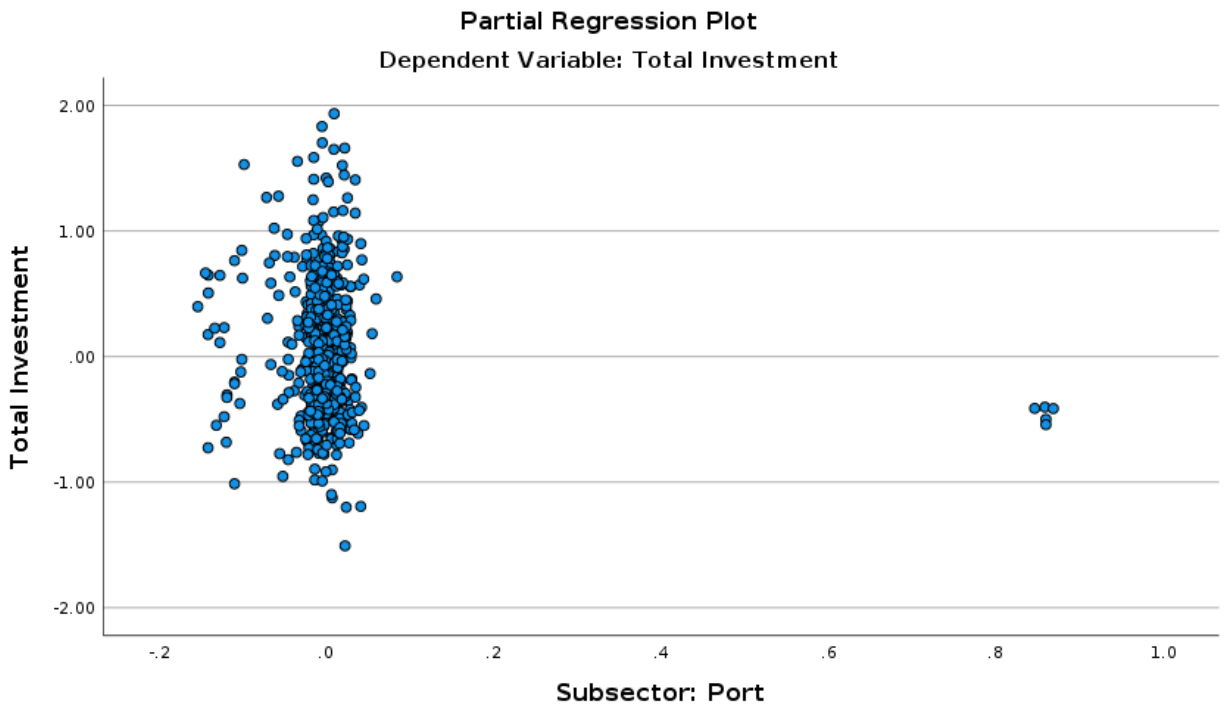


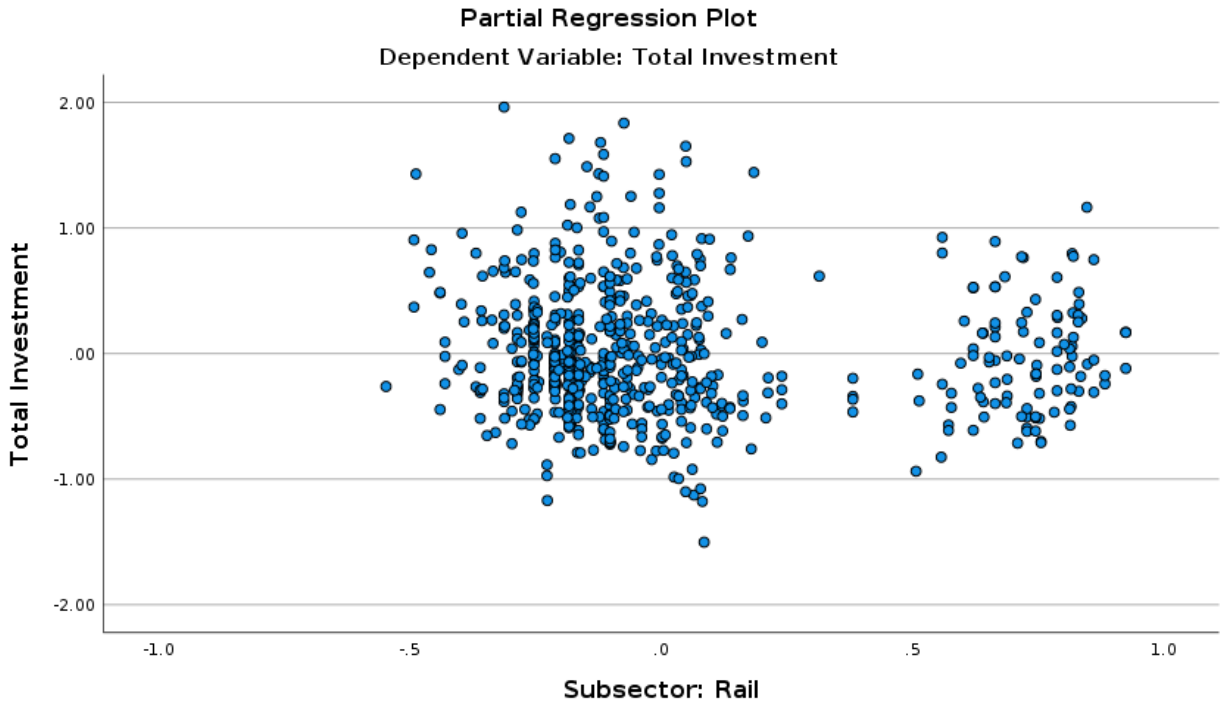

Scatterplot
Dependent Variable: Total Investment
Regression Standardized Residual
4
2
0
-2
-2
0
2
4
Regression Standardized Predicted Value

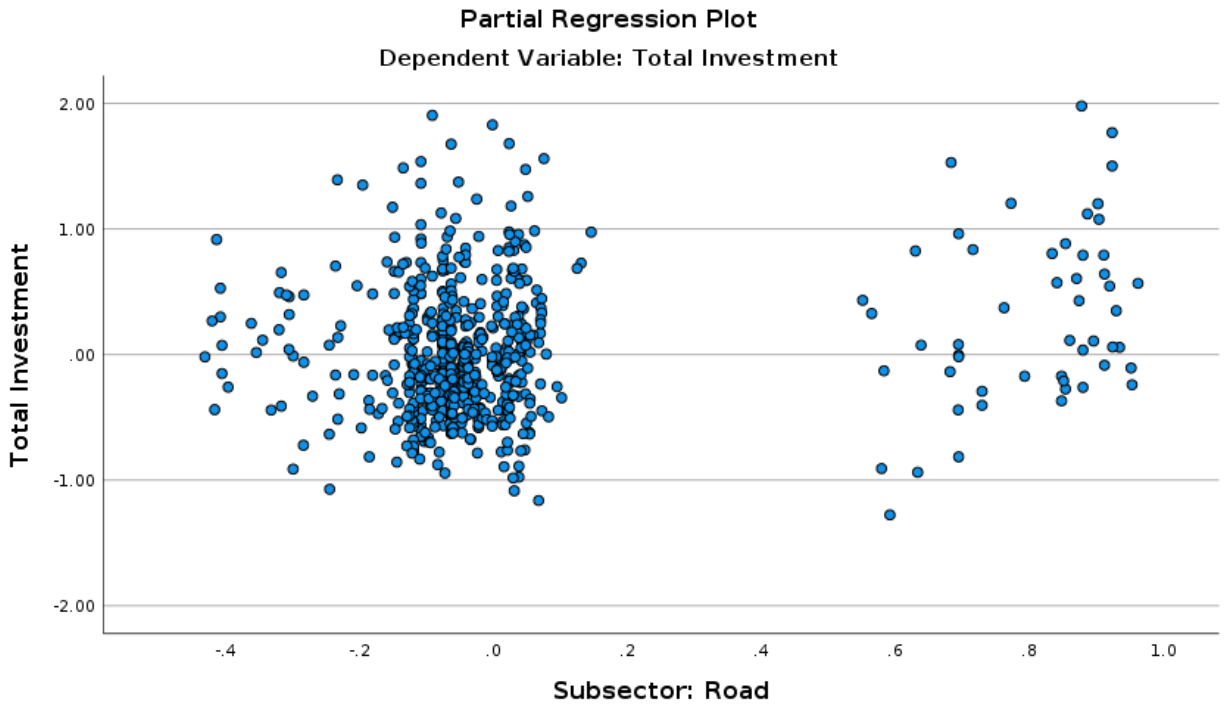

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-.4
-.2
.0
.2
.4
.6
.8
1.0
Subsector: Airport

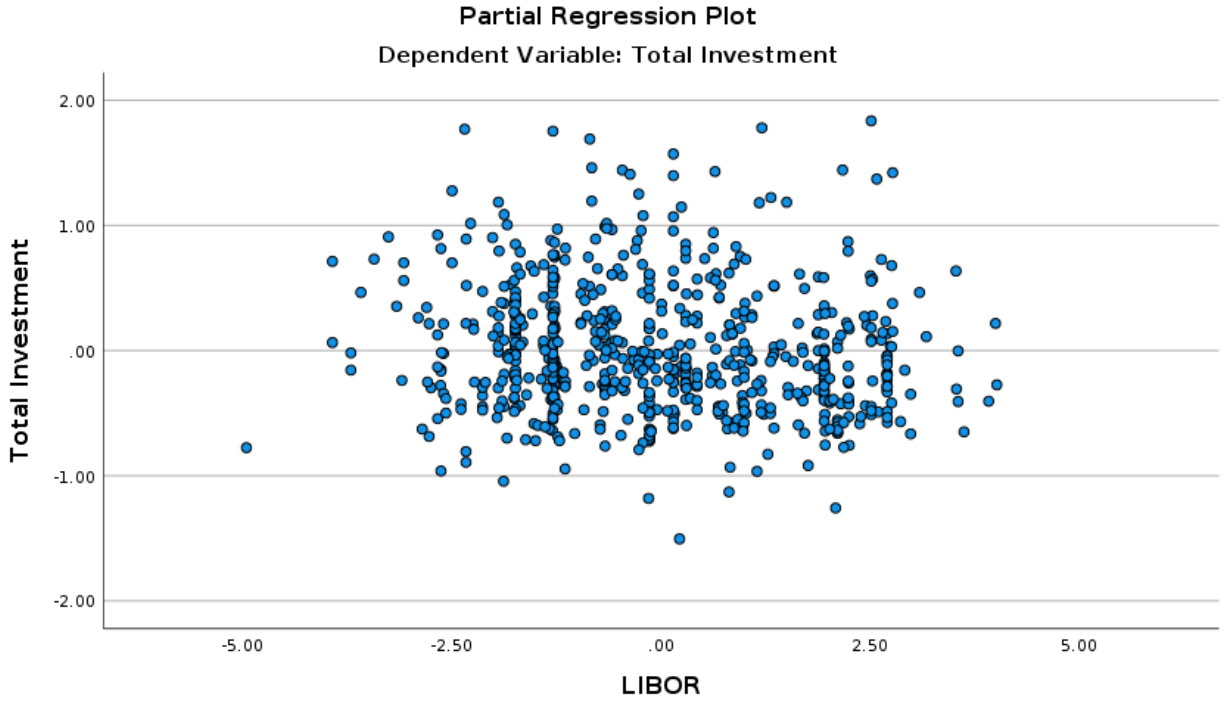

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-1.0
-.5
.0
.5
1.0
Subsector: Bridge

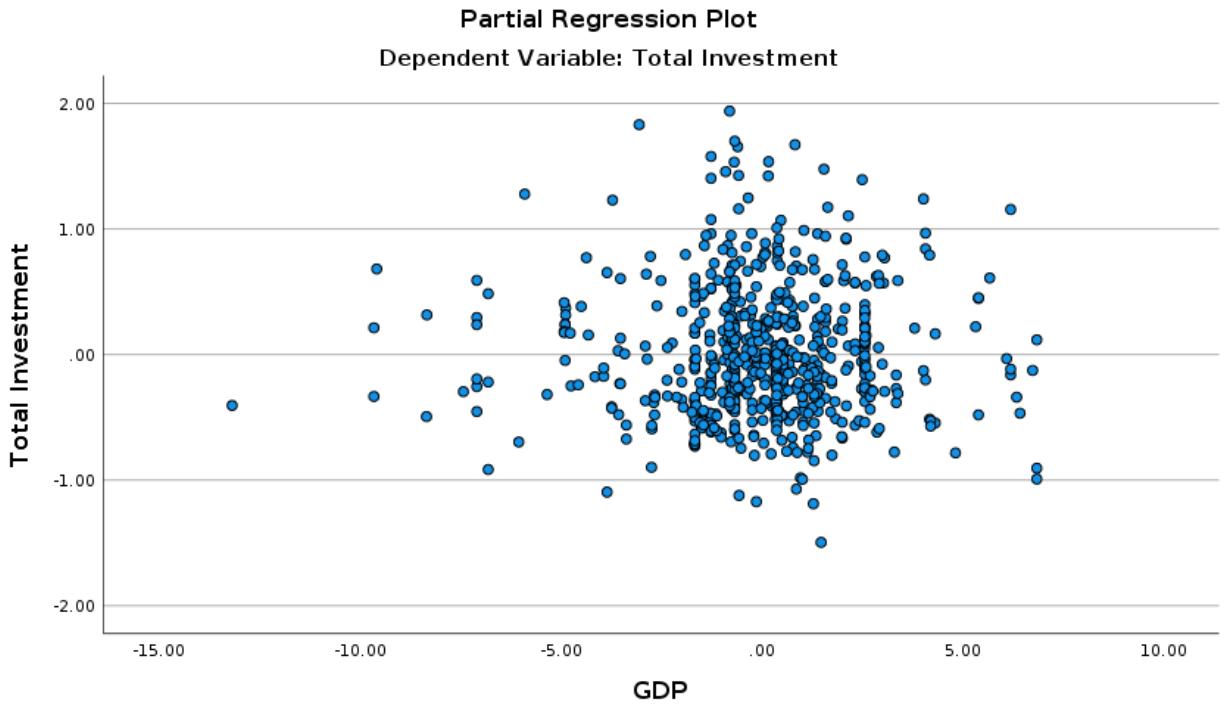

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
3.00
2.00
1.00
.00
-1.00
-2.00
-.4
-.2
.0
.2
.4
.6
.8
1.0
Subsector: Highway

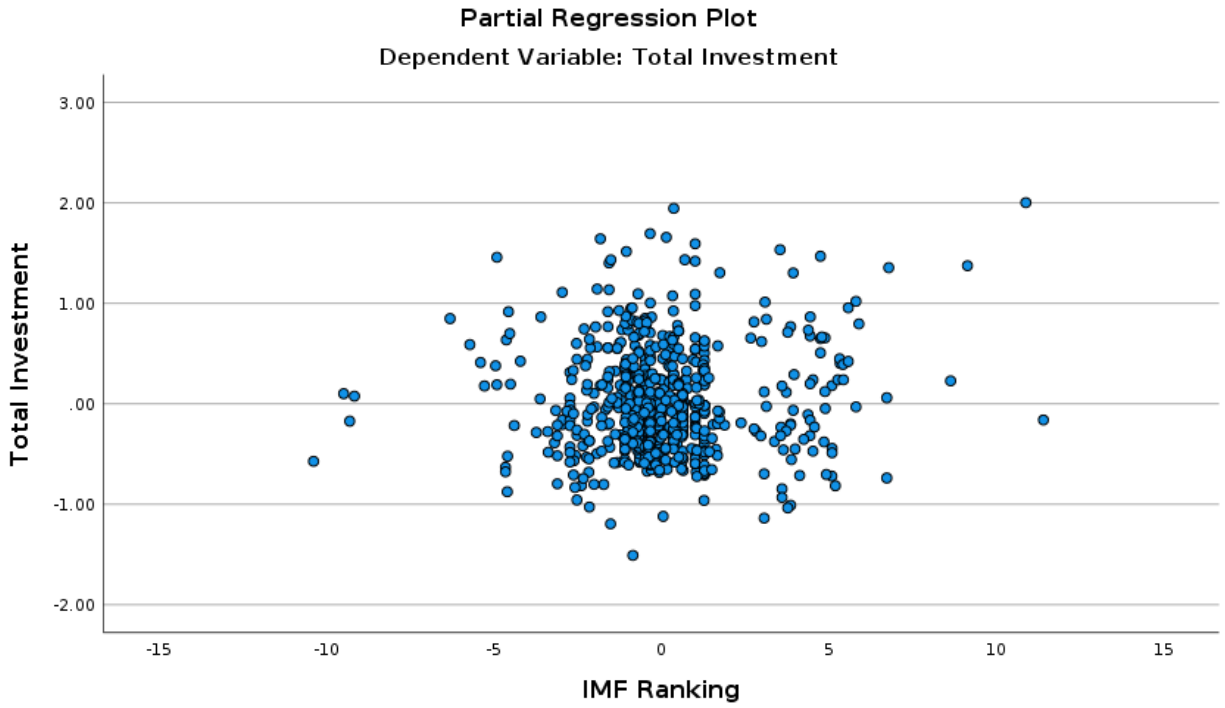

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-.2
.0
.2
.4
.6
.8
1.0
Subsector: Port

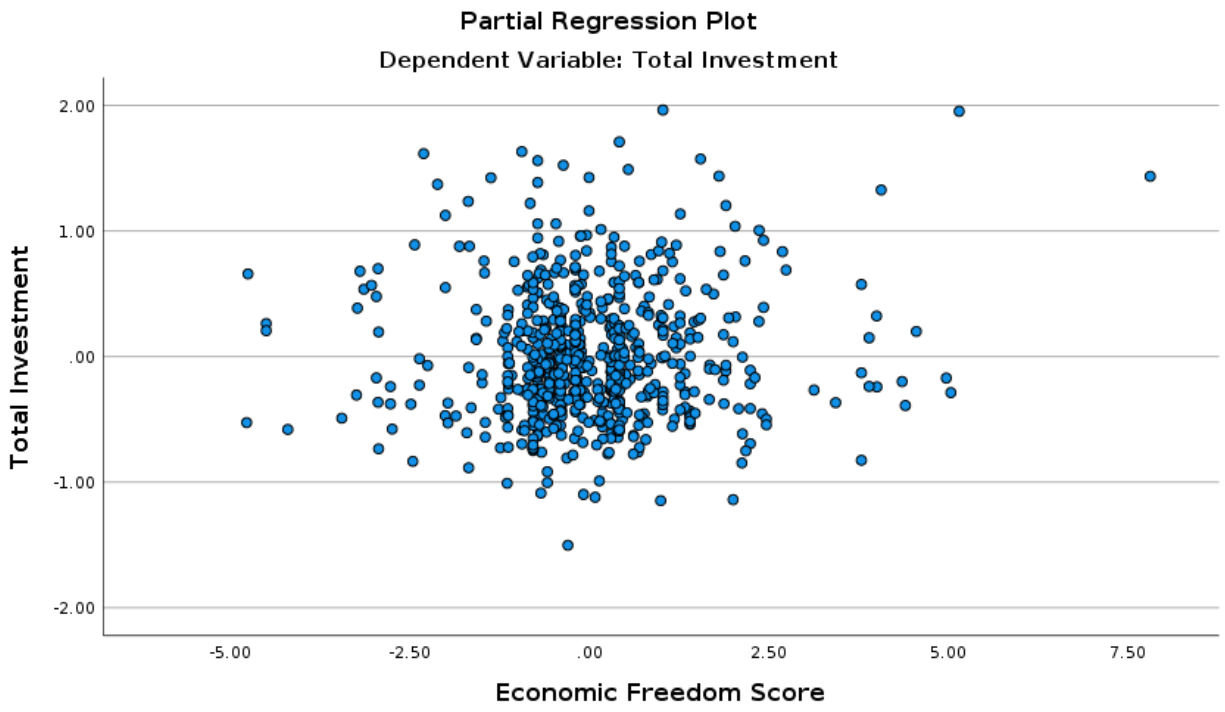

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-1.0
-.5
.0
.5
1.0
Subsector: Rail

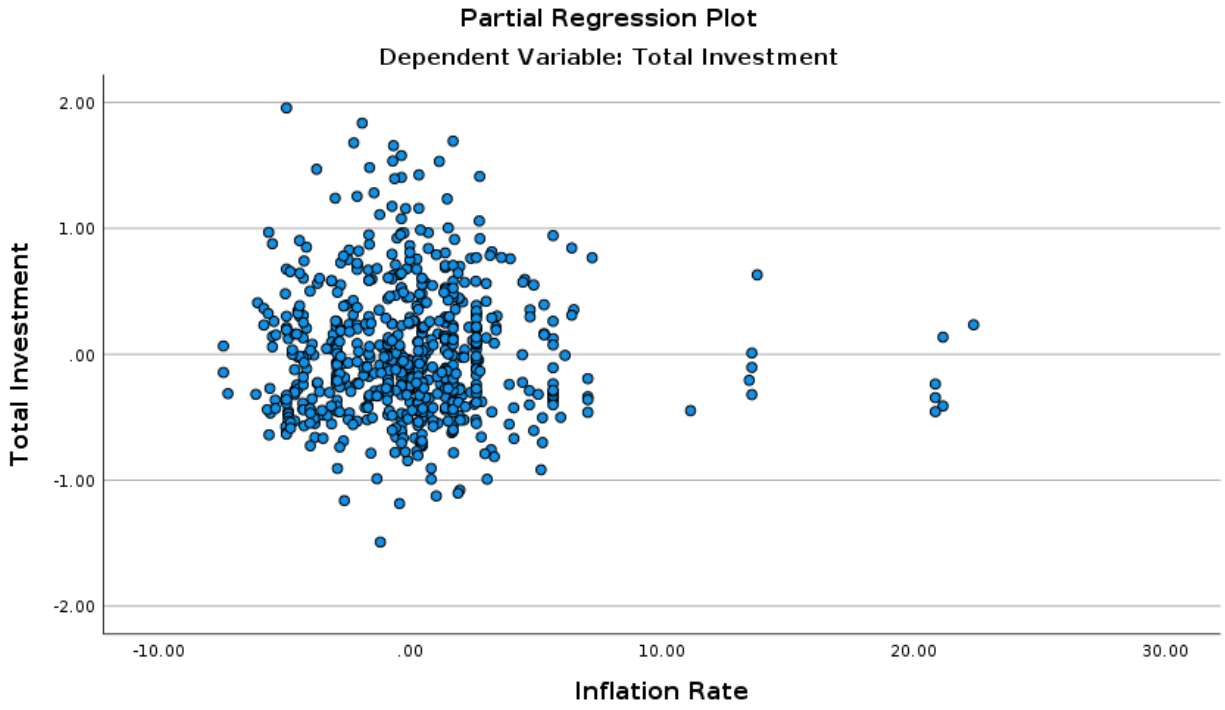

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-.4
-.2
.0
.2
.4
.6
.8
1.0
Subsector: Road

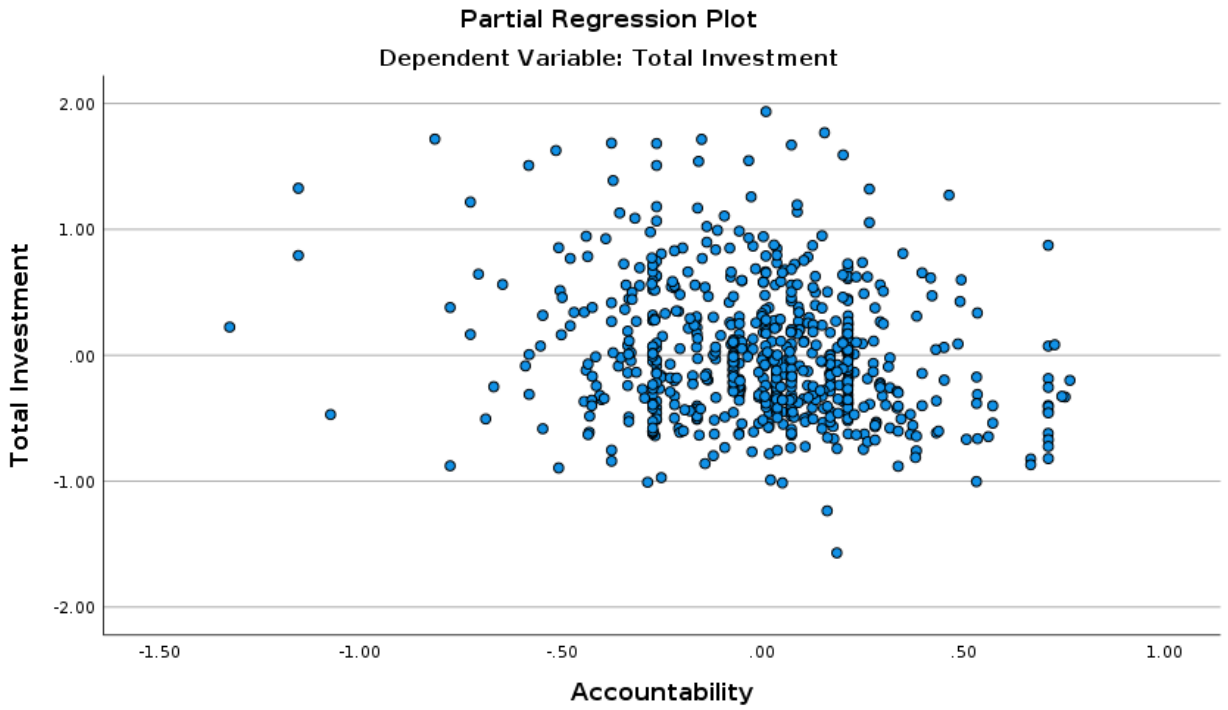

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-5.00
-2.50
.00
2.50
5.00
LIBOR

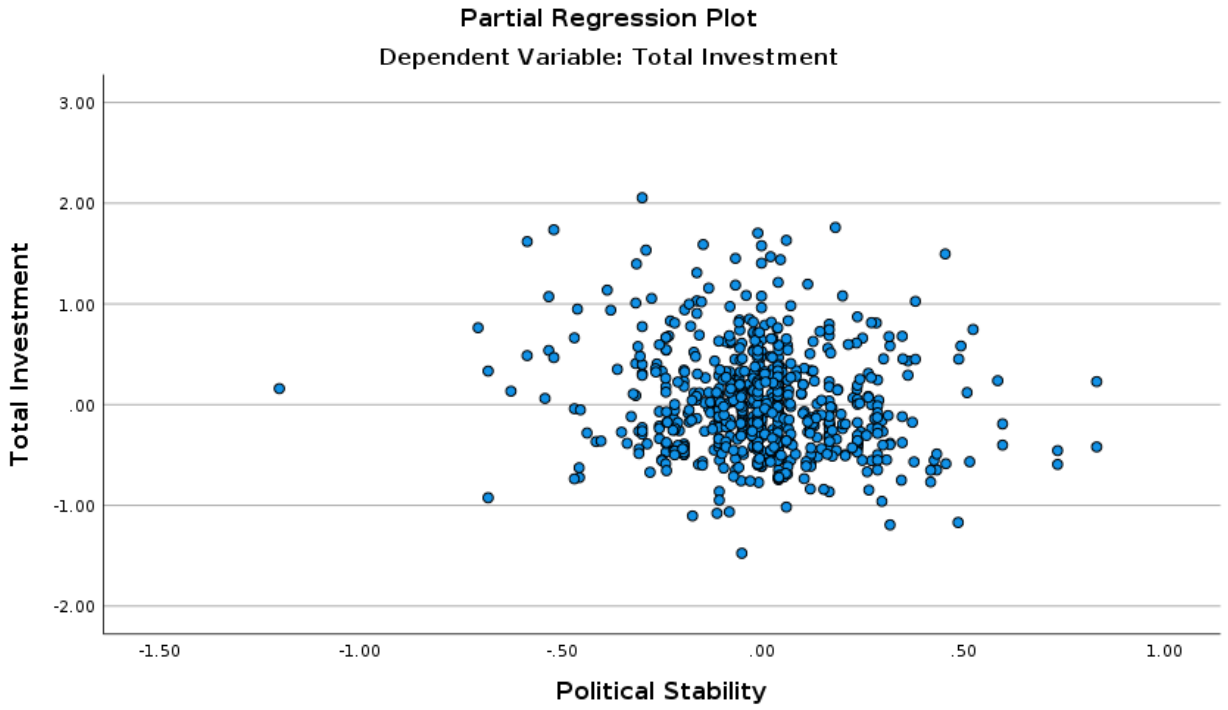

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-15.00
-10.00
-5.00
.00
5.00
10.00
GDP

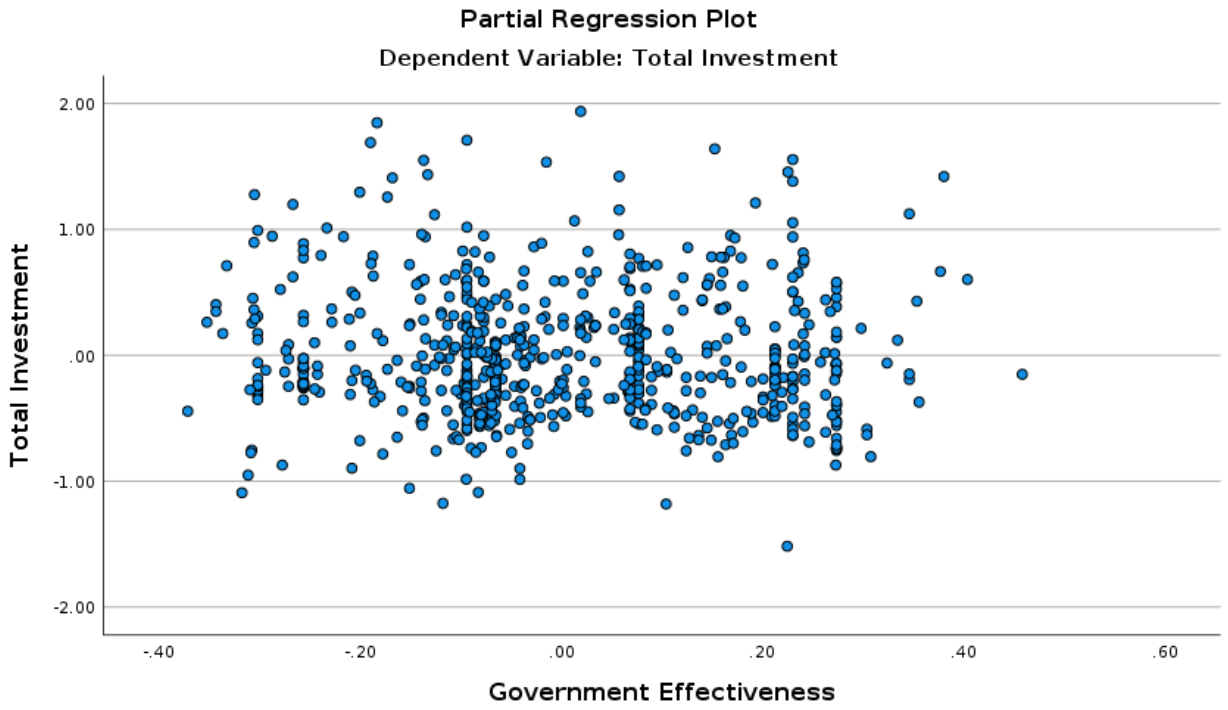

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
3.00
2.00
1.00
.00
-1.00
-2.00
-15
-10
-5
0
5
10
15
IMF Ranking

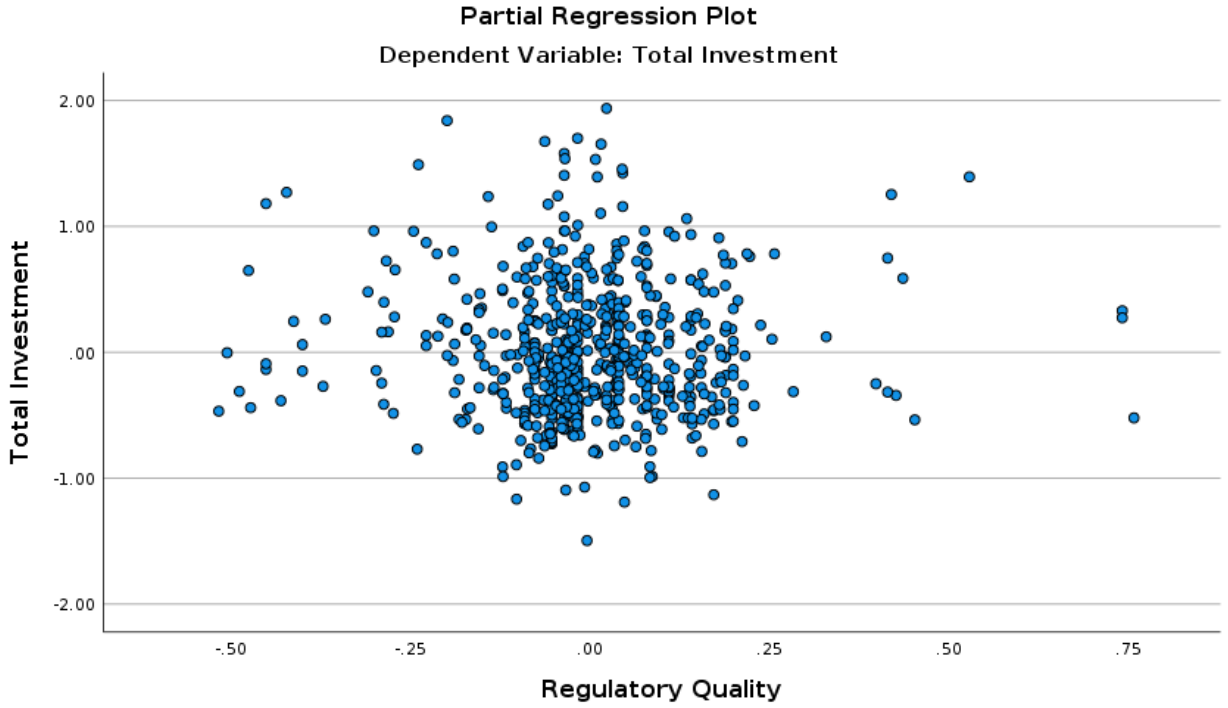

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-5.00
-2.50
.00
2.50
5.00
7.50
Economic Freedom Score

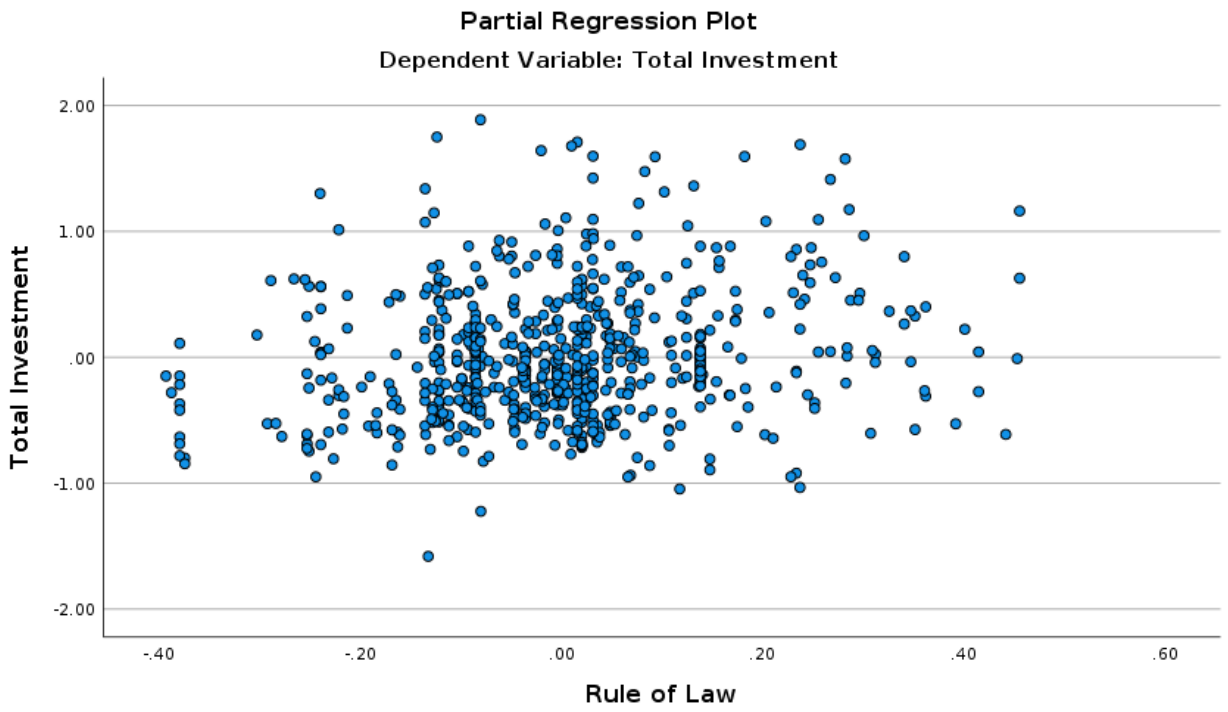

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-10.00
.00
10.00
20.00
30.00
Inflation Rate

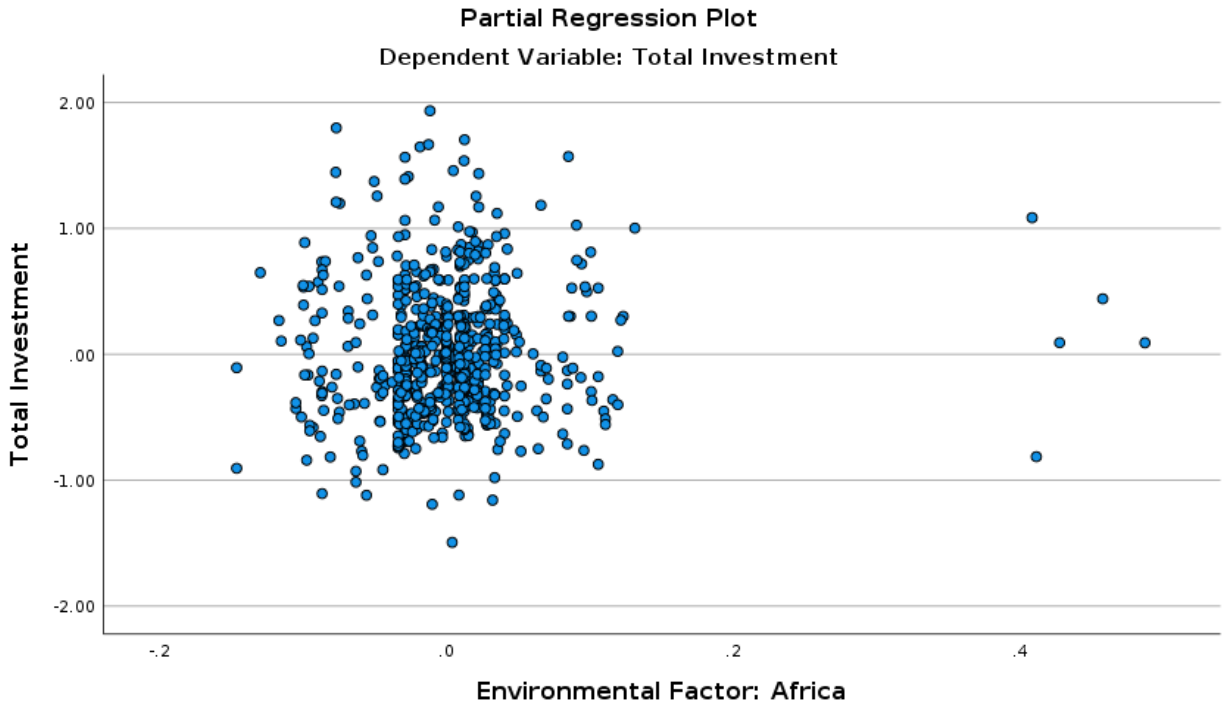

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-1.50
-1.00
-.50
.00
.50
1.00
Accountability

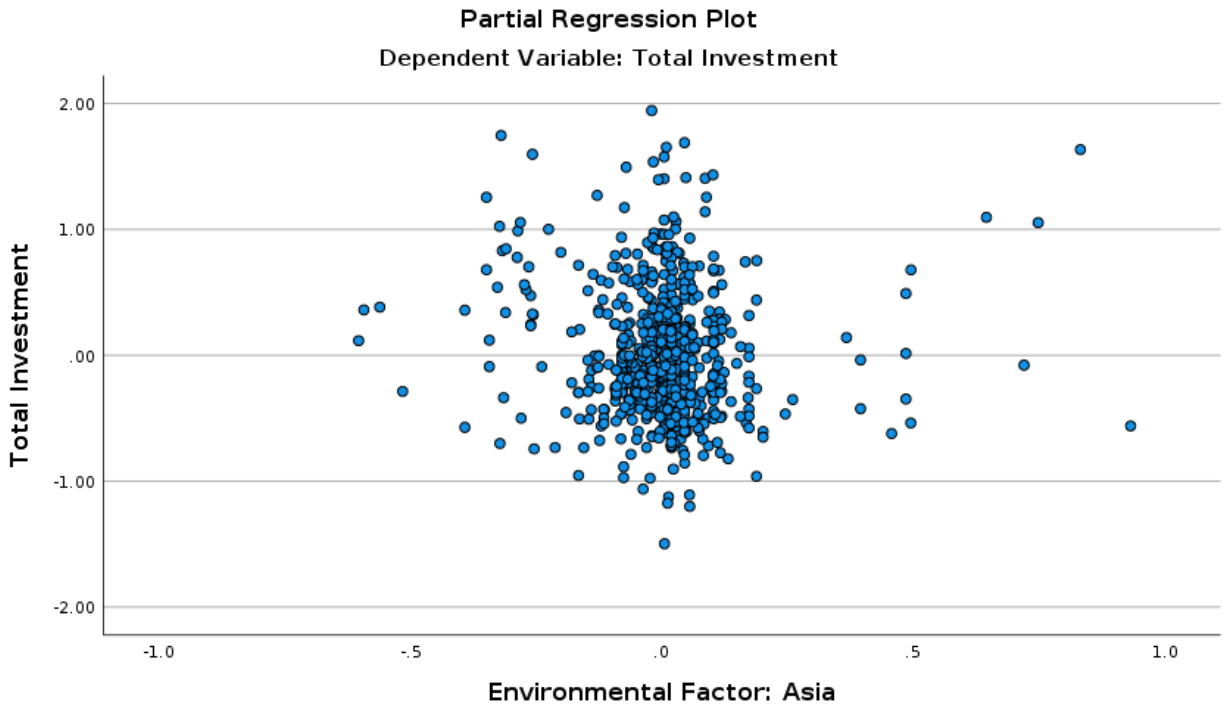

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
3.00
2.00
1.00
.00
-1.00
-2.00
-1.50
-1.00
-.50
.00
.50
1.00
Political Stability

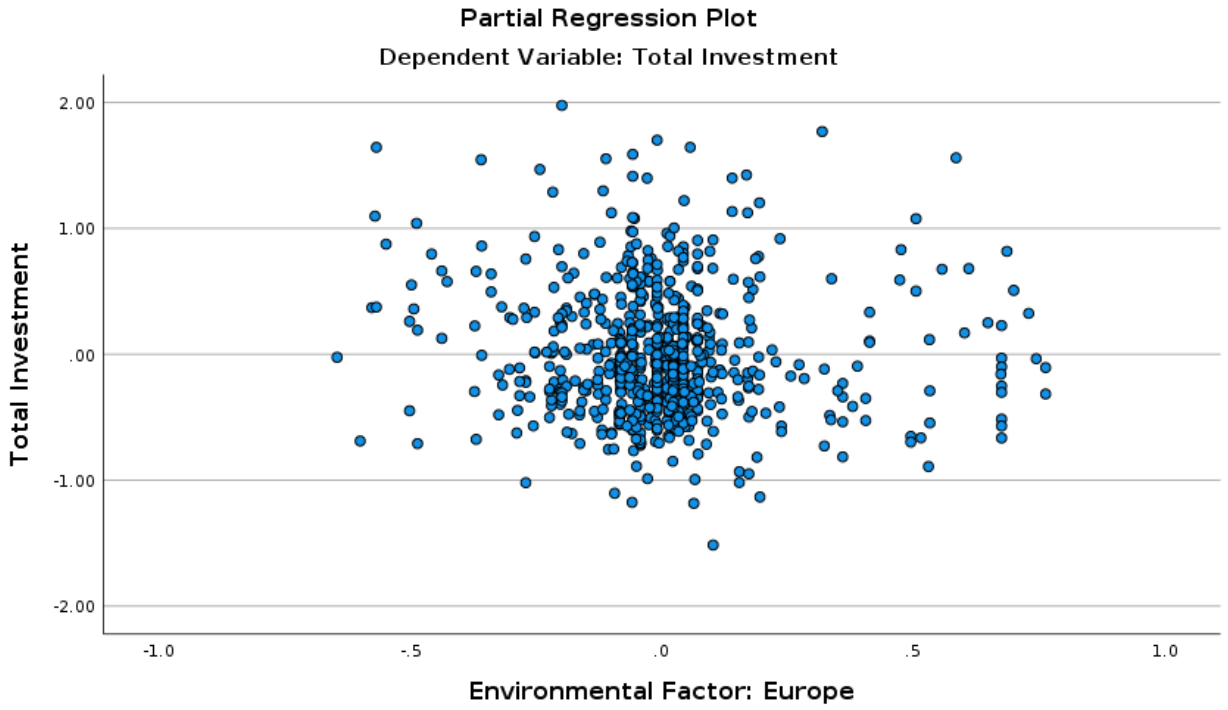

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-.40
-.20
.00
.20
.40
.60
Government Effectiveness

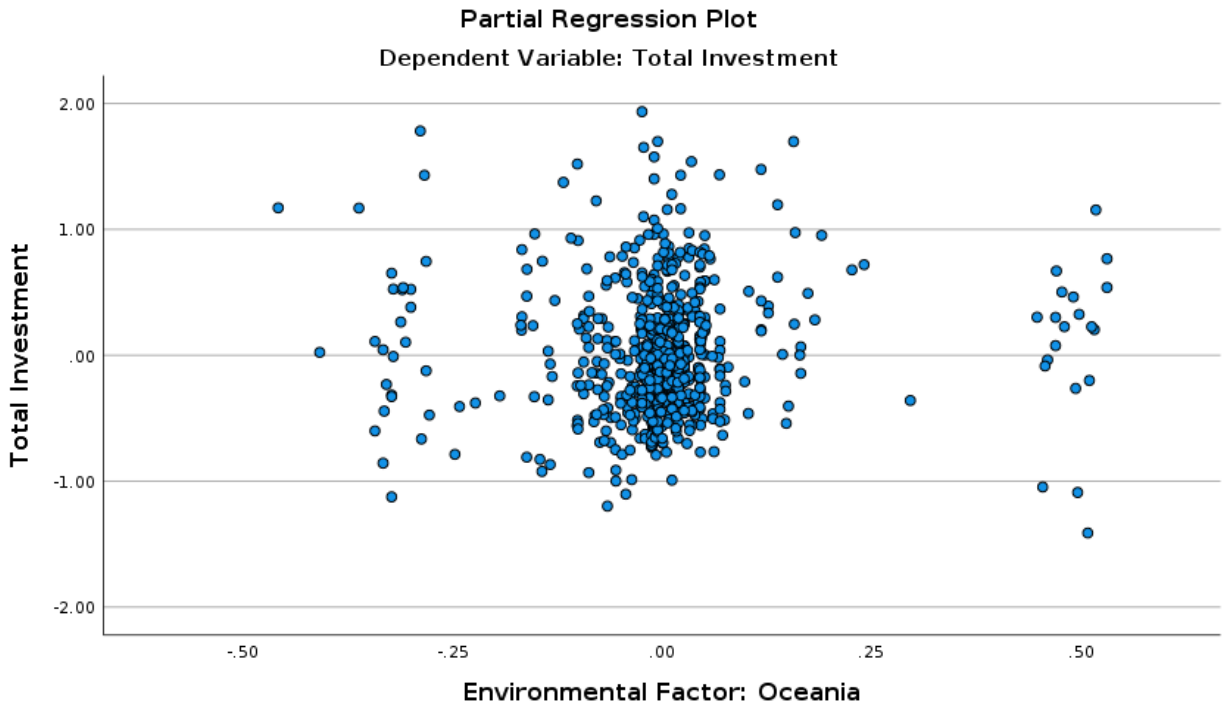

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-.50
-.25
.00
.25
.50
.75
Regulatory Quality

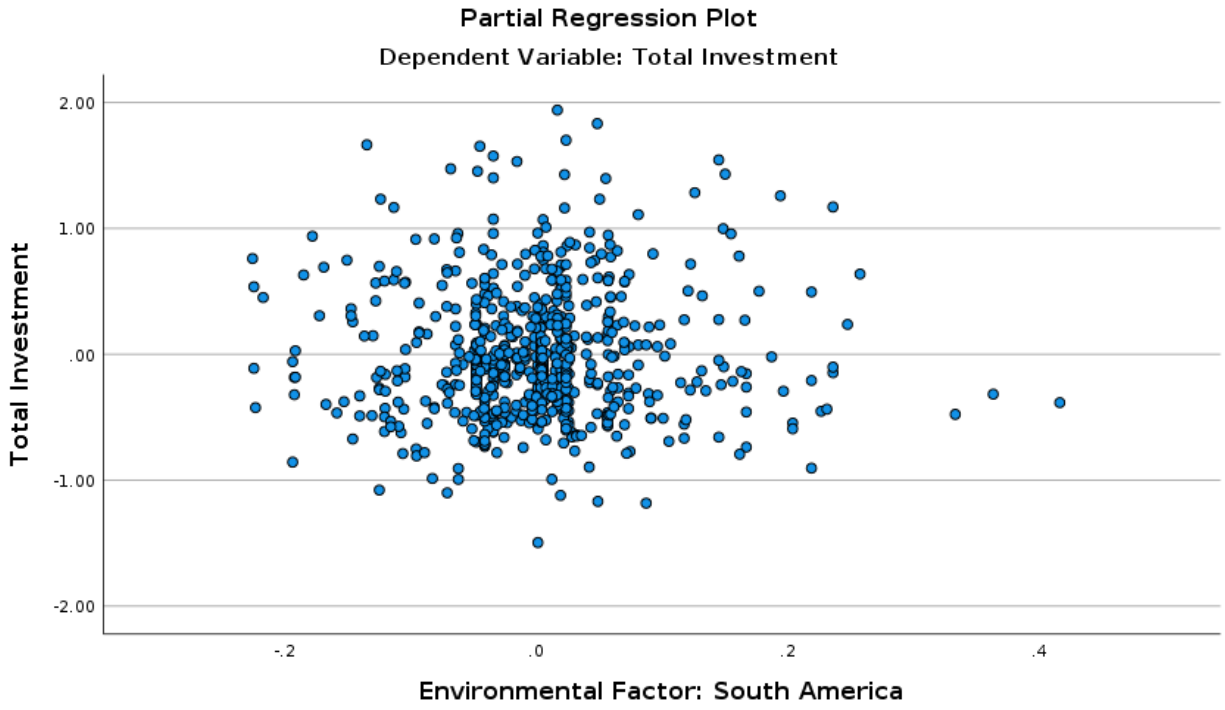

Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-.40
-.20
.00
.20
.40
.60
Rule of Law


Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-.2
.0
.2
.4
Environmental Factor: Africa


Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-1.0
-.5
.0
.5
1.0
Environmental Factor: Asia


Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-1.0
-.5
.0
.5
1.0
Environmental Factor: Europe


Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-.50
-.25
.00
.25
.50
Environmental Factor: Oceania


Partial Regression Plot
Dependent Variable: Total Investment
Total Investment
2.00
1.00
.00
-1.00
-2.00
-.2
.0
.2
.4
Environmental Factor: South America