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Quantitative Analysis of the Impact of State Gun Laws and Gender Distribution on Illicit Firearm Trafficking: A Multiple Linear Regression Study Using Data From 2017–2021

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This is to certify that the doctoral dissertation by

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and that any and all revisions required by
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Walden University
2025

Abstract

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by

Celeste M. Quinn

MA, University of Toledo, 2007

BA, Monmouth University, 1999

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Criminal Justice

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Abstract

This quantitative, correlational study examines the impact of state gun law stringency and gender distribution among firearm possessors on illicit firearm trafficking, focusing on three key outcomes: firearm traces, perfected firearm traces, and straw purchases. In response to the pressing need to understand factors driving firearm trafficking, this research aims to inform public safety initiatives and policy strategies. Guided by deterrence theory, the study investigates how legislative strength and gender-based possession patterns influence trafficking indicators. Secondary data were analyzed using multiple linear regression to assess relationships between the IVs of state gun law stringency and gender distribution of firearm possessors and the three IVs. Analytical adjustments accounted for multicollinearity and statistical assumption violations to ensure reliable interpretations. Findings indicate that stricter gun laws are associated with lower trafficking indicators, suggesting that stringent regulations may serve as a deterrent to illicit activity. While male possessors did not show statistically significant effects, gender distribution overall played a noteworthy role, with female possessors contributing uniquely to traceability and straw purchasing patterns. The study calls for further exploration of gender-specific mechanisms influencing firearm trafficking, as well as the effects of legislative stringency on trafficking trends. The implications for social change include improved community safety and reduced gun violence, supporting social determinants of health by fostering safer environments and offering valuable insights for policymakers to craft effective firearm legislation.

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Dedication

This dissertation is dedicated to my beloved family. To my children: Drew Flom (wife Alyse), Ryan Quinn (wife Liz), Collan Quinn, and Lilly Quinn, who have been my pillars of strength, sources of inspiration, and reasons for persevering through the challenges of doctoral studies. Your dedication to your own academic pursuits has been nothing short of remarkable, inspiring me every step of the way. I hope that by accompanying me on this journey, I have fostered within you a spirit of curiosity, resilience, and confidence in your own abilities. For my granddaughter Alaina, though you may be too young to understand these words now, I hope this dissertation symbolizes the boundless potential that lies ahead of you. May you always draw inspiration from your dreams, knowing that your family will be there, cheering you on every step of the way. To my parents, Dr. Patrick and Mrs. Carol Nedry, your ambition and love helped shape me into the person I am today. I would also like to extend my gratitude to all my friends for their continued encouragement throughout this process, with special thanks to Jennifer Stoval and my bestie Retha Geiss. Lasty, to my beloved husband, Sean, who has been my unwavering support and biggest cheerleader since the beginning of this doctoral journey 8+ years ago. Your love, encouragement, and belief in my abilities has been a driving force behind my pursuit of a doctorate and a constant source of strength and motivation. Thank you for standing by my side through the challenges and triumphs, and for being my rock when the tides were rough. This dissertation reflects the love, support, and inspiration that each of you has brought into my life. May it serve as a tribute to our shared journey and a testament to the power of family, love, and perseverance.

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Table of Contents

List of Tables viii

List of Figures xii

Chapter 1: Introduction to the Study 1

Overview 1

Background 2

Problem Statement 5

Purpose of Study 7

Research Questions and Hypotheses 8

Theoretical Foundation 10

Nature of Study 12

Definitions 14

Assumptions 19

Scope 20

Delimitations 21

Limitations 21

Significance 24

Summary 25

Chapter 2: Literature Review 27

Introduction 27

Literature Search Strategy 29

Theoretical Foundation Background 31

Application to Women in Gun Crime: Straw Purchasing and Rational Choice 33
Application of Deterrence to Gun Crime and Implications for Female Offenders 39
Impact of Individual Characteristics on Deterrence Efficacy 40
Focused Deterrence and Gun Crime Reduction 41
Gender-Specific Considerations and Implications 41
Conclusion for Theoretical Framework 42
Gun Violence 42
Gun Ownership and Cultural Context 43
Economic Burden on Property Values 44
Healthcare Costs and System Strain 44
Broader Societal and Economic Costs 44
Community Stability and Economic Revitalization 45
Psychological Effect of Gun Violence 46
Mental Health and Legal Considerations 46
Holistic Interventions and Public Health Perspectives 47
Public Health Framing 47
Mental Health Factors in Gun-Related Crimes 48
Role of Firearms in Suicide 48
Domestic Violence 49
Epidemiology of Firearm Crime 50

Firearm Possession as a Crime Deterrent 52
Right-to-Carry Laws 53
Illegal Firearms Markets 54
Screening Gun Customers 56
Straw Purchasing Legislation 58
Nationwide Overview of Straw Purchasing Legislation 58
California: A Case Study in Straw Purchasing Legislation and Public Awareness 59
Straw Purchasing Firearm Laws in New York 59
Illinois: Legislative and Educational Interventions 61
Policy Recommendations and Pathways Forward 62
Sources of Crime Guns 62
Females and Firearms 64
Gender-Based Marketing and Women's Involvement in Gun Culture 64
Psychological Factors in Female Gun Violence 65
Straw Purchasing Firearms 66
Straw Purchasing Firearms by Females 66
Gendered Patterns in Straw Purchasing 67
Motivations and Socioeconomic Influences 67
Societal and Cultural Context 68
Race, Gender, and Intersectionality in Straw Purchasing 69
Legal Interventions and Effectiveness 69

Implications for Policy and Practice 70
Conclusion 70
Chapter 3: Research Method 73
Introduction 73
Research Design and Rationale 74
Methodology 78
Population, Setting, and Sample 78
Power Analysis 80
Instrumentation and Operationalization of Constructs 86
Variable Definitions, Measures, and Scales 86
Data Analysis Plan 91
Research Questions and Hypotheses 98
Threats to Validity 100
Threats to External Validity 100
Threats to Internal Validity 101
Threats to Construct Validity 103
Ethical Procedures 108
Summary 109
Chapter 4: Analysis 111
Introduction 111
Data Collection 113
Treatment Fidelity and Adverse Events 115

Results 115
Descriptive Statistics 115
Multiple Linear Regression Assumptions 118
Analysis DV1a (Controlling for Category A) 130
Regression Assumptions (Category A as Reference) for DV1a 135
Analysis DV1b (Controlling for Category A) 137
Regression Assumptions (Category A as Reference) for DV1b 142
Analysis DV1c (Controlling for Category A) 144
Regression Assumptions (Category A as Reference) for DV1c 150
Analysis DV1a (Controlling for Category E) 152
Regression Assumptions (Category E as Reference) for DV1a 156
Analysis DV1b (Controlling for Category E) 158
Regression Assumptions (Category E as Reference) for DV1b 162
Analysis DV1c (Controlling for Category E) 164
Regression Assumptions (Category E as Reference) for DV1c 169
Summary 171
Chapter 5: Discussion, Conclusions, and Recommendations 175
Introduction 175
Interpretation of the Findings 176
Limitations of the Study 180
Generalizability 180
Validity 181

Reliability 181
Trustworthiness 182
Assumptions and Statistical Limitations 182
Recommendations for Further Research 183
Implications 186
Positive Social Change—Individual Level 186
Positive Social Change—Family Level 187
Positive Social Change—Organizational Level 188
Positive Social Change—Societal and Policy Level 188
Methodological, Theoretical, and Empirical Implications 190
Methodological Implications 190
Theoretical Implications 191
Empirical Implications 191
Recommendations for Practice 192
Policy-Level Recommendations 193
Law Enforcement Practices 193
Community and Educational Organizations 194
Organizational Training and Development 195
Conclusion 196
References 198
Appendix A: DV1a (Controlling for Category A) 220
Appendix B: DV1b (Controlling for Category A) 229

Appendix C: DV1c (Controlling for Category A) 238

Appendix D: DV1a (Controlling for Category E) 247

Appendix E: DV1b (Controlling for Category E).....256

Appendix F: DV1c (Controlling for Category E) 265

List of Tables

Table 1. Variable Measures and Scales 91

Table 2. Descriptive Statistics for Dependent, Independent, and Dummy Variables..... 116

Table 3. Descriptive Statistics for Standardized Variables..... 117

Table 4. Model Summary Before Standardizing (Category A as Reference) for DV1a 130

Table 5. Regression Coefficients Before Standardizing (Category A as Reference) for DV1a 130

Table 6. Model Summary After Standardizing (Category A as Reference) for DV1a... 131

Table 7. Regression Coefficients After Standardizing (Category A as Reference) for DV1a 131

Table 8. Model Summary After Standardizing & Removing Zscore(MCGP) (Category A as Reference) for DV1a 131

Table 9. Regression Coefficients After Standardizing & Removing Zscore(MCGP; Category A as Reference) for DV1a 132

Table 10. Model Summary After Before Standardizing (Category A as Reference) for DV1b 137

Table 11. Regression Coefficients Before Standardizing (Category A as Reference) for DV1b 138

Table 12. Model Summary After Standardizing (Category A as Reference) for DV1b. 138

Table 13. Regression Coefficients After Standardizing (Category A as Reference) for DV1b 139

Table 14. Model Summary After Standardizing & Removing Zscore(MCGP; Category A as Reference) for DV1b 139
Table 15. Regression Coefficients After Standardizing & Removing Zscore(MCGP; Category A as Reference) for DV1b 140
Table 16. Model Summary Before Standardizing (Category A as Reference) for DV1c 144
Table 17. Regression Coefficients Before Standardizing (Category A as Reference) for DV1c 145
Table 18. Model Summary After Standardizing (Category A as Reference) for DV1c 145
Table 19. Regression Coefficients After Standardizing (Category A as Reference) for DV1c 146
Table 20. Model Summary After Standardizing & Removing Zscore (MCGP; Category A as Reference) for DV1c 146
Table 21. Regression Coefficients After Standardizing & Removing Zscore (MCGP; Category A as Reference) for DV1c 147
Table 22. Model Summary Before Standardizing (Category E as Reference) for DV1a 152
Table 23. Regression Coefficients Before Standardizing (Category E as Reference) for DV1a 152
Table 24. Model Summary After Standardizing (Category E as Reference) for DV1a 152

Table 25. Regression Coefficients After Standardizing (Category E as Reference) for DV1a 153
Table 26. Model Summary After Standardizing & Removing Zscore (MCGP; Category E as Reference) for DV1a 153
Table 27. Regression Coefficients After Standardizing & Removing Zscore (MCGP; Category E as Reference) for DV1a 154
Table 28. Model Summary Before Standardizing (Category E as Reference) for DV1b 158
Table 29. Regression Coefficients Before Standardizing (Category E as Reference) for DV1b 158
Table 30. Model Summary After Standardizing (Category E as Reference) for DV1b 158
Table 31. Regression Coefficients After Standardizing (Category E as Reference) for DV1b 159
Table 32. Model Summary After Standardizing & Removing Zscore (MCGP; Category E as Reference) for DV1b 159
Table 33. Regression Coefficients After Standardizing & Removing Zscore (MCGP; Category E as Reference) for DV1b 160
Table 34. Model Summary Before Standardizing (Category E as Reference) for DV1c 164
Table 35. Regression Coefficients Before Standardizing (Category E as Reference) for DV1c 165

Table 36. Model Summary After Standardizing (Category E as Reference) for DV1c 165

Table 37. Regression Coefficients After Standardizing (Category E as Reference) for DV1c 166

Table 38. Model Summary After Standardizing & Removing Zscore (MCGP; Category E as Reference) for DV1c 166

Table 39. Regression Coefficients After Standardizing & Removing Zscore (MCGP; Category E as Reference) for DV1c 167

List of Figures

Figure 1. Power Analysis for Multiple Linear Regression (Large Effect Size-3 Predictors) 82

Figure 2. Power Analysis for Multiple Linear Regression (Medium Effect Size-3 Predictors) 83

Figure A1. Histogram of Regression Standardized Residuals for Dependent Variable: TCG (Initial Model, Controlling for Category A) 220

Figure A2. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: TCG (Initial Model, Controlling for Category A) 221

Figure A3. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: TCG (Initial Model, Controlling for Category A) 222

Figure A4. Histogram of Regression Standardized Residuals for Dependent Variable: TCG (Standardized Model, Controlling for Category A) 223

Figure A5. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: TCG (Standardized Model, Controlling for Category A) 224

Figure A6. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: TCG (Standardized Model, Controlling for Category A)..... 225

Figure A7. Histogram of Regression Standardized Residuals for Dependent Variable: TCG (MCGP Removed, Controlling for Category A)..... 226

Figure A8. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: TCG (MCGP Removed, Controlling for Category A)..... 227

Figure A9. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: TCG (MCGP Removed, Controlling for Category A) 228
Figure B1. Histogram of Regression Standardized Residuals for Dependent Variable: PTCG (Initial Model, Controlling for Category A) 229
Figure B2. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PTCG (Initial Model, Controlling for Category A) 230
Figure B3. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PTCG (Initial Model, Controlling for Category A)..... 231
Figure B4. Histogram of Regression Standardized Residuals for Dependent Variable: PTCG (Standardized Model, Controlling for Category A)..... 232
Figure B5. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PTCG (Standardized Model, Controlling for Category A)..... 233
Figure B6. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PTCG (Standardized Model, Controlling for Category A) .. 234
Figure B7. Histogram of Regression Standardized Residuals for Dependent Variable: PTCG (MCGP Removed, Controlling for Category A) 235
Figure B8. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PTCG (MCGP Removed, Controlling for Category A) 236
Figure B9. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PTCG (MCGP Removed, Controlling for Category A)..... 237
Figure C1. Histogram of Regression Standardized Residuals for Dependent Variable: PPD (Initial Model, Controlling for Category A)..... 238

Figure C2. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PPD (Initial Model, Controlling for Category A) 239
Figure C3. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PPD (Initial Model, Controlling for Category A)..... 240
Figure C4. Histogram of Regression Standardized Residuals for Dependent Variable: PPD (Standardized Model, Controlling for Category A)..... 241
Figure C5. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PPD (Standardized Model, Controlling for Category A)..... 242
Figure C6. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PPD (Standardized Model, Controlling for Category A) 243
Figure C7. Histogram of Regression Standardized Residuals for Dependent Variable: PPD (MCGP Removed, Controlling for Category A) 244
Figure C8. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PPD (MCGP Removed, Controlling for Category A) 245
Figure C9. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PPD (MCGP Removed, Controlling for Category A)..... 246
Figure D1. Histogram of Regression Standardized Residuals for Dependent Variable: TCG (Initial Model, Controlling for Category E)..... 247
Figure D2. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: TCG (Initial Model, Controlling for Category E)..... 248
Figure D3. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: TCG (Initial Model, Controlling for Category E) 249

Figure D4. Histogram of Regression Standardized Residuals for Dependent Variable: TCG (Standardized Model, Controlling for Category E) 250
Figure D5. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: TCG (Standardized Model, Controlling for Category E) 251
Figure D6. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: TCG (Standardized Model, Controlling for Category E) 252
Figure D7. Histogram of Regression Standardized Residuals for Dependent Variable: TCG (MCGP Removed, Controlling for Category E) 253
Figure D8. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: TCG (MCGP Removed, Controlling for Category E) 254
Figure D9. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: TCG (MCGP Removed, Controlling for Category E) 255
Figure E1. Histogram of Regression Standardized Residuals for Dependent Variable: PTCG (Initial Model, Controlling for Category E) 256
Figure E2. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PTCG (Initial Model, Controlling for Category E)..... 257
Figure E3. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PTCG (Initial Model, Controlling for Category E) 258
Figure E4. Histogram of Regression Standardized Residuals for Dependent Variable: PTCG (Standardized Model, Controlling for Category E) 259
Figure E5. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PTCG (Standardized Model, Controlling for Category E) 260

Figure E6. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PTCG (Standardized Model, Controlling for Category E)... 261
Figure E7. Histogram of Regression Standardized Residuals for Dependent Variable: PTCG (MCGP Removed, Controlling for Category E)..... 262
Figure E8. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PTCG (MCGP Removed, Controlling for Category E)..... 263
Figure E9. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PTCG (MCGP Removed, Controlling for Category E)..... 264
Figure F1. Histogram of Regression Standardized Residuals for Dependent Variable: PPD (Initial Model, Controlling for Category E) 265
Figure F2. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PPD (Initial Model, Controlling for Category E) 266
Figure F3. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PPD (Initial Model, Controlling for Category E) 267
Figure F4. Histogram of Regression Standardized Residuals for Dependent Variable: PPD (Standardized Model, Controlling for Category E)..... 268
Figure F5. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PPD (Standardized Model, Controlling for Category E) 269
Figure F6. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PPD (Standardized Model, Controlling for Category E)..... 270
Figure F7. Histogram of Regression Standardized Residuals for Dependent Variable: PPD (MCGP Removed, Controlling for Category E)..... 271

Figure F8. Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PPD (MCGP Removed, Controlling for Category E)..... 272
Figure F9. Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PPD (MCGP Removed, Controlling for Category E) 273

Chapter 1: Introduction to the Study

Overview

Illicit firearm trafficking remains a significant public safety challenge in the United States, with consequences that impact communities, law enforcement agencies, and policymakers nationwide. One method fueling this illegal distribution is straw purchasing, where individuals legally eligible to purchase firearms acquire them on behalf of those prohibited from ownership. This practice bypasses critical legal checks and contributes to the circulation of firearms in criminal activities, heightening risks for both communities and law enforcement (Cook et al., 2015; Smith & Brown, 2017). Given that states vary widely in the stringency of their gun laws, the regulatory landscape presents potential gaps that traffickers exploit, making it essential to understand how these laws, along with demographic patterns of firearm ownership, contribute to the prevalence of illicit trafficking (Gius, 2018; Webster et al., 2020).

This study is needed to address these gaps by examining the relationships between the stringency of state gun laws, gender distribution among firearm possessors, and patterns of firearm trafficking. Although much research has focused on the impacts of firearm policies on gun violence, few studies have explored how these regulatory factors specifically affect trafficking patterns across states (Cook & Ludwig, 2018; Wintemute, 2019). By analyzing data from all 50 states, this study aims to provide evidence-based insights to inform policies that could reduce trafficking activities and, consequently, firearm-related crime. The potential for positive social change lies in guiding policymakers and law enforcement agencies to implement strategies that mitigate illicit

firearm distribution, thereby enhancing public safety and protecting vulnerable communities.

This chapter provides an overview of the study, detailing the background and context for the research. It then presents the problem statement, research questions, and hypotheses guiding the investigation, followed by a description of the study's purpose and theoretical foundation. The nature of the study, including the research design, data sources, and methodology, is also outlined. Finally, I discuss the assumptions, scope, delimitations, and limitations before summarizing the chapter and providing a transition to Chapter 2.

Background

Illicit firearm trafficking has long posed significant challenges to public safety in the United States, largely driven by practices such as straw purchasing, where individuals legally eligible to buy firearms purchase them on behalf of those who are legally prohibited from firearm ownership. Straw purchasing bypasses background checks and restrictions designed to prevent firearm access to individuals involved in criminal activity, thus facilitating the entry of these firearms into illegal markets (Cook et al., 2015; Smith & Brown, 2017). Research on firearm trafficking highlights that straw purchasing is a major source of crime guns in the United States, often exploiting inconsistencies in state laws and enforcement practices across jurisdictions (Cook & Ludwig, 2018; Webster et al., 2020). These challenges underscore the need for a comprehensive understanding of factors influencing firearm trafficking, especially as

varying state policies and demographic factors may contribute differently to patterns of firearm distribution and trafficking.

While firearm laws vary widely in their stringency, factors such as demographic differences in firearm possession and the aggregate gender distribution of firearm owners may also shape trafficking patterns. Demographic variables, including gender, can influence the demand for firearms as well as the availability of "straw buyers" who supply firearms to prohibited individuals (Azrael et al., 2017; Gius, 2018). Gendered differences in firearm possession, for instance, have been linked to varying motivations for firearm ownership, which may subsequently affect involvement in straw purchasing. Prior research on gun policy indicates that these demographic influences, combined with the inconsistencies in state-level regulatory environments, can create conditions conducive to firearm trafficking across state lines (Cook & Ludwig, 2018; Schwartz, 2021). However, these demographic and regulatory relationships remain underexplored in the literature, leaving a need for further investigation into how these factors intersect to impact illicit firearm distribution.

Much of the existing literature has focused on the impacts of firearm policies on gun violence and mortality rates, with findings indicating that stricter regulations are often associated with lower rates of firearm-related deaths and injuries (Cook & Ludwig, 2006; Wintemute, 2019). Studies have examined the role of background checks, waiting periods, and sales restrictions in reducing access to firearms among high-risk individuals, demonstrating the effectiveness of these measures in lowering firearm availability among prohibited persons (Gius, 2018; Webster et al., 2013). Although these studies contribute

valuable insights on firearm policy effectiveness, they have largely centered on firearm violence outcomes rather than on trafficking behaviors and straw purchasing. This emphasis leaves a notable gap in research specifically addressing how the combined effects of state gun law stringency and demographic factors such as gender distribution among firearm possessors influence trafficking patterns, including the prevalence of straw purchasing activities (Schwartz, 2021; Webster et al., 2020).

Few studies have systematically analyzed these variables in tandem, leaving policymakers and law enforcement agencies without comprehensive data to guide targeted interventions that could curb illicit firearm transactions. Moreover, the lack of research integrating both regulatory and demographic variables contributes to an incomplete understanding of the underlying dynamics driving firearm trafficking across states. In light of this gap, there is a pressing need for a data-driven approach that examines how these factors together shape trafficking patterns, providing a nuanced perspective on the factors that enable illicit firearm distribution.

This study sought to address this knowledge gap by examining the relationships between state gun law stringency, gender distribution among firearm possessors, and patterns of illicit firearm trafficking. By analyzing data across all 50 U.S. states, this research aimed to provide an empirical foundation for understanding how regulatory and demographic factors contribute to trafficking dynamics. Ultimately, these findings are intended to offer actionable insights for policymakers and law enforcement, supporting efforts to create data-driven strategies to mitigate firearm trafficking and enhance public safety. This analysis contributes to the existing body of research by expanding the scope

of firearm trafficking studies to include not only the impact of regulatory frameworks but also the role of demographic distributions among firearm owners, thereby filling a critical gap in the literature.

Problem Statement

The illicit trafficking of firearms remains a persistent and critical issue in the United States, posing considerable risks to public safety and contributing to high rates of gun violence nationwide. Straw purchasing, where individuals legally eligible to acquire firearms purchase them on behalf of those prohibited from ownership, has emerged as a central mechanism in the illegal firearm supply chain. This practice circumvents background checks and other regulatory safeguards, allowing firearms to enter illegal markets and, ultimately, the hands of individuals who may use them in criminal activities. Despite efforts to reduce gun violence through state and federal regulations, an estimated 33,000 Americans die annually due to firearm-related incidents, with trafficking contributing to the availability of crime guns used in these incidents (Wamser-Nanney et al., 2021). The economic impact of gun violence and trafficking is also substantial, with estimates indicating that it costs the United States more than $229 billion each year in healthcare, legal, and societal costs, further underscoring the urgent need for effective interventions and policies (Cook & Ludwig, 2018; Everytown for Gun Safety, 2021).

Research underscores that the stringency of state gun laws significantly influences firearm accessibility and is often associated with reduced gun violence and firearm mortality. Studies have shown that stricter regulations, including universal background checks, waiting periods, and restrictions on certain types of firearm sales, are linked to

decreased rates of gun-related deaths and injuries (Webster et al., 2020; Wintemute, 2019). However, while the existing literature has made significant progress in examining how state gun laws impact gun violence, it has primarily focused on direct outcomes such as firearm mortality and has often overlooked the nuanced mechanisms by which firearms enter illegal channels. Specifically, relatively few studies have addressed how variations in state gun law stringency may influence firearm trafficking and straw purchasing patterns, leaving a gap in understanding the relationship between regulatory frameworks and the supply side of illicit firearm distribution (Gius, 2018; Schwartz, 2021).

Additionally, while demographic factors such as gender distribution among firearm possessors may influence the likelihood of participation in straw purchasing, this dimension remains underexplored in research on firearm trafficking. Demographic analyses have often focused on firearm ownership motivations or violence outcomes, rather than on the role that gender distribution might play in the dynamics of firearm trafficking (Azrael et al., 2017; Cook & Ludwig, 2018). This lack of research integrating both regulatory and demographic variables contributes to an incomplete understanding of the underlying dynamics that drive firearm trafficking across the United States, limiting the effectiveness of policy interventions that target this issue. To support the development of comprehensive policies, there is a pressing need for studies that systematically examine how these factors intersect to impact illicit firearm distribution.

This study addressed this knowledge gap by investigating the relationships between the stringency of state gun laws, gender distribution among firearm possessors,

and patterns of illicit firearm trafficking across all 50 U.S. states. By analyzing data from diverse jurisdictions, this research aimed to provide an empirical foundation for understanding how regulatory and demographic factors together contribute to firearm trafficking dynamics. These findings are intended to support policymakers and law enforcement agencies in crafting data-driven strategies that mitigate illicit firearm trafficking, thereby enhancing public safety and addressing a significant public health crisis.

Purpose of Study

The purpose of this quantitative study was to examine the relationships between state gun law stringency, gender distribution among firearm possessors, and patterns of illicit firearm trafficking across all 50 U.S. states. Specifically, this study aimed to explore how variations in the stringency of state gun laws (independent variable [IV]) and the aggregate gender distribution of male and female firearm possessors IVs influenced firearm trafficking patterns, as measured by the total number of firearm traces, perfected firearm traces, and incidents of straw purchasing (dependent variables [DVs]). Recognizing that socioeconomic factors and population density may also impact firearm trafficking, I included these factors as covariates to control for external influences that could affect trafficking rates across states (Gius, 2018; Webster et al., 2020).

The intent of this study was to explore the extent to which these regulatory and demographic factors correlate with firearm trafficking activities, providing insights into how specific legislative and demographic conditions might exacerbate or mitigate trafficking risks. By employing a correlational research design, this study utilized

multiple linear regression analysis to quantify the relationships between independent, dependent, and covariate variables, seeking to identify significant predictors of trafficking patterns. The study contributes to the limited body of research focused on the supply-side mechanisms of firearm trafficking, thereby addressing a gap in existing literature that primarily centers on firearm violence outcomes rather than the entry points of illegal firearms into communities (Cook & Ludwig, 2018; Schwartz, 2021).

Research Questions and Hypotheses

The study was structured around three primary research questions, each focusing on key influences on illicit firearm trafficking:

RQ1a: How does the stringency of state gun laws influence the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor)?

Null Hypothesis ($H_0$1a): There is no statistically significant relationship between the stringency of state gun laws, measured on a categorical scale from permissive to stringent, and the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor).

Alternative Hypothesis (H_A1a): There is a statistically significant relationship between the stringency of state gun laws, measured on a categorical scale from permissive to stringent, and the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor).

RQ1b: How does the aggregate gender distribution of male firearm possessors influence the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor)?

Null Hypothesis ($H_0$1b): There is no statistically significant relationship between the aggregate gender distribution of male firearm possessors and the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor).

Alternative Hypothesis (H_A1b): There is a statistically significant relationship between the aggregate gender distribution of male firearm possessors and the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor).

RQ1c: How does the aggregate gender distribution of female firearm possessors influence the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor)?

Null Hypothesis ($H_0$1c): There is no statistically significant relationship between the aggregate gender distribution of female firearm possessors and the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor).

Alternative Hypothesis (H_A1c): There is a statistically significant relationship between the aggregate gender distribution of female firearm possessors and the

prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor).

Theoretical Foundation

The theoretical foundation for this study is based on classical deterrence theory, originally developed by Italian criminologist Cesare Beccaria in the 18th century. In *On Crimes and Punishments*, Beccaria (1764/2009) argued that individuals are rational actors who weigh the potential risks and rewards of their actions, seeking to maximize benefits while minimizing potential consequences. Classical deterrence theory posits that individuals are less likely to engage in criminal behavior if the perceived consequences, such as punishment and legal repercussions, outweigh the expected rewards. The theory emphasizes that for deterrence to be effective, consequences must be certain, swift, and severe, creating a strong disincentive for engaging in illegal activities (Beccaria, 1764/2009).

In contemporary criminological research, classical deterrence theory has been used extensively to explain how individuals make decisions about engaging in illegal behavior, particularly within the context of regulatory compliance. Applied to firearm trafficking, this theory suggests that individuals involved in activities like straw purchasing or trafficking weigh the potential benefits—such as financial gain—against the likelihood and severity of legal repercussions (Cook & Ludwig, 2018). When gun laws are stringent and consistently enforced, the perceived risk of penalties increases, potentially deterring individuals from participating in firearm trafficking. Recent studies support this perspective, demonstrating that stricter firearm regulations, especially when

consistently enforced, are associated with reductions in gun-related crimes and trafficking activities (Webster et al., 2020; Wintemute, 2019).

The major theoretical proposition of classical deterrence theory relevant to this study is that the certainty, severity, and consistency of legal consequences can deter illegal behaviors, such as firearm trafficking. By examining the stringency of state gun laws as a regulatory factor, this study investigates whether and how these legal deterrents correlate with the prevalence of illicit firearm trafficking. More specifically, the theory provides a foundation for understanding how stringent laws may impact trafficking behaviors, supporting the development of the research questions. For example, RQ1a directly addresses the relationship between the stringency of state gun laws and trafficking prevalence, positing that more stringent regulations may serve as a deterrent for illegal firearm activities, including straw purchasing and the circulation of crime guns.

Classical deterrence theory also supports the analysis of demographic factors, such as gender distribution among firearm possessors, in RQ1b and RQ1c. Although demographic factors are not typically emphasized within deterrence theory, understanding the rational decision-making processes among different demographic groups can inform more targeted interventions. By examining the aggregate gender distribution of firearm possessors, this study aims to explore how deterrence mechanisms might vary across demographics, addressing potential differences in responses to regulatory frameworks. This approach aligns with recent calls in the literature for a more nuanced application of deterrence theory that incorporates demographic influences on criminal behavior (Azrael et al., 2017; Schwartz, 2021).

In sum, classical deterrence theory offers a relevant lens through which to examine the influence of state gun law stringency and demographic factors on illicit firearm trafficking. This theory provides a basis for hypothesizing that stricter, well-enforced regulations can reduce trafficking rates, a concept that will be explored in greater depth in Chapter 2 through a detailed literature review and an analysis of current deterrence research.

Nature of Study

This study employed a quantitative, correlational design to examine the relationships between state gun law stringency, gender distribution among firearm possessors, and patterns of illicit firearm trafficking across the United States. A quantitative approach was chosen for its capacity to systematically analyze numeric data and objectively test relationships between variables, providing a clear picture of existing patterns within large datasets. The correlational design was particularly suitable, as it enabled the examination of associations among multiple IVs and DVs without manipulating them, allowing the study to reflect naturally occurring relationships in the data (Creswell & Creswell, 2018). This approach aligned with the study's intent to explore correlations between demographic and regulatory factors and firearm trafficking behaviors, rather than attempting to establish causation.

The study included three IVs: the stringency of state gun laws, measured on a categorical scale from permissive to stringent; the aggregate gender distribution of male firearm possessors, represented as a percentage of total firearm possessors within each state; and the aggregate gender distribution of female firearm possessors, similarly

represented as a percentage of total firearm possessors. The DVs were three primary indicators of illicit firearm trafficking: the total number of firearm traces, the number of perfected firearm traces, and incidents of straw purchasing within each state. Socioeconomic factors and population density were included as covariates, as prior research has shown these factors can influence patterns of firearm ownership and trafficking (Gius, 2018; Webster et al., 2020).

The study analyzed a sample size of 50 U.S. states, allowing for comprehensive examination across diverse jurisdictions and regulatory environments. Given this sample size, the study leveraged secondary data from publicly accessible law enforcement and crime databases to ensure reliable coverage of firearm-related incidents and firearm ownership trends across the entire country. Key data sources included the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), which provides extensive information on firearm traces, and the Federal Bureau of Investigation (FBI) and National Instant Criminal Background Check System (NICS), which offer robust data on background checks and crime incidents. Using data from 2017 to 2021, this study constructed a cross-sectional dataset that reflected 5 years of firearm trafficking activities, allowing for robust examination of trends within this timeframe.

Data analysis involved the use of multiple linear regression to evaluate relationships between IVs and DVs while controlling for covariates. This statistical approach quantified each variable's contribution to firearm trafficking prevalence, highlighting significant predictors within the dataset. By analyzing data from all 50 states over 5 years, this study aimed to generate findings with substantial breadth, providing

empirical insights that could inform policy and law enforcement strategies to mitigate illicit firearm trafficking (Field, 2018). This methodology ensured that the study's results were both statistically rigorous and relevant to the development of data-driven interventions.

Definitions

In my research, I provided definitions for key terms to enhance clarity, precision, and a shared understanding of critical concepts. This approach was crucial to establishing clear and precise meanings for key terms, ensuring that I, as the researcher, and my readers were on the same page. This clarity reduced ambiguity and the risk of misinterpretation (Babbie, 2017). By clearly defining terms, I minimized the potential for errors in analysis and conclusions, as definitions ensured that readers and fellow researchers understood the intended meaning of critical concepts (Neuman, 2013). In conclusion, well-crafted definitions enhanced the quality of my research by promoting clarity, effective communication, and a solid theoretical foundation, ultimately contributing to a better understanding of the research findings and concepts.

Access to firearms: Refers to an individual's ability to obtain and possess firearms, encompassing both legal and illegal means of acquisition, and is influenced by various factors, including firearm laws, regulations, socioeconomic status, and availability (Kleck, 2015).

Crime gun: A term commonly used in criminal justice and firearms investigations to refer to a firearm used in committing a crime or associated with criminal activities.

Crime prevention strategies: In the context of firearm trafficking and straw purchasing, involve a set of targeted measures and policies designed to deter, disrupt, and mitigate the illegal acquisition and distribution of firearms. These strategies often include enhanced law enforcement efforts, regulatory controls, public awareness campaigns, and community-based initiatives to reduce these illicit activities (ATF, 2023b).

Criminal intent: Also known as *mens rea*; refers to an individual's mental state or subjective intention to engage in actions contrary to the law. It involves a conscious and purposeful mindset where the individual knows their illegal actions and intends to commit a criminal offense (Gardner & Anderson, 2019).

Firearm: The term "firearm" means (a) any weapon (including a starter gun) which will, or is designed to, or may readily be converted to expel a projectile by the action of an explosive; (b) the frame or receiver of any such weapon; (c) any firearm muffler or firearm silencer; or (d) any destructive device. Such a term does not include an antique firearm (U.S. Code, Title 18, § 921(a)(3).

Firearm possessor: An individual possessing a firearm, often recovered at a crime scene or in connection with law enforcement.

Firearm purchaser: An individual or entity that legally acquires a firearm through a legitimate and authorized process, often involving background checks and compliance with relevant laws and regulations. This term encompasses individuals, businesses, or organizations that go through the proper channels to obtain firearms for various purposes, including personal protection, sporting activities, or business operations (ATF, 2021).

Firearm Trace Report (Summary): A report that provides detailed information about the history and ownership of a specific firearm. It includes data such as the firearm's manufacturer, serial number, date of manufacture, initial point of sale, and subsequent transactions through licensed dealers. Law enforcement agencies often use ATF Firearms Trace Summaries to track the movement of firearms and investigate criminal activities involving firearms traced by the Bureau of Alcohol, Tobacco, Firearms and Explosives. (ATF, 2023a).

Firearm Trace Report (Summary) (Perfected): A report that provides detailed information about the history and ownership of a specific firearm. It includes data such as the firearm's manufacturer, serial number, date of manufacture, initial point of sale, and subsequent transactions through licensed dealers. Law enforcement agencies often use ATF Firearms Trace Summaries to track the movement of firearms and investigate criminal activities involving firearms traced by the Bureau of Alcohol, Tobacco, Firearms and Explosives. A perfected firearms trace report provides comprehensive information about the firearm's journey from its manufacturer to its current possessor. This information typically includes details such as the firearm's make, model, serial number, manufacturer, and distributor. Importantly, a perfected trace report confirms the identification of the last legal purchaser of the firearm, allowing law enforcement to establish a direct link between the firearm and its possessor at the time of the crime. (ATF, 2023a).

Firearm trafficking: Refers to the illegal and often covert activity of acquiring, transporting, selling, or transferring firearms across geographic areas or borders, typically

for unlawful purposes. It involves the movement of firearms from areas with less restrictive gun laws to those with stricter regulations, with the intent of evading legal restrictions or supplying firearms to prohibited individuals (Smith & Brown, 2017).

Gender dynamics: Encompass the complex interplay of social and cultural factors that shape and define the roles, behaviors, and expectations associated with individuals based on their gender identity, influencing their experiences and interactions within society (Connell, 2014).

Illegal firearm possession: Refers to the unauthorized ownership, possession, or control of firearms by individuals who are legally prohibited from acquiring or having access to firearms, often due to prior criminal convictions, restraining orders, or other legal restrictions (Cook & Goss, 2014).

Intersectionality: Intersectionality is a concept that recognizes how the interplay of multiple social categories, such as gender, race, and socioeconomic status, shapes individuals' experiences and social positions. It emphasizes that these intersecting identities can result in unique and compounded experiences of privilege and discrimination, influencing an individual's access to resources, opportunities, and social outcomes (Schwartz, 2021).

Legal framework: Governing firearm sales, possession, and transfer, encompasses a structured system of laws, regulations, and statutes established by federal, state, and local government authorities to regulate and oversee the acquisition, ownership, possession, transfer, and utilization of firearms within their respective jurisdictions. This

framework includes specific regulations and ordinances relevant to Detroit's firearm policies and practices (Cook & Ludwig, 2018).

Peer influence: Refers to the impact that individuals within one's peer group, such as friends, acquaintances, or colleagues, can exert on an individual's attitudes, behaviors, or decisions. It involves the process of social interaction and conformity to group norms, which can lead to changes in one's own beliefs or actions (Matsueda & Drakulich, 2018).

Risk perception: Within the context of firearm-related behaviors, refers to an individual's subjective evaluation and cognitive assessment of the potential hazards, dangers, and adverse outcomes of firearm possession, use, or mishandling. It involves the individual's judgment regarding the likelihood and seriousness of various risks associated with firearms-related activities (Lerner et al., 2003).

Socioeconomic factors: Encompass the social and economic conditions that individuals and communities experience, including income, education, employment status, access to resources, and other related factors. These factors collectively influence individuals' well-being, opportunities, and life trajectories within a society (Gius, 2018).

Straw purchasing a firearm: (a) Straw purchasing a firearm is the unlawful act where an individual who meets the legal requirements for purchasing firearms under existing regulations acquires a firearm intending to transfer it to another person legally prohibited from owning or buying firearms. This practice bypasses background checks and evades legal restrictions (ATF, 2023c). (b) Straw purchasing a firearm refers to the illegal act where an individual legally eligible to purchase firearms under existing laws buys a firearm on behalf of someone legally prohibited from acquiring one. The

purchaser, often known as the "straw buyer," then transfers the firearm to the prohibited individual, effectively circumventing background checks and legal restrictions (Cook & Goss, 2014). (c) Straw purchase of a firearm is when the firearm was recovered from a male but was initially purchased by a female (Cook et al., 2015).

Assumptions

In conducting regression analysis, I considered several statistical assumptions to ensure the validity and reliability of the results. The primary assumptions were linearity, normality, homoscedasticity, and independence, each of which was crucial for the integrity of the regression models (Osborne & Waters, 2002; Tabachnick & Fidell, 2019). The assumption of linearity posited that a straight-line relationship existed between the IVs and DVs, indicating that changes in the DVs could be explained through linear associations with the IVs. Ensuring linearity was essential because regression analysis fundamentally relied on modeling linear trends within the data (Field, 2018).

Normality pertained to the distribution of residuals, which ideally followed a normal distribution. This assumption was significant for validating the results of significance tests, as deviations from normality could impact the accuracy of statistical inferences (Osborne & Waters, 2002). The homoscedasticity assumption indicated that the variance of residuals, or errors, remained consistent across all levels of the IVs. When this assumption was violated, it could signal potential nonlinearity or heterogeneity in the data, which could undermine the conclusions drawn from the model (Field, 2018; Tabachnick & Fidell, 2019).

Lastly, the assumption of independence ensured that the observations were not correlated, meaning residuals were independent of one another. Meeting this assumption was crucial to avoiding bias in standard errors and significance tests (Field, 2018). While perfect adherence to these assumptions was not always achievable, recognizing and addressing any violations enhanced the robustness and interpretability of the regression analysis (Osborne & Waters, 2002).

Scope

The scope of this dissertation encompassed an examination of the relationships between the stringency of state gun laws, gender distribution among firearm possessors, and the prevalence of illicit firearm trafficking in the United States. The analysis focused on three DVs: firearm traces, perfected firearm traces, and straw purchases. The study aimed to identify how variations in gun laws and demographic distributions contributed to patterns of firearm trafficking, utilizing multiple linear regression analysis as the primary statistical method.

The research was conducted at a national level, incorporating data from various states to ensure a comprehensive understanding of the factors influencing firearm trafficking. By concentrating on these specific variables, the study provided insights intended to inform policymakers and law enforcement agencies about the potential impacts of regulatory frameworks on illicit firearm activities. The findings contribute to the existing body of literature on gun policy and crime, highlighting the need for evidence-based approaches to address firearm-related issues in the United States (Dahl & Dorr, 2021).

Delimitations

Delimitations refer to the boundaries set for this study, defining what was included and excluded from the research. This dissertation was limited to the examination of state-level gun laws and their direct correlation with illicit firearm trafficking, thus excluding individual-level factors that might also play a significant role, such as personal motivations, socioeconomic status, or mental health conditions. While these aspects were undoubtedly important, they fell outside the scope of this analysis to maintain a focused and manageable investigation (Squires, 2020).

Additionally, the study utilized data from publicly available datasets, which may not have encompassed all aspects of firearm trafficking, particularly the underground elements that are difficult to quantify. Consequently, this research did not aim to provide a comprehensive overview of all factors influencing firearm trafficking but rather to highlight specific regulatory and demographic influences (Parker, 2021). The analysis was confined to the United States, which limited the generalizability of the findings to other countries with different legal and cultural contexts regarding firearm possession and trafficking. Future research could expand on these delimitations by including international comparisons or a broader range of influencing factors (Matz et al., 2022).

Limitations

This dissertation had several limitations that should be acknowledged to contextualize the findings and guide future research. One significant limitation was the potential for omitted variable bias, as not all factors that may influence illicit firearm trafficking were included in the analysis. While the study incorporated variables such as

the stringency of state gun laws and the aggregate gender distribution of firearm possessors, other important factors, such as socioeconomic conditions, law enforcement practices, or cultural attitudes toward firearms, were not explicitly analyzed. The exclusion of these variables may have led to incomplete or biased estimates of the relationships being examined (Frost, 2020).

Another limitation concerned the data's cross-sectional nature, which captured a snapshot of firearm trafficking patterns during a specific timeframe rather than examining changes over time. This design limited the ability to make causal inferences or assess the dynamics of how policy changes affected firearm trafficking trends longitudinally. Longitudinal data or time-series analysis would have been necessary to better understand causality and temporal relationships (Tabachnick & Fidell, 2019). The use of cross-sectional data also posed challenges for controlling for unobserved heterogeneity, which could have biased the estimates if unmeasured factors varied systematically across states (Wooldridge, 2016).

Data quality and availability further constrained the study, as not all states consistently reported firearm trafficking data or applied uniform definitions for key metrics, such as "firearm trace" or "straw purchase." This variability may have introduced measurement error, leading to potential inaccuracies in the analysis. In addition, the study relied on existing datasets, which may not have fully captured the underground nature of illicit firearm activities. Self-reported data or data from law enforcement agencies may have suffered from underreporting or discrepancies, thus limiting the generalizability of the findings (Parker, 2021).

Furthermore, the categorization of gun laws based on their stringency simplified the complexity of state regulations. While the classification used in this study served to differentiate levels of regulatory stringency, it did not account for the specific provisions or enforcement mechanisms that may have differed widely even among states with similar overall gun law ratings. This approach might have obscured the nuanced effects of particular types of firearm regulations, such as background check requirements, waiting periods, or concealed carry laws (Zimring & Hawkins, 2020).

The statistical assumptions inherent to multiple linear regression also presented limitations. Assumptions such as linearity, normality, homoscedasticity, and independence of residuals needed to be met to ensure accurate and unbiased estimates. Although diagnostic tests were conducted, some violations of these assumptions persisted, potentially affecting the validity of the findings. For instance, residuals that were not normally distributed may have compromised the accuracy of significance testing, while heteroscedasticity may have led to biased standard errors (Field, 2018; Parker, 2021).

Finally, the generalizability of the study was restricted to the context of the United States, where firearm laws and cultural attitudes toward gun ownership differ substantially from those in other countries. Consequently, the findings may not be applicable to regions with distinct legal frameworks or firearm-related issues. This limitation suggested the need for further research to examine how different regulatory environments influence firearm trafficking globally (Small Arms Survey, 2019).

Significance

The significance of this dissertation lies in its potential to contribute to the understanding of the intricate relationships between the stringency of state gun laws, demographic factors related to firearm possession, and the prevalence of illicit firearm trafficking in the United States. While extensive research had been conducted on gun violence and the effectiveness of various gun control measures, significant gaps remained in the literature, particularly concerning how gender distribution among firearm possessors intersected with regulatory frameworks to influence firearm trafficking patterns.

This study aimed to fill these gaps by analyzing not only the direct impacts of gun law stringency, but also how the gender composition of firearm owners may have affected the illicit distribution of firearms. Research had suggested that gender differences in firearm possession and usage could shape patterns of violence and trafficking, yet these nuances had not been thoroughly examined in the context of state-level gun laws (Dahl & Dorr, 2021; Matz et al., 2022). By focusing on the interplay between these variables, the dissertation provided a more nuanced perspective on the dynamics of firearm trafficking, contributing to a deeper understanding of the social and regulatory factors that may exacerbate or mitigate these issues.

Furthermore, the findings from this research could inform policymakers by providing empirical evidence that highlights the necessity of tailored gun control strategies that consider demographic factors. The existing literature has often treated gun laws as uniform entities, overlooking how their effectiveness may vary based on the

gender distribution of firearm possessors and the specific contexts of different states (Boulouta & Koutoupis, 2023). By exploring these interactions, this dissertation not only adds to the academic discourse but also serves as a crucial resource for developing evidence-based policies that address the complexities of firearm trafficking and violence.

Additionally, this study contributes to the broader public health discourse by emphasizing the importance of viewing gun violence as a multifaceted public health issue rather than solely a criminal justice concern. Gun violence impacts communities across various socioeconomic and demographic lines and understanding the multifactorial nature of these influences is essential for effective intervention strategies (Webster & Vernick, 2023). By linking public health perspectives with criminological analysis, this research encourages a more integrated approach to addressing firearm-related issues, potentially guiding future research directions and policy initiatives. Overall, the significance of this dissertation extends beyond academic inquiry; it aspires to provide valuable insights for policymakers, public health officials, and community stakeholders who seek to develop comprehensive strategies to combat illicit firearm trafficking and enhance public safety.

Summary

In this chapter, I provided an overview of the research study's background, identified gaps in existing knowledge on the factors influencing firearm trafficking, and introduced the problem statement, purpose of the study, and the research questions guiding this investigation. Additionally, I discussed the theoretical foundation, nature of the study, assumptions, scope, delimitations, and limitations, which set the context for a

comprehensive analysis of how state gun laws and gender distribution among firearm possessors shape illicit firearm trafficking. In Chapter 2, I review the literature relevant to this study, including search strategies, an analysis of Beccaria's classical deterrence theory, and studies examining gun violence, illegal firearm markets, and straw purchasing laws. This review provides a deeper understanding of the research landscape and supports the development of a framework for investigating factors contributing to illicit firearm trafficking.

Chapter 2: Literature Review

Introduction

In In this study, the literature review examines the relationships among state gun laws, gender demographics among firearm owners, and the prevalence of illicit firearm trafficking in the United States. The review begins by analyzing existing research on state-level gun regulations and their impact on various outcomes, including firearm-related violence rates, overall crime levels, and trafficking patterns (Webster & Vernick, 2013). It also includes theoretical foundations that explain the effectiveness of specific gun laws—such as background checks and licensing requirements—in deterring illegal gun trafficking (Wintemute, 2015). Additionally, this review investigates studies addressing gender disparities in firearm ownership and use, highlighting differences in ownership rates and behaviors between men and women (Morin & Parker, 2017). Furthermore, it synthesizes findings on methodologies used to measure and analyze illicit firearm trafficking, with a focus on firearm trace data and investigations into straw purchases (Braga & Hureau, 2015).

As a researcher, I have immersed myself in extensive literature on gun violence and illicit firearms markets, uncovering a wealth of knowledge on this complex societal issue. Existing studies have thoroughly explored the sociopolitical landscape of gun control policies, the epidemiology of firearm-related injuries, and behavioral dynamics in legal and illegal gun ownership. However, a clear gap remains—particularly regarding the underutilization of firearm trace data in scholarly research. Firearm trace data, commonly collected by law enforcement agencies, offer unique insights into the

pathways of illicit firearm trafficking by revealing the origins, transit routes, and destinations of firearms implicated in criminal activities (ATF, 2019; Koper & Reedy, 2020). Despite its potential to illuminate the networks driving the illicit firearms trade, scholarly examination of firearm trace data has remained relatively scarce.

In this research endeavor, I aim to address this gap by integrating firearm trace data with an analysis of the stringency of state firearm laws. This combined approach allows for the examination of how variations in state-level gun laws influence patterns of illicit firearm trafficking as captured through trace data. Specifically, I investigate how regulatory differences affect the dynamics of illicit firearm markets, revealing the nuanced interplay between legal frameworks and the flow of illegal firearms. This integrative approach holds promise for addressing critical questions about the effectiveness of firearm regulations in curbing illegal firearm proliferation. By examining the intersection between state regulatory regimes and the flow of illicit firearms documented in trace data, my research seeks to provide a comprehensive understanding of the mechanisms fueling illicit firearms markets.

Ultimately, this work aims to inform evidence-based policy interventions designed to reduce gun violence and protect communities against the risks posed by illegal firearm distribution. By synthesizing a wide range of scholarly sources, this literature review provides a holistic understanding of the complex dynamics influencing illicit firearm trafficking within the United States, establishing the foundation for the empirical investigation described in this dissertation.

This chapter outlines detailed search strategies and provides an overview of the literature relevant to the study. It begins with the literature search strategy and proceeds into an analysis of Cesare Beccaria's (1774/2009) theory on classical deterrence. The review then explores literature on gun violence, including its costs and mental health implications, such as suicide. Research on the epidemiology of firearm crime and the role of firearm possession as a crime deterrent is also included. Next, the review examines literature on illegal firearm markets, customer screening processes, and current straw purchasing laws in California, New York, and Illinois. The chapter concludes with discussions on the sources of crime guns and the practice of straw purchasing.

Literature Search Strategy

To To conduct a comprehensive literature review on the likelihood of female engagement in straw purchasing firearms in Detroit, I have implemented a systematic and rigorous search strategy. I have selected databases including the Walden University Thoreau database, PubMed, ProQuest Criminal Justice Databases, ProQuest-SAGE Journals, JSTOR, Google Scholar, PsycINFO, Routledge Media Company, Elsevier Publishing Company, EBSCO database, JAMA Network, and Wiley Online Library. These sources have been chosen for their extensive coverage of peer-reviewed and academic literature, as well as their relevance to criminal justice, firearm regulations, and gender dynamics (Booth et al., 2016).

To ensure precision in the search process, I have used controlled vocabulary terms and keywords relevant to the scope of the study. Key terms have included "background checks," "cost of gun violence," "crime," "crime mortality," "criminal justice,"

"deterrence theory," "Federal Firearms Licensees (FFLs)," "female involvement in firearm crimes," "firearm regulations," "firearm screening," "firearm trafficking," "gender dynamics," "gun control legislation," "gun violence," "illicit firearm sales," "law enforcement strategies," "mental health," "states with straw purchasing laws," and "straw purchasing." I have employed Boolean operators (AND, OR) to structure search queries effectively, which has helped refine and expand results as needed. For instance, I have used search combinations like "straw purchasing AND female involvement," "firearm trafficking OR gun smuggling," and "illicit firearms AND gender dynamics" to capture nuanced aspects of the topic and tailor results to the specific research focus (Fink, 2020).

Inclusion criteria have been carefully defined to prioritize studies that directly address the stringency of state firearm laws and the dynamics of illicit firearm markets, with an emphasis on female involvement in straw purchasing activities. I have included peer-reviewed articles, reports, and government publications to maintain a high level of academic rigor while excluding materials that were not directly relevant to these themes. To capture recent trends and developments within the field, I have limited the search to literature published between 2000 and 2024, providing a broad yet current dataset. Additionally, I have restricted the search to English-language publications, as language constraints have made it impractical to review materials in other languages.

To ensure thorough exploration of the topic, I have also examined additional literature sources, such as government reports, local news articles, and non-peer-reviewed publications. These resources have been invaluable for understanding the practical, on-the-ground implications of straw purchasing laws and enforcement in Detroit and similar

urban areas (Gough et al., 2017). I have reviewed reference lists of identified articles and reports to locate supplementary sources, minimizing the risk of missing significant studies due to database limitations. This strategy has been intended to reduce bias and ensure that the review encompasses both quantitative and qualitative data, ultimately contributing to a balanced and comprehensive analysis of the factors influencing female involvement in illicit firearm markets and straw purchasing activities.

Theoretical Foundation Background

Beccaria's classical deterrence theory, developed in 1764, has served as a foundational framework for understanding criminal deterrence by framing individuals as rational actors who weigh the costs and benefits of their actions (Beccaria, 1764/2009). Within this framework, two primary forms of deterrence have emerged: specific and general. Specific deterrence targets individual offenders, aiming to prevent recidivism through punitive consequences tailored to discourage further offenses. In contrast, general deterrence seeks to influence broader behavior by exemplifying punishment to deter the wider population (Beccaria, 2009/1774). Both forms rely on the principles of certainty, swiftness, and severity of punishment, which have been posited to maximize the deterrent effect on criminal behavior. However, scholars like Piquero and Rosay (2019) have emphasized that achieving deterrence is often complex due to the variable impact of these factors, which have not consistently produced desired outcomes across different contexts.

Critics have argued that deterrence theory oversimplifies decision-making, as it assumes that individuals rationally calculate risks and rewards. Various sociological and

psychological influences challenge this assumption, as individuals may not accurately gauge potential outcomes due to factors such as impulsivity, socioeconomic conditions, or psychological traits. For example, Lee and McCrary (2018) have addressed how individuals with short-term focus, or myopia, are less likely to respond to deterrent measures as effectively as those with a longer-term outlook. Similarly, Nagin and Pogarsky (2001) have contended that incorporating additional factors, like impulsivity and the perceived threat of extralegal sanctions, can offer a more nuanced understanding of how individuals respond to the potential for punishment. They argued that swiftness, rather than the severity of punishment, is more likely to impact impulsive offenders, suggesting that tailored approaches to deterrence might improve efficacy.

In the context of gun crime, deterrence theory has been widely applied, although its effectiveness remains debated. Studies like Martinez (2020) and Johnson (2022b) have explored how deterrence measures are operationalized in gun control policies, such as mandatory sentencing and increased penalties, to dissuade potential offenders. Williams (2019a) further examined whether heightened enforcement and strict firearm regulations effectively reduce gun crime, finding that while these strategies can contribute to deterrence, they are insufficient without addressing underlying social factors. This critique has been echoed by Smith (2020b), who found that perceptions of deterrence among firearm offenders vary significantly, influenced by factors like the perceived likelihood of apprehension and immediate emotional or impulsive decision-making.

Focused deterrence strategies, as reviewed by Braga and Weisburd (2021), have shown a promising application of deterrence principles tailored to gun violence reduction.

By focusing on high-risk offenders and employing customized interventions, these strategies have demonstrated that targeted enforcement can reduce violent crime. However, the authors have also noted that implementation quality and adherence to deterrence principles are crucial in achieving sustainable effects. They have argued that tailored, localized deterrence approaches can be more effective in addressing gun violence than blanket punitive measures.

The relationship between deterrence and offender behavior has been further nuanced by research on cognitive and situational factors. For instance, Mastrofski et al. (2019) examined how police legitimacy, built on fair and transparent procedures, influences public compliance and reduces both citizen and police misconduct. This research has suggested that fostering trust in law enforcement could augment deterrent measures by enhancing public cooperation, thus addressing limitations of a purely punitive approach. Moreover, Doob and Cesaroni (2004) explored sentencing reforms in Canada and advocated for a more balanced justice system that incorporates rehabilitative and restorative principles alongside deterrence. They argued that such an approach better addresses recidivism and the complex motivations behind criminal behavior.

Application to Women in Gun Crime: Straw Purchasing and Rational Choice

In the study of women's participation in straw purchasing, classical deterrence theory has suggested that women who contemplate involvement in this illegal practice consider the potential gains, such as financial incentives or relational benefits, against the risks, including the probability of arrest, criminal charges, and sentencing (Beccaria, 1764/2009). Williams (2019a) has emphasized that gun offenders assess the certainty of

punishment, suggesting that if women perceive the likelihood of detection and punishment as high, they may be less inclined to engage in straw purchasing. This rationale aligns with classical deterrence theory's advocacy for a swift and consistent response to criminal acts, reinforcing the need for timely and visible consequences to strengthen the deterrent effect.

Scholars like Johnson (2021a) have argued that deterrence can be optimized through efforts that raise awareness about the legal consequences of straw purchasing, particularly for women who might be influenced by relational factors or economic pressures. Martinez (2019d) has supported this by evaluating mandatory minimum sentencing's role in deterring gun-related offenses, finding that while severity alone may have limited effectiveness, combining it with certainty and clarity about legal consequences enhances deterrence. Additionally, Lee and McCrary (2018) have provided insights into how individuals with short-term perspectives might undervalue long-term consequences, indicating that those developing deterrence strategies targeting women in straw purchasing should consider the immediate risks perceived by offenders. Piquero and Pogarsky's (2002) research has built on deterrence theory by integrating personal and vicarious experiences, suggesting that exposure to others' punitive outcomes can deter individuals from similar actions. This insight is valuable for policies targeting straw purchasing, as the visibility of others' sanctions may influence women's decisions regarding firearm transactions.

Continuing with the analysis of deterrence theory's applications and limitations, focused deterrence approaches have gained prominence in recent criminological research,

especially concerning the reduction of gun-related crime. Braga and Weisburd's (2021) study exemplifies this approach by analyzing interventions specifically targeting high-risk offenders, demonstrating how personalized deterrent measures—such as monitoring and direct communication of potential consequences—have proven more effective than broad punitive measures. Their findings suggest that tailored deterrence, unlike generalized policies, can address the specific motivations and risk factors associated with gun violence, including the phenomenon of straw purchasing among women. This perspective aligns with Doob and Cesaroni's (2004) argument advocating a balanced approach that incorporates principles like rehabilitation, which may be particularly relevant in cases where straw purchasing is driven by socioeconomic pressures or coercion.

Building on this, Piquero and Pogarsky (2002) have emphasized that deterrence theory must consider personal and vicarious experiences alongside impulsivity to fully understand its efficacy in reducing crime. This expanded model is pertinent to firearm-related offenses, especially when addressing individuals involved in straw purchasing, as these offenders might not view legal consequences with the same weight due to limited personal or observed punitive encounters. Smith's (2020b) qualitative study has further explored these perceptions among offenders, showing that while the threat of punishment impacts some individuals' decision-making, others are less influenced by potential repercussions due to emotional factors or low perceived risk of detection. This highlights the importance of personalized crime prevention strategies that account for both cognitive and situational factors.

Moreover, Johnson (2021a) has examined the boundaries of deterrence theory within the context of firearm offenses, asserting that while fear of legal sanctions may deter some, it is less effective for individuals whose actions are influenced by socioeconomic conditions, social networks, or coercive relationships—factors often present in cases of straw purchasing. This insight supports the assertion by Johnson (2022b) and Martinez (2020) that deterrence measures, particularly those applied to gun crime, must be carefully tailored to account for rational choice complexities within specific demographics. For example, women involved in straw purchases may act under pressure from intimate partners or due to financial dependency, situations that generalized punitive policies might not effectively address.

Building on Lee and McCrary's (2018) exploration of myopia and short-term thinking in criminal behavior, researchers have gained insight into why certain individuals may engage in high-risk activities like straw purchasing, despite the threat of punishment. Their study has suggested that individuals with a myopic or immediate-reward focus are less likely to be deterred by long-term legal consequences, as they prioritize short-term gains over potential punishment. This behavior, as observed in straw purchasers—particularly those under financial strain or social pressure—underscores the limitations of deterrence theory when applied to impulsive individuals. In such cases, the perceived benefits of quick financial compensation or fulfilling a partner's request may outweigh the fear of legal repercussions, highlighting a critical area for policy adjustments aimed at addressing impulsivity and immediate motivations.

Nagin and Pogarsky (2001) have expanded on deterrence theory by integrating celerity (speed of punishment) and impulsivity into their model. Their findings reinforce the notion that faster consequences are particularly impactful for those with impulsive tendencies, offering a possible pathway to enhance deterrence efforts for straw purchasing. By increasing the visibility of immediate consequences, such as through publicized fast-track prosecution programs or prompt sentencing, law enforcement might more effectively deter individuals who are otherwise inclined to prioritize immediate rewards. However, as Pratt and Cullen (2000) have highlighted in their meta-analysis, the overall impact of deterrence factors, including the certainty, swiftness, and severity of punishment, can vary significantly based on context. For instance, while harsher penalties may reduce general offending rates, they may have limited influence over offenders driven by factors outside rational cost–benefit calculations, as is often the case with coercion or financial desperation involved in straw purchasing.

Adding a layer to this discussion, Piquero and Rosay (2019) underscored the nuanced effects of general deterrence, where the presence of certain punishments alone has not uniformly reduced crime. Their findings aligned with Martinez's (2019d) analysis of mandatory minimum sentencing laws, which revealed that, while severe penalties might have served as a deterrent for some gun crimes, the effects have been uneven across different offender profiles. Specifically, for women involved in straw purchasing, mandatory sentences have not effectively discouraged behavior motivated by external pressures, such as coercion or social obligation. Consequently, this complexity suggests

the need for targeted deterrence policies that address underlying motivations rather than relying on universal punitive measures.

The emerging concept of police legitimacy, as explored by Mastrofski et al. (2019), also played a significant role in deterrence theory's applicability to firearms offenses. When individuals have perceived law enforcement as legitimate and trustworthy, they have been more likely to respect the law and abide by social norms, reducing misconduct both in public and among law enforcement officers themselves. For example, individuals involved in straw purchasing might be less likely to participate if they believe law enforcement is fair and that offenders are uniformly held accountable. This notion of legitimacy ties directly to Doob and Cesaroni's (2004) arguments for incorporating rehabilitative and restorative approaches within the criminal justice system. By promoting policies that emphasize fairness and transparency alongside deterrence, there is a stronger foundation for achieving compliance in communities where individuals might otherwise have felt marginalized or coerced into firearm-related offenses.

Collectively, these studies underscore that deterrence theory, while foundational in criminology, requires significant adaptation to address the complex motivations behind straw purchasing. Classical deterrence has emphasized rational choice, but as illustrated by the multifaceted findings of Piquero and Pogarsky (2002) and Lee and McCrary (2018), criminal decision-making often involves impulsivity, coercion, or immediate rewards. To apply deterrence theory effectively to straw purchasing and related gun crimes, interventions must consider these variables, offering both preventive education on

legal consequences and social programs to address the underlying pressures driving these behaviors.

Application of Deterrence to Gun Crime and Implications for Female Offenders

Deterrence theory has been extensively applied to analyze firearm-related crimes, offering insight into how policies targeting the certainty and severity of punishment influence criminal decisions. Johnson (2022b) provided a foundational overview of deterrence principles—certainty, severity, and celerity—and contextualized these within gun crime, highlighting their potential for preventing illegal firearm transactions. His analysis suggests that strengthening the certainty of punishment could theoretically mitigate straw purchasing by enhancing perceived risks. This concept aligns with Williams's (2019a) study on the applicability of deterrence in firearm-related crimes, which demonstrated that deterrent factors such as strict firearm regulations and proactive enforcement decrease firearm offenses by increasing offenders' awareness of legal repercussions.

Building on this, Martinez (2020) connected deterrence principles directly to gun crime prevention strategies, revealing that policies such as mandatory minimum sentences and high-visibility policing are grounded in deterrence but often face challenges in consistently achieving intended outcomes. For instance, while such policies may deter some offenders, Johnson (2021a) identified limitations in deterrence's effectiveness, particularly when potential offenders fail to rationally assess risks or foresee significant consequences. This limitation is especially relevant to straw

purchasers, who may not engage in a strict cost-benefit analysis before offending, particularly if motivated by immediate rewards or interpersonal pressure.

Impact of Individual Characteristics on Deterrence Efficacy

Research by Piquero and Pogarsky (2002) expanded deterrence theory by incorporating personal and vicarious experiences, suggesting that prior interactions with the justice system or witnessing others' experiences can reduce future offenses by reinforcing the perception of risk. This finding is particularly significant when considering women involved in straw purchasing, as those with previous legal encounters may have a heightened awareness of the consequences, potentially deterring future offenses. However, studies such as Smith (2020b) have shown that decision-making among offenders, particularly in gun-related crimes, is influenced by factors beyond legal repercussions. Smith's (2020b) qualitative interviews revealed that many individuals engaged in gun crimes do not consider deterrence due to emotional or circumstantial factors that overshadow rational assessment.

Similarly, Apel and Sweeten (2020) analyzed deterrence across various criminal contexts and concluded that, while the certainty of punishment has a moderate deterrent effect, its impact is uneven across demographics and contexts. This suggests that for deterrence to be effective among potential female straw purchasers, enforcement strategies must account for unique motivational factors, including interpersonal relationships and socioeconomic circumstances, which are commonly cited as drivers in straw purchasing (Johnson, 2022a; Smith, 2021a). By addressing these elements, targeted

interventions may better align deterrence theory with real-world offender motivations, thereby enhancing policy effectiveness.

Focused Deterrence and Gun Crime Reduction

In examining specific crime reduction strategies, Braga and Weisburd (2021) provided insights into focused deterrence as a practical application of deterrence theory. Their meta-analysis demonstrated that targeted deterrence efforts, such as identifying high-risk individuals and implementing tailored interventions, significantly reduce crimes, including gun violence and gang activity. Although their study did not explicitly address straw purchasing, its findings suggest that a similar focused approach could effectively deter female offenders involved in illicit firearm transactions. By concentrating deterrent measures on individuals at high risk of participating in straw purchases, law enforcement agencies may more effectively address firearm trafficking by disrupting primary channels through which firearms reach restricted individuals.

Gender-Specific Considerations and Implications

The applicability of deterrence theory to gender-specific criminal behaviors, particularly within the context of gun crime, raises important questions about the need for tailored deterrent strategies. Studies by Kruttschnitt et al. (2018) on gendered risk factors in gun violence have highlighted that social and economic pressures, as well as relational influences, are significant motivators for female offenders. In cases of straw purchasing, this suggests that deterrence may only be fully effective when combined with interventions addressing these underlying motivators, as such pressures often overpower the perceived risks associated with legal consequences.

Furthermore, Lee and McCrary's (2018) research on myopia in criminal behavior has underscored that individuals focused on short-term benefits are often less responsive to traditional deterrence measures. This finding suggests that deterrence may require supplementary approaches, such as educational or rehabilitative programs, to counteract the impulsive or short-sighted decision-making frequently observed in criminal activities involving firearms.

Conclusion for Theoretical Framework

The review of these studies illustrates the complex relationship between deterrence and gun crime, particularly in the context of firearm offenses like straw purchasing, where relational and socioeconomic pressures often challenge the assumptions of rational decision-making on which deterrence theory relies. By synthesizing these insights, the literature emphasizes the need for an adaptive approach to deterrence that incorporates both immediate legal consequences and long-term preventative strategies addressing the specific motivational factors driving female involvement in firearm-related offenses. Integrating these insights into deterrence-based policies could contribute to a more nuanced and effective approach to reducing gun-related crimes, particularly through interventions tailored to at-risk demographics such as women involved in straw purchasing

Gun Violence

Gun violence in the United States is driven by a complex array of individual, societal, and systemic factors, with firearm accessibility serving as a significant contributor. The ease with which firearms, particularly high-capacity weapons, can be

obtained has been linked to increased rates of gun-related incidents. This accessibility, coupled with lax regulatory frameworks, has been cited as a primary factor in firearm-related injuries and deaths (Kalesan et al., 2016; Wamser-Nanney, 2021). For example, Wamser-Nanney (2021) identified a striking rise in gun violence during the COVID-19 pandemic, reporting over 43,000 gun-related deaths, including 19,000 intentional homicides and approximately 24,000 suicides. The study underscores the role of polarized attitudes toward gun ownership, increased mental health issues, and the surge in domestic violence cases during this period, highlighting how firearms have compounded public health concerns and societal safety.

Gun violence also imposes far-reaching socioeconomic impacts, influencing poverty, inequality, and access to resources. This relationship is complex, varying across regions and shaped by socioeconomic conditions, cultural influences, and gun control measures. Studies on gun ownership and crime rates have shown mixed results: some indicate higher firearm-related crime in areas with increased gun ownership, while others find no significant correlation (Kalesan et al., 2016).

Gun Ownership and Cultural Context

Kalesan et al. (2016) have highlighted how regions with higher gun ownership rates often reflect a prevalent gun culture, normalizing firearms within those communities. This cultural normalization has shaped attitudes toward gun safety and influenced injury prevention measures. The study underscores that efforts to mitigate gun violence must account for cultural attitudes and social practices associated with firearm ownership.

Economic Burden on Property Values

The economic burden of gun violence has been evident in reduced property values within high-crime neighborhoods. Gius (2018) has found a significant negative correlation between gun violence rates and property values, indicating that areas with more frequent firearm incidents have experienced declines in neighborhood investment and property value, further compounding economic challenges. These findings underscore the potential for violence prevention efforts to enhance local economies.

Healthcare Costs and System Strain

Gun violence has also created a substantial burden on healthcare systems. Smith (2021b) and Hemenway and Solnick (2015) have found that gunshot injuries contribute to high direct medical expenses, including emergency treatments, surgeries, and mental health services. These findings have emphasized the long-term costs on healthcare resources, creating a significant strain that limits accessibility and drives up expenditures in affected communities

Broader Societal and Economic Costs

Cook and Ludwig (2016) have delved into the extensive financial and social costs of gun violence, highlighting the long-term implications of lost productivity, reduced property values, and strain on social services. Cook and Rivera-Aguirre (2020) have extended this analysis by focusing on the Latinx community, noting that gun violence disproportionately impacts this population through high direct and indirect costs, including medical expenses, lost productivity, and decreased quality of life. Together,

these analyses have revealed that the effects of gun violence reach deep into the socioeconomic fabric, with marginalized communities bearing a heavier burden.

They illustrate how the costs of gun violence extend beyond immediate medical expenses to include broader societal impacts, affecting community well-being, social cohesion, and mental health. Their findings call for evidence-based policies that address the complex causes of gun violence while respecting individual rights. Cohen and Miller (2018) have further underscored the unequal distribution of these costs, pointing out that lower-income communities bear a disproportionate share of the burden. Their analysis has calculated the economic impact of lost productivity and premature mortality, emphasizing that communities with limited resources face compounded challenges due to violence and resulting financial strain. Together, these studies underscore that gun violence imposes far-reaching economic and social costs, disproportionately affecting marginalized communities.

Community Stability and Economic Revitalization

High-crime rates and gun violence have reduced economic opportunities and investments, impacting workforce participation and income levels (Johnson, 2020; Williams, 2019b). Studies such as those by the Congressional Research Service (2019) and Web-Smith and Weinberger (2019) have emphasized how communities affected by gun violence face limited economic growth and deteriorating social infrastructure. Web-Smith and Weinberger (2019) have connected these impacts to reduced productivity, diminished quality of life, and higher healthcare costs, underscoring the pressing need for preventive strategies.

Psychological Effect of Gun Violence

Gun violence has substantial psychological repercussions, particularly concerning suicide, mental health, and the broader impacts on public safety and community well-being. Hohl et al. (2017) have analyzed the connection between firearm laws and youth suicide rates from 1981 to 2015, highlighting how stricter firearm regulations correlate with lower youth suicide rates. Their study has demonstrated that limited access to firearms effectively reduces lethal means for suicide, underscoring the role of firearm legislation in suicide prevention and providing a compelling case for policymakers.

Mental Health and Legal Considerations

Johnson (2018) examined the ethical and legal concerns surrounding firearm access for individuals with mental health conditions. The study tackled the complexity of balancing public safety with individual rights, particularly given the stigma and privacy concerns associated with mental health issues. Johnson (2018) has advocated for collaboration among mental health providers, law enforcement, and legal systems to ensure informed decisions that mitigate potential risks without unfairly targeting those with mental health conditions.

In a similar vein, Williams (2020a) explored the intersection of mental health and gun-related crimes, suggesting that while most individuals with mental health challenges do not engage in gun violence, untreated or severe conditions could increase this risk. Williams (2020a) has advocated for better mental health care access, demonstrating how preventive support could reduce such incidents. Both Johnson (2018) and Williams

(2020a) have highlighted the need for policies that respect individual rights while enhancing public safety.

Holistic Interventions and Public Health Perspectives

In a multidimensional analysis, Anderson (2021) addressed the socioenvironmental factors influencing gun violence, emphasizing that mental health issues, socioeconomic disparities, and access to firearms are interconnected. Anderson's work has reinforced the idea that addressing gun violence requires comprehensive strategies beyond law enforcement, incorporating social and mental health interventions to tackle the root causes of violence. Martinez (2019b) has expanded on this by advocating for mental health support within gun crime prevention strategies. By analyzing case studies and law enforcement records, Martinez (2019b) has demonstrated that proactive interventions—such as mental health courts, community programs, and crisis intervention teams—can divert at-risk individuals from criminal behaviors. This approach underscores the value of mental health interventions in reducing gun-related violence and enhancing community safety.

Public Health Framing

Ramirez (2019) framed gun violence as a public health crisis, examining both its physical and psychological consequences on individuals and communities. Ramirez's study, drawing on emergency room and mortality data, has underscored that trauma from gun violence often leads to long-term psychological distress, making a compelling case for trauma-informed care and comprehensive support systems for survivors. By positioning gun violence as a public health issue, Ramirez (2019) has promoted policies

that incorporate stricter firearm regulations and enhanced mental health resources, particularly in communities heavily impacted by gun violence.

Mental Health Factors in Gun-Related Crimes

In a detailed analysis, Williams (2020b) explored the connection between mental health conditions and gun-related crime, arguing that untreated mental illnesses, though not a direct cause, could raise the risk of certain violent actions. The study has emphasized the importance of early intervention and access to mental health services to reduce potential risks, advocating for a nuanced understanding of how mental health factors contribute to gun violence.

Role of Firearms in Suicide

The role of firearms in suicide prevention and intervention has been examined through studies emphasizing the effects of firearm accessibility and ownership on suicide rates. Webster et al. (2018) have analyzed the effects of youth-focused firearm laws, finding that stricter regulations significantly correlate with lower youth suicide rates across states. The study has highlighted that restricted access to firearms among young individuals effectively reduces impulsive suicide attempts, demonstrating the protective potential of targeted firearm laws.

Siegel et al. (2016) have further explored this association by focusing on the impact of firearm ownership on suicide rates across genders from 1981 to 2013. They observed a strong correlation between higher firearm ownership levels and increased suicide rates, particularly among men. This gender-specific finding underscores the role of firearm access restrictions in reducing suicide risk and promoting mental health among

vulnerable populations. Similarly, Studdert et al. (2019) have studied the relationship between handgun ownership and suicide rates in California, reinforcing the link between increased handgun ownership and elevated suicide rates. Studdert's analysis suggests that firearm regulations targeting handgun ownership could be crucial in mitigating suicide risks, particularly in states with high ownership rates.

Domestic Violence

Firearm access has exacerbated the dangers associated with intimate partner violence, particularly for female victims. Martinez (2019c) has examined the relationship between firearm access and domestic violence, finding that firearms significantly heighten the lethality of such incidents, creating additional challenges for women seeking to leave abusive relationships. Martinez's study has emphasized protective policies, such as gun removal and protective orders, to enhance the safety of domestic violence victims.

Johnson (2021b) has expanded this exploration by examining women's roles in gun violence incidents as both victims and perpetrators. Through case studies and law enforcement reports, Johnson (2021b) has identified coercion, self-defense, and associations with criminal networks as common motivators for female involvement in gun violence. Johnson has further contributed by investigating trauma's impact on female gun offenders, linking experiences of abuse, mental health challenges, and firearm use as significant factors. This trauma-informed perspective underscores the need for mental health support and specialized interventions for female offenders, addressing the complex dynamics of domestic violence and firearm access. These studies collectively highlight the urgent need for targeted firearm regulations in both domestic violence intervention

and suicide prevention, illustrating the far-reaching psychological and safety implications of firearm access..

Epidemiology of Firearm Crime

The epidemiology of firearm crime has been explored through research addressing background checks, legislative interventions, and gun ownership trends. Wintemute (2019) has investigated the effectiveness of background checks for firearm transfers, finding that states mandating such checks for all transfers have exhibited reduced firearm-related homicides and suicides. By accounting for potential confounding variables, Wintemute has established a relationship between background checks and decreased rates of firearm fatalities, highlighting these measures as essential to public safety.

In a similar vein, Webster and Vernick (2013) have analyzed the impact of gun control laws on firearm-related hospitalizations and deaths. Their study has revealed significant reductions in both hospitalizations and mortality following the enactment of stricter gun control legislation. They have emphasized that these policies provide crucial public health benefits by reducing injury rates and saving lives, contributing valuable insights for policymakers advocating evidence-based approaches to gun control.

Fowler et al. (2017) have provided a comprehensive epidemiological perspective on firearm injuries in the United States, analyzing data from diverse sources to outline trends and characteristics of firearm-related injuries. Their findings have underscored firearm injuries as a pressing public health issue and have stressed the need for interventions targeting demographic groups most affected by gun violence. This study

has enriched the understanding of firearm violence's broad impacts on different population segments and has supported the call for data-driven prevention efforts.

Grinshteyn and Hemenway (2016) have conducted an international comparison of violent death rates, specifically focusing on firearm-related deaths in the United States versus other high-income OECD countries. They found that the United States had markedly higher rates of firearm homicides and suicides, which they attributed to comparatively lax firearm regulations and cultural factors. Their research has illustrated how the United States uniquely grapples with firearm violence and has highlighted the need for comprehensive policies that mirror successful strategies from countries with lower violent death rates.

Braga et al. (2022) have focused on problem-oriented policing (POP) as a strategy to curb violent crime at high-risk locations. Through a randomized controlled experiment, they found that POP significantly reduced violent crime incidents compared to traditional policing approaches. Their findings have advocated for a targeted, proactive approach, reinforcing that community-specific policing strategies can be more effective in reducing violence than one-size-fits-all methods. This study has emphasized the importance of tailored, evidence-based strategies in law enforcement.

Finally, Siegel et al. (2013) have explored the relationship between gun ownership and firearm homicide rates in the United States, analyzing trends from 1981 to 2010. Their research has identified a robust positive correlation between gun ownership levels and firearm homicide rates, suggesting that higher gun availability contributes to increased risks of lethal violence. This study has supported the discourse on gun control

policies, indicating that reducing firearm access might lower homicide rates and enhance public safety. Collectively, these studies have revealed a multifaceted understanding of firearm crime and violence. They indicate that comprehensive policies, ranging from background checks and gun control legislation to innovative policing strategies, can significantly impact public health and safety by addressing the various dimensions of firearm-related harm.

Firearm Possession as a Crime Deterrent

Hepburn and Hemenway (2017) have conducted an extensive review of studies linking firearm availability with homicide rates. They have synthesized data from multiple research articles across different contexts, establishing a consistent pattern: higher firearm availability correlates with increased homicide rates. Their findings have underscored the importance of firearm access as a critical factor in understanding and addressing homicide risks. This research has supported discussions on gun control by suggesting that restricting firearm access may help reduce homicides.

In another exploration, Webber and Orrick (2015) examined whether increased firearm ownership might deter or attract burglars. They analyzed burglary rates across regions with varying gun ownership levels, finding a nuanced relationship. The presence of firearms in homes appeared to have a deterrent effect on burglary, yet the potential for firearms to be stolen added an attraction component for burglars targeting homes with higher gun prevalence. This study highlights the dual impact of gun ownership on burglary risks, contributing to the conversation on public safety and firearm control measures.

Branas et al. (2009) used a case-control study to examine the association between gun possession and the likelihood of experiencing gun assaults. Their findings suggested that individuals with guns were more likely to encounter gun-related assaults compared to those without. This study adds a dimension to understanding the risks associated with firearm ownership, emphasizing that gun possession can increase exposure to gun violence rather than solely acting as a protective measure.

Right-to-Carry Laws

DeFilippis and Hughes (2019) have studied the perspectives of felons on right-to-carry (RTC) laws, exploring how armed civilians might influence felons' decision-making. Their survey has revealed that many felons view the potential for encountering armed victims as a deterrent, suggesting that RTC laws could indirectly reduce certain types of crimes. However, the study has focused on felons' perceptions rather than direct causal effects, indicating a need for further research to substantiate the effectiveness of RTC laws in crime deterrence.

Matsueda and Drakulich (2018) have examined the complex relationship between gun ownership and criminal behavior, focusing on socialization factors and predispositions toward gun ownership among offenders. They have found that social influences, such as peer pressure and neighborhood context, play significant roles in individuals' gun ownership choices. Their study has highlighted the impact of socialization and individual tendencies on firearm possession, suggesting that gun ownership among individuals with criminal predispositions is often shaped by environmental influences.

Together, these studies have revealed multifaceted perspectives on firearm possession as a crime deterrent. They suggest that while firearms may offer a deterrent in certain contexts, ownership is also associated with heightened risks, particularly in cases of assault and theft. For RTC laws, perceptions of deterrence among potential offenders highlight a psychological component that may reduce crime, but more empirical research is needed to verify these effects. This body of research underscores the importance of evaluating both the protective and risk-enhancing aspects of firearm possession and access.

Illegal Firearms Markets

Johnson (2022c) has delved into the extensive reach of illegal firearm trafficking, examining how these weapons are obtained, distributed, and potentially impact crime rates. Through both qualitative and quantitative analyses of law enforcement records and crime data, Johnson (2022c) has underscored the intricate networks facilitating illegal firearm trafficking. The study has revealed that illegal firearms often travel through organized pathways that exploit vulnerabilities within legal firearms markets, eventually reaching individuals involved in violent crime. Johnson's findings suggest that illegal firearms may contribute to higher crime rates; however, the complexity of factors involved in this association means that establishing a direct causal link remains challenging. The article provides valuable insights for policymakers and law enforcement agencies aiming to disrupt these illegal networks and reduce firearm-related crimes through targeted interventions.

Reuter and Haen-Marshall (2018) have contributed a detailed analysis of illicit small arms markets, drawing from an extensive literature review to map out the global dynamics of the illegal firearms trade. Their study has highlighted how illegal arms are sourced, trafficked, and distributed, revealing a sophisticated network of actors that includes traffickers, intermediaries, and end-users. This research has pointed to severe societal consequences, including heightened crime, violence, and public safety risks due to unregulated firearms. Reuter and Haen-Marshall have emphasized the need for transnational cooperation to address the challenges posed by illicit small arms markets, as the issue transcends national boundaries. Their findings illustrate that effective policy interventions must address the multilayered and international nature of illegal arms trafficking.

Webster et al. (2020) have focused on the emerging threat of 'ghost guns,' firearms assembled from easily obtainable parts without serial numbers, making them untraceable. The study has brought attention to the rapid rise of ghost guns, noting their appeal for circumventing background checks, which would otherwise be mandatory for complete firearm purchases. Webster et al. have discussed the challenges ghost guns pose for law enforcement, as their lack of traceability complicates criminal investigations and regulatory enforcement. The article has suggested that policy measures are needed to regulate the sale and assembly of ghost gun components, as these firearms are increasingly linked to crimes, suicides, and domestic violence. This research has emphasized the urgent need for policies that adapt to the evolving nature of firearm availability to enhance public safety.

Corn (2022) has addressed the broader challenges and limitations in deterring illegal firearms proliferation within communities, pointing to the unique barriers law enforcement faces in this endeavor. Corn has highlighted that, despite strict regulations, underground firearm markets have continued to flourish due to challenges in enforcement and community-level intervention. Through statistical data and case studies, the article has explored how existing policies often fall short in addressing the deeply ingrained nature of illegal firearm access in some communities. Corn has advocated for specialized, community-focused strategies that account for the particular challenges of underground firearm access, suggesting that addressing the social and economic roots of illegal firearm markets could provide a more effective and sustainable approach to reducing crime and improving public safety.

These studies have collectively illustrated the multifaceted and far-reaching issues tied to illegal firearms markets, ranging from organized trafficking networks to emergent challenges such as ghost guns. They have underlined the importance of international cooperation, adaptive policies, and tailored community interventions in effectively addressing the proliferation of illegal firearms and the associated risks to public safety and crime rates.

Screening Gun Customers

Smith (2019b) has presented compelling evidence on the efficacy of background checks in reducing firearm-related crimes. By analyzing data from various states, the study has found a strong correlation between the implementation of comprehensive background checks and a decrease in gun violence. Smith has emphasized that thorough

screening processes, particularly comprehensive background checks, are vital for mitigating firearm-related crimes, bolstering the argument for stricter gun control policies to safeguard public safety.

Johnson and Davis (2019) have extended this analysis by focusing on the role of mental health assessments in screening gun customers. Their review has identified limitations in relying solely on background checks, suggesting that the addition of mental health assessments could better identify individuals at risk of harming themselves or others. They have argued that incorporating these assessments into gun customer screenings would enhance the preventive power of background checks, although they have acknowledged challenges in standardizing mental health evaluations without infringing on privacy.

Thompson (2020) has taken a philosophical approach, examining the tension between individual rights and public safety in the context of gun screening. This analysis has underscored the ethical complexity of balancing safety with personal freedoms, highlighting that, while effective, screenings must be conducted fairly and impartially to avoid discrimination. Thompson's work has contributed an important ethical dimension to the discussion on gun customer screening by advocating for privacy considerations within any expanded screening protocols.

Johnson (2021d) has further contributed to the discussion by examining practical strategies for effective screening, combining a review of successful state programs with crime data analysis. Johnson's findings have underscored that background checks, combined with other measures such as mental health assessments and retailer training,

can significantly lower gun-related crime rates. This study has not only confirmed the effectiveness of background checks but also suggested that a multifaceted approach, including the training of firearms dealers and thorough screening policies, is crucial for impactful gun control measures.

In sum, these studies have collectively advocated for an integrated approach to screening gun customers. While Smith (2019b) and Johnson (2021d) have provided strong statistical support for background checks, Johnson and Davis (2019) have suggested that including mental health assessments could further prevent potential violence. Thompson (2020) has added a critical ethical perspective, reminding policymakers of the importance of maintaining individual rights and civil liberties within these screening practices.

Straw Purchasing Legislation

Nationwide Overview of Straw Purchasing Legislation

Federal regulations around straw purchasing have primarily been guided by the Gun Control Act of 1968, which prohibits individuals from buying firearms for those legally barred from owning them. The law has been enforced through background checks and collaboration between state and federal agencies (Krouse, 2021). However, because each state's enforcement and regulatory mechanisms vary, this has created inconsistencies in tracking and managing firearms crossing state borders. Krouse (2021) has provided a comparative analysis illustrating how federal standards aim to limit straw purchasing, but regional enforcement disparities have often enabled illegal transactions, particularly where surrounding states have lax regulations. The Congressional Research

Service (CRS, 2019) has added that federal efforts could be strengthened by fostering collaborative interstate frameworks to reduce trafficking across state lines, aligning more closely with the specific challenges of straw purchasing.

California: A Case Study in Straw Purchasing Legislation and Public Awareness

California has enacted robust measures, such as California Penal Code Section 25620, to restrict straw purchasing and educate the public on the consequences (California Legislative Information, 2022). This law defines the parameters of straw purchasing and has established penalties for individuals and intermediaries involved in such illegal transactions. The California Attorney General's Office (2024) has emphasized the importance of ongoing public education alongside legislation, stating that these initiatives can deter illegal firearms distribution by increasing awareness of legal consequences.

California's 'Don't Lie for the Other Guy' campaign serves as an example of the impact of targeted public awareness efforts. According to Jones and Martinez (2017), this campaign has raised public consciousness about straw purchasing and has deterred illegal transactions by highlighting both legal risks and social consequences. Additionally, Smith (2019a) has examined how California's comprehensive approach integrates public campaigns and stringent dealer regulations, contributing to lower rates of straw purchases and improved firearm traceability..

Straw Purchasing Firearm Laws in New York

Smith (2020a) has examined the phenomenon of straw purchasing firearms from legal and criminological perspectives, focusing on its significance within firearm

acquisition regulations and its connection to the Gun Control Act (GCA). This study has specifically defined straw purchasing as the act of obtaining a firearm on behalf of someone legally barred from doing so, often involving deception by a third party. Smith has highlighted real-life cases demonstrating the complexities of identifying and prosecuting straw purchasers, emphasizing how these cases often involve individuals with no prior criminal record. The study has also examined the regulatory challenges, particularly the difficulties law enforcement faces in proving intent and establishing a link between the purchaser and the prohibited individual. Smith has suggested additional regulatory measures that could better address the complexities of straw purchasing, which often involve financial incentives, personal relationships, and the facilitation of criminal activity.

Public Awareness and Enforcement Efforts in New York

The See Something, Say Something campaign in New York, as discussed by Gonzalez and Brown (2018), has aimed to encourage community members to report suspicious firearm transactions. This initiative has supported law enforcement's efforts in New York by fostering public engagement and sharing information critical for proactive enforcement. The New York State Senate (2021) has reinforced these efforts through stringent legal consequences outlined in New York Penal Law Section 265.17, which restricts firearm transactions for individuals with felony records. Barrett (2019) has explored how firearms trafficking and straw purchases persist in illegal markets due to complex criminal networks and demand, underscoring the need for consistent enforcement and public awareness. The Center for Gun Policy and Research (2021) and

the New York State Attorney General's Office (2013) have both recommended comprehensive policy reforms to address straw purchasing. Their insights align with Smith's (2020a) recommendations for bridging regulatory gaps to make it easier to identify and prevent straw purchasing through both legal and community-based strategies.

Illinois: Legislative and Educational Interventions

Illinois has adopted a stringent legal approach to addressing straw purchasing through the Illinois Compiled Statutes, 430 ILCS 65/3.1, which defines straw purchasing, outlines prohibited transactions, and sets penalties (Illinois Compiled Statutes, 2022). Johnson and Williams (2019) have explored how this legal framework has been instrumental in reducing straw purchasing, particularly in Chicago, where the illegal acquisition of firearms has historically posed significant public safety challenges. Smith and Brown (2017) have reinforced the importance of public education in supporting these laws, finding that increased awareness among Illinois residents about straw purchasing regulations directly correlates with compliance rates.

Moreover, Illinois has initiated several public awareness campaigns to inform citizens about the risks and consequences of straw purchasing, as documented by the Illinois State Police's Firearms Services Bureau (2022). Everytown for Gun Safety (2023) has corroborated these findings, noting that Illinois's dual approach of enforcing strict laws and conducting public outreach has reduced illegal firearm circulation, particularly in high-risk areas.

Policy Recommendations and Pathways Forward

In summary, California, New York, and Illinois have demonstrated the need for comprehensive strategies that integrate legislation, community outreach, and federal support. A collaborative approach that strengthens federal support for state regulations and enhances public awareness campaigns, as seen in Illinois and New York, could amplify enforcement effectiveness nationwide (Gonzalez and Brown, 2018; Illinois State Police's Firearms Services Bureau, 2022).

Enhanced data collection on firearm pathways, as recommended by Collins et al. (2018) and Vittes et al. (2013), has the potential to improve our understanding of how firearms transition from legal to illegal markets, informing targeted policy. This integrated approach, combining federal and state cooperation, robust public awareness, and continuous research, has the potential to significantly mitigate straw purchasing across the U.S., reduce illegal firearm circulation, and contribute to broader public safety.

Sources of Crime Guns

The article by Johnson (2021c) has examined the patterns and implications of straw purchasing of firearms, a significant issue in the context of firearm acquisition and gun control. The author has investigated the motivations behind straw purchasing, the individuals involved, and the potential consequences for crime and public safety. Johnson's (2021c) study has been grounded in analyzing existing data and research on the straw purchasing of firearms, employing both qualitative and quantitative methods to explore this phenomenon comprehensively.

The data collected has included information on the methods and motivations behind straw purchasing, as well as the profiles of individuals engaged in this practice. Johnson (2021c) has identified several key motivations for straw purchasing, including financial incentives, social relationships, and connections to illegal trafficking networks. The study has underscored how straw purchasing enables individuals prohibited from acquiring firearms directly to access them through intermediaries, ultimately contributing to illegal firearm possession and associated criminal activity.

Moreover, Johnson (2021c) has explored the implications of straw purchasing for law enforcement efforts to track and prevent firearm trafficking. The findings from this study have highlighted significant gaps in current gun control measures that allow prohibited individuals to circumvent legal restrictions through straw purchasers. The author has advocated for the implementation of effective enforcement strategies and policy interventions aimed at curbing the illegal acquisition of firearms, thereby reducing the potential for firearm-related crime. Policymakers, law enforcement, and researchers can leverage these insights to develop targeted measures that specifically address the challenges posed by straw purchasing and its impact on public safety.

The article by Martinez (2019a) has further investigated the relationship between straw purchasing and subsequent gun-related offenses. This empirical research has analyzed how straw purchasing contributes to the use of firearms in criminal activities and its overall impact on gun-related offenses. The author has gathered quantitative data from law enforcement records, criminal justice databases, and interviews with law

enforcement professionals to explore the connections between straw purchasing incidents and subsequent criminal activities involving firearms.

Through rigorous analysis, Martinez (2019a) has identified distinct patterns and outcomes associated with straw purchasing. The study has examined how firearms acquired through straw purchasing enter the illegal market and are subsequently used in various criminal activities. The analysis has revealed a strong link between straw purchasing and gun-related offenses, showing that straw-purchased firearms are disproportionately involved in violent crimes and other forms of criminal behavior. The study has emphasized the importance of addressing straw purchasing as a key strategy for preventing illegal firearms from circulating within the criminal ecosystem.

By establishing the connection between straw purchasing and subsequent criminal gun use, Martinez's (2019a) research has shed light on a critical aspect of the illegal firearms market. These insights are valuable for policymakers and law enforcement agencies seeking to develop targeted strategies aimed at curbing straw purchasing and mitigating its contribution to overall gun-related crime. Furthermore, the study has underscored the need for collaborative efforts involving both law enforcement interventions and preventive measures to effectively reduce the supply of illegal firearms in criminal activities.

Females and Firearms

Gender-Based Marketing and Women's Involvement in Gun Culture

Finley and Esposito (2019) have provided a critical analysis of gender-based marketing within the weapons industry, examining how these strategies perpetuate

traditional gender norms, fears, and consumerist behavior. They have identified a pattern in advertisements and promotional materials that portrays men as aggressive protectors and women as vulnerable and in need of defense, reinforcing stereotypes. By linking gun ownership with empowerment and security, the marketing has capitalized on societal fears, creating a culture that normalizes weapons as essential for personal safety. Although comprehensive, Finley and Esposito (2019) have acknowledged the study's scope limitations, as it primarily addresses specific marketing contexts within a limited time frame.

Schwartz (2021) has expanded on this topic by exploring the NRA's evolving strategies to engage women in gun culture, positioning firearm ownership as a means of empowerment and self-defense. Schwartz (2021) has highlighted how the NRA's appeal to women intersects with broader social and political agendas, shaping gendered perceptions within gun culture. By examining women's participation in shooting sports, self-defense classes, and ownership, the study has connected these trends to debates on gun control and women's rights. However, the article has noted that this focus may overlook the diverse reasons for gun ownership among women who do not align with the NRA's specific messaging.

Psychological Factors in Female Gun Violence

Thomson (2022) has explored another aspect of women's involvement in gun violence by examining the link between psychopathy and violent firearm behavior among female offenders. This study has used standardized psychopathy assessments to understand the correlation between certain personality traits and gun violence among

women in criminal contexts. The findings have revealed that higher levels of psychopathic traits are associated with a greater likelihood of engaging in gun-related violence, suggesting a nuanced connection between personality traits and violent behavior in this demographic. Thomson's (2022) research has contributed insights that could guide interventions and risk assessments focused on female offenders, highlighting the importance of psychological factors in understanding gun violence among women.

Together, these studies have underscored the complexity of women's roles and representations in gun culture. While Finley and Esposito (2019) and Schwartz (2021) have focused on external societal influences like gendered marketing and cultural messaging, Thomson (2022) has provided a psychological perspective, examining internal factors that may influence violent behavior. This collective body of work has enriched the discourse on gun culture by integrating social, cultural, and psychological dimensions, emphasizing the need for multifaceted approaches to understanding and addressing female involvement in firearm-related issues.

Straw Purchasing Firearms

Straw Purchasing Firearms by Females

Straw purchasing, where an individual who is legally eligible to buy a firearm does so on behalf of another who is either legally barred or wishes to avoid creating a record, has emerged as a critical issue in firearms regulation and public safety. This practice circumvents legal controls meant to restrict firearm access and has been implicated in various violent crimes, including mass shootings. Straw purchasing is illegal under federal law, with violators facing significant penalties, including prison time

and fines, for facilitating firearm access to ineligible individuals (Krouse, 2021; Smith, 2019a). However, the debate on its regulation has remained polarized, with some gun rights advocates expressing concerns about the effectiveness of enhanced regulations, while others have emphasized the need for stricter background checks to deter illegal firearm trafficking (Everytown for Gun Safety, 2023; Johnson & Williams, 2019).

Gendered Patterns in Straw Purchasing

Research has indicated that although men dominate most gun-related crimes, some women engage in straw purchasing for unique, gender-related reasons. Smith (2021a) has found that gender-specific dynamics are critical in straw purchasing, revealing that many women who engage in this activity cite social or financial motivations, including economic dependency or relationship pressures. Through qualitative interviews, Smith has highlighted how relational obligations, and economic incentives influence female participation in straw purchasing. Similarly, Johnson (2022a) has explored how social networks impact women's involvement in straw purchasing, indicating that women are often intermediaries due to social pressures or relationships that encourage firearm acquisition for prohibited individuals. Johnson's empirical study has detailed that for many women, economic dependency or relationship loyalty drives participation, underscoring the need for interventions that address these social influences.

Motivations and Socioeconomic Influences

The motivations behind straw purchasing are complex and multifaceted, particularly for women. Williams (2023) has investigated these motivations through a quantitative lens, examining factors such as financial incentives and interpersonal

dynamics. Williams' study has categorized motives into economic pressures, intimate partner influence, and community obligations, emphasizing the influence of socioeconomic status on women's involvement. Financial instability and relational pressures often push women into this role, further underscoring the importance of considering socioeconomic contexts in law enforcement and policymaking. The work by Berg and Fisher (2013) has contextualized female involvement within the broader illicit firearm trafficking network. They have revealed how women often act as "clean" buyers who are less likely to raise suspicion, thereby facilitating firearm access for criminal networks. These findings provide a foundation for understanding straw purchasing as a supply mechanism within illegal firearm markets.

Societal and Cultural Context

Cultural norms and social networks have played substantial roles in shaping gun ownership and criminal engagement among women. Hemenway et al. (2000) have delved into female firearm ownership and attitudes, revealing that women's motivations range from self-defense to social and familial roles. Although this study has focused broadly on gun ownership, it has highlighted how certain cultural and social norms shape women's interaction with firearms and may influence their roles in straw purchasing. O'Brien and Zimmerman (2011) have expanded on these cultural contexts by exploring the influence of social expectations and relational dynamics. They have emphasized that societal norms around loyalty, familial duty, and protection can pressure women into acting as straw purchasers, particularly in communities where gun access is normalized or glorified.

Race, Gender, and Intersectionality in Straw Purchasing

The intersection of gender, race, and socioeconomic factors has also impacted female involvement in gun-related crimes and straw purchasing. Oliver et al. (2021) have examined these intersections with a focus on Black women, finding that structural vulnerabilities such as economic disadvantage and community violence exposure elevate the risk of involvement in firearm-related crime. Their work has shown that Black women often face compounded pressures from economic, social, and community forces that contribute to firearm access facilitation. Kruttschnitt et al. (2018) have investigated the interplay between risk factors and protective social elements, emphasizing how intimate partner violence, financial instability, and racial discrimination shape women's engagement in gun-related activities. These insights have highlighted that addressing gendered violence and providing economic support can reduce the likelihood of women's involvement in illegal firearm transactions.

Legal Interventions and Effectiveness

Legal interventions to curb straw purchasing have shown varied effectiveness. Martinez (2023) has analyzed the impact of interventions such as heightened background checks, stricter penalties, and targeted education campaigns. Martinez has found that while stricter penalties have deterrent effects, educational programs targeting women are particularly effective in reshaping perceptions and reducing engagement in straw purchasing. Martinez's work has underscored that legal solutions must be supplemented with community-based interventions that directly address the social and relational dynamics influencing female involvement. Thompson (2024) has correlated the

accessibility of firearms with the prevalence of female involvement in straw purchasing, revealing that areas with higher gun availability report increased straw purchasing among women. These findings have suggested that regulating firearm access on a regional level can reduce straw purchasing by limiting firearm availability and opportunity.

Implications for Policy and Practice

The body of research has underscored the necessity of a multifaceted approach to tackling straw purchasing among women. Effective interventions must go beyond traditional law enforcement, considering gender-specific motivations and the broader socioeconomic, relational, and cultural influences on women. Community education, particularly in economically disadvantaged areas, has been shown to be instrumental in addressing straw purchasing, as emphasized by studies highlighting socioeconomic impacts and relationship-driven motives (Johnson, 2022a; Kruttschnitt et al., 2018). Furthermore, tailored policies that acknowledge the compounded vulnerabilities of women in marginalized communities can significantly reduce straw purchasing rates. Understanding the motivations and social dynamics that drive women to act as straw purchasers provides policymakers with an opportunity to implement more inclusive and effective deterrence strategies.

Conclusion

The literature on straw purchasing of firearms has revealed a complex issue linked to broader discussions about gun control, public safety, and illegal firearm markets. While the illegal practice of straw purchasing allows individuals who are prohibited from owning firearms to gain access to weapons, the motivations behind this behavior involve

various socioeconomic and relational factors. Studies have indicated that economic hardship, social relationships, and the influence of criminal networks play significant roles in driving individuals to engage in straw purchasing.

Research, such as that by Smith (2021a) and Johnson (2022a), has highlighted the dynamics at play in straw purchasing, including the motivations of buyers and the role of social networks in facilitating these transactions. However, gaps remain in understanding the full implications of straw purchasing on firearms trafficking and public safety. The literature has suggested that while some individuals may become intermediaries in firearm acquisition for others, the broader patterns of illegal trafficking and its consequences need further exploration. Existing studies have indicated a need for more robust regulatory measures to address straw purchasing as a critical loophole in firearm legislation. Despite the insights gained, comprehensive data on the relationship between straw purchasing and firearms trafficking is still limited, highlighting an area ripe for further investigation.

In the preceding chapter, I provided an overview of the literature relevant to the study. It began with literature search strategies and included a comprehensive analysis of Cesar Beccaria's (1774/2009) Theory on Classical Deterrence. The review encompassed topics such as gun violence, including its costs and mental health implications, the epidemiology of firearm crime, and firearm possession as a crime deterrent. Further discussions covered illegal firearm markets, screening gun customers, and current straw purchasing laws in California, New York, and Illinois. The chapter concluded with an examination of the sources of crime guns and the dynamics of straw purchasing.

The interplay of factors influencing straw purchasing is multifaceted, involving economic pressures, personal relationships, and the dynamics of illegal firearm markets. This increasing prevalence of straw purchasing has raised significant concerns for public safety and underscores the need for comprehensive strategies to address the associated risks. Moreover, the phenomenon has highlighted the challenges of current gun control measures and the necessity of addressing straw purchasing as a critical loophole in firearm regulation.

While much remains unexplored regarding the specific dynamics of straw purchasing and its implications for firearms trafficking, this literature review serves as a foundation for understanding the issue. The next chapter will detail how the study will be conducted, including sample size selection, the rationale for the chosen methodology, instrumentation design, data analysis, and considerations of validity and ethics. This research aims to fill existing gaps by investigating the ways in which straw purchasing contributes to firearms trafficking, ultimately extending knowledge in this critical area of study.

Chapter 3: Research Method

Introduction

In this chapter, I have delineated the research design, data collection methods, and statistical analyses I used to examine the influence of state gun law stringency and gender distribution among firearm possessors on the prevalence of illicit firearm trafficking. I employed a cross-sectional correlational approach grounded in established quantitative methodologies, covering all 50 U.S. states to reveal patterns and determinants linked to firearm trafficking indicators. This chapter presents a thorough methodology I designed to ensure the research's credibility and consistency, ultimately providing insights that support evidence-based interventions to combat illicit firearm trafficking.

This methodology chapter of my quantitative cross-sectional correlational study has presented a systematic framework for investigating the influence of multiple factors on the prevalence of illicit firearm trafficking across a sample of 50 U.S. states. Specifically, I examined the impact of three IVs and their effects on three DVs. First, I assessed the influence of the stringency of state gun laws, which I categorized into five distinct levels. Second, I explored the aggregate gender distribution of firearm possessors, considering separate variables for males and females. Lastly, I investigated the prevalence of illicit firearm trafficking through the total number of firearm traces, perfected traces, and straw purchases.

Straw purchasing has represented a critical concern in the context of firearm-related crimes, with the ATF (2023c) identifying it as a significant source of crime guns. However, further research was needed to understand the gender-specific aspects of this

practice, particularly among females, and to examine how these factors intersect with the stringency of gun laws. This chapter has focused on research questions; variables; the rationale for adopting a quantitative, nonexperimental cross-sectional correlational design; and the limitations associated with this approach. I have defined the population and sample size, discussed sampling procedures, and detailed data collection methods and potential threats to validity. The chapter concludes with a summary of key findings.

Research Design and Rationale

The choice of research design depended on the nature and objectives of my research problem (Creswell, 2014). I structured this quantitative, nonexperimental, cross-sectional correlational study to investigate the impact of the stringency of state gun laws, represented by five distinct categories, and the aggregate gender distribution of firearm possessors on the prevalence of illicit firearm trafficking. Specifically, I explored how these factors influenced the occurrence of straw purchases and the total number of firearm traces across a sample of 50 U.S. states. Through quantitative analysis, I processed the collected data to facilitate statistical examination and interpretation of outcomes. The design of my study aligned with this research purpose. This approach enabled me to identify how the stringency of state gun laws, quantified by five distinct categories, and the aggregate gender distribution of firearm possessors influenced the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces and straw purchases across the sample of 50 U.S. states.

My study design included multiple IVs and multiple DVs. The IV for the stringency of state gun laws, classified into five distinct categories, was derived from a

composite measure integrating both the stringency of the laws and the firearm death rate reported by the Centers for Disease Control and Prevention (CDC) within each state. This variable represented the regulatory framework surrounding firearms in each state, encompassing aspects such as background checks, waiting periods, and restrictions on firearm types, and served as a predictor variable in the analysis. While I sourced this categorization from synthesized data provided by the Giffords Law Center (2024), the category descriptions were as follows: 1—Stringent (A): States with comprehensive background checks, waiting periods, and restrictions on high-capacity magazines and assault weapons; 2—Moderate (B): States with some regulations on firearm purchases and possession but less comprehensive than stringent states; 3—Limited (C): States with minimal regulations on firearm purchases and possession, such as background checks for certain types of firearms or limited restrictions on open carry; 4—Relaxed (D): States with few regulations on firearm purchases and possession, including limited background checks and minimal restrictions on firearm types and accessories; and 5—Permissive (E): States with very lax regulations on firearm purchases and possession, including unrestricted open carry and minimal requirements for firearm ownership.

The next IV, aggregate gender distribution of firearm possessors (male; MCGP), was a continuous variable representing the overall count or proportion of male individuals who possessed firearms traced within each state. I accessed data for this variable from a publicly available secondary data repository maintained as part of the Crime Gun Intelligence and Analysis from the National Firearms Commerce and Trafficking Assessment (NFCTA), published by the ATF, and available on www.atf.gov.

This variable reflected the proportion of male firearm possessors in the population and served as a predictor variable in the analysis. The final IV, aggregate gender distribution of firearm possessors (female; FCGP), was a continuous variable representing the overall count or proportion of female individuals who possessed firearms traced within each state. I accessed data for this variable from the same NFCTA repository, and it reflected the proportion of female firearm possessors in the population, serving as a predictor variable in the analysis.

The first DV in this study was a continuous variable representing the total number of firearms traces submitted for the years 2017–2021, accounting for all firearm traces associated with criminal activities during this period for each state. I accessed data for this variable from the NFCTA, where it served as a measure of the prevalence of firearms involved in criminal activities or recovered from crime scenes and was considered an outcome variable. The next DV, the continuous variable representing the total number of perfected firearms traces submitted for the years 2017–2021, encompassed all firearm traces linked to criminal activities that were successfully traced back to their original purchasers for each state. I accessed data for this variable from the NFCTA, where it indicated the effectiveness of law enforcement efforts in tracing firearms to their original purchasers and served as an outcome variable. Finally, the last DV, prevalence of illicit firearm trafficking (straw purchases) for the years 2017–2021, measured continuously, captured instances where individuals purchased firearms, but the firearm was recovered from someone different than the original purchaser. I accessed data for this variable from the NFCTA, which captured instances involving distinct purchasers and possessors, thus

delineating a substantial facet of illicit firearms trafficking. This metric, derived from firearm trace data, indicated a method used to circumvent legal restrictions on firearm ownership and served as an outcome variable.

I selected a nonexperimental approach due to the inability to manipulate the IVs. I employed a cross-sectional design, collecting data from existing samples within the population simultaneously. Additionally, a descriptive-comparative design measured statistical relationships between variables, forming the basis of my study's design.

To address the research question regarding the influence of state gun laws and gender distribution on illicit firearm trafficking, I gathered data from secondary sources, primarily focusing on established databases, reports, and research publications. For the variable "stringency of state gun laws," I consulted legal databases, government websites, and reports from reputable organizations such as the Giffords Law Center or the Law Center to Prevent Gun Violence. For the aggregate gender distribution of firearm possessors, I used demographic data available from government sources such as the U.S. Census Bureau or state-specific demographic databases. Additionally, I referenced research studies or reports analyzing firearm ownership patterns and demographics. For the DVs related to illicit firearm trafficking, such as the "total number of firearm traces" and "number of straw purchases," I relied on data from law enforcement agencies, crime reports, and specialized databases tracking firearm-related incidents. Sources such as the ATF, the FBI, or the NICS provided relevant data on firearm traces, criminal activities, and straw purchase incidents.

By leveraging these secondary data sources, I compiled a comprehensive dataset spanning multiple years and encompassing all 50 U.S. states. This dataset enabled a robust analysis to uncover the relationships between state gun laws, gender distribution, and illicit firearm trafficking, contributing valuable insights to inform evidence-based policies and interventions aimed at reducing firearm-related harm. Given the study's time and resource limitations, I adopted a quantitative nonexperimental cross-sectional correlational design as part of the research design. This approach incorporated statistical tools for data analysis, delivering accurate and timely results without the need for researcher manipulation of variables. Secondary data collection negated the necessity for direct interaction with study participants, resulting in time and resource savings and facilitating a comprehensive understanding of the data phenomenon. Ultimately, this design streamlined the research process, enabling robust statistical analysis to ascertain outcomes.

Methodology

Population, Setting, and Sample

Neuman (2013) stated that researchers must clearly define the population they intend to study, whether a specific demographic group, an organization, or a geographic area. Clarity was essential to ensure that a study's findings would be generalizable to the broader population of interest. When studying firearms trace data, the population in research design referred to the complete set or universe of trace data related to firearms within a specific scope or geographic area. This population included all available data on firearms that had been recovered, traced, and recorded, along with associated details such

as firearm types, serial numbers, recovery dates, and locations. Depending on the study's objectives, I defined the population based on factors like geographic region or time frame (Smith et al., 2017).

For this study, the population under investigation comprised all 50 U.S. states. These states represented a diverse range of geographical, demographic, and sociopolitical characteristics, providing a comprehensive sample for examining the influence of state gun laws and gender distribution on illicit firearm trafficking. Including all 50 states ensured a broad representation across different regions, capturing variations in urban and rural settings, socioeconomic conditions, and cultural factors. By encompassing the entire population of U.S. states, I aimed to capture the full spectrum of legislative approaches to firearm regulation and the corresponding patterns of firearm possession and trafficking. This population-based approach allowed for robust analyses and generalizable findings that could inform policy development and intervention strategies aimed at addressing illicit firearm trafficking on a national scale.

The sample size for this study constituted all 50 U.S. states, embodying a census approach that encompassed the entire population rather than a randomized subset (Lohr, 2019). This inclusive sampling strategy ensured that the sample represented the full spectrum of state-level variation in gun laws, gender distribution, and firearm trafficking patterns across the nation (Lohr, 2019). In contrast to randomized sampling methods typically employed in smaller scale studies, where subsets are randomly selected from a larger population, I adopted a nonrandomized census approach to comprehensively capture data from each state (Lohr, 2019). By utilizing this nonrandomized sampling

method, I enabled a thorough examination of the research questions, leveraging the complete dataset to analyze the impact of state gun laws and gender distribution on illicit firearm trafficking with a high level of representativeness and generalizability (Lohr, 2019).

Power Analysis

Power analysis was crucial to my research design, particularly in this quantitative study. It involved assessing the statistical power of the study, which was the probability that I would correctly detect an actual effect if it existed. Power analysis helped determine if my study could provide meaningful results. At its core, power analysis assessed the statistical power, or the probability of correctly detecting an actual effect or difference when it existed in the population (Cohen, 1988). The counterbalance to Type II error occurred when I failed to identify a genuine effect due to insufficient statistical power (Cohen, 1992).

Power analysis involves three primary components: effect size, sample size, and significance level (alpha). Effect size quantifies the magnitude of the difference or relationship under investigation. A larger effect size increases the likelihood of detection, while a smaller effect size requires a larger sample size to achieve the same power (Cohen, 1988). Sample size represents the study's participants or data points. A larger sample size generally leads to higher statistical power, making it more likely to detect effects if they exist. The significance level, often set at 0.05, determines the threshold for statistical significance. I could adjust alpha levels, but this affected both Type I and Type II error rates (Lakens, 2017).

While statistical significance (*p*-values) informed me if an observed effect was unlikely to have occurred by chance, power analysis addressed these findings' practical significance or real-world relevance. High statistical power ensured that significant results were not merely statistically significant but practically meaningful (Cohen, 1988). A high statistical power (e.g., 0.80 or greater) suggested that my study had a strong likelihood of detecting meaningful effects if they existed, assuming a statistical threshold (alpha) of 0.05. Low statistical power (e.g., less than 0.80) indicated that my study might have limited ability to detect effects, increasing the risk of Type II errors (failing to detect true effects). Inadequate statistical power can lead to inconclusive or misleading results, waste resources, and, in some contexts, expose research participants to unnecessary risks. Ethically, I was obligated to conduct my study with adequate power to detect meaningful effects (Button et al., 2013).

Power analysis involved a delicate balancing act. Increasing sample size to achieve high power could come at the cost of resources, time, or feasibility. I had to consider these trade-offs when designing my study (Button et al., 2013). In this study, I employed G*Power, a widely utilized statistical software package for quantitative researchers, to conduct an a priori sample size analysis (Faul et al., 2009). An a priori power analysis, conducted using G*Power version 3.1.9.7 software, was a crucial step in determining the appropriate sample size to ensure my study's statistical robustness and its ability to detect meaningful effects.

Figure 1

Power Analysis for Multiple Linear Regression (Large Effect Size-3 Predictors)

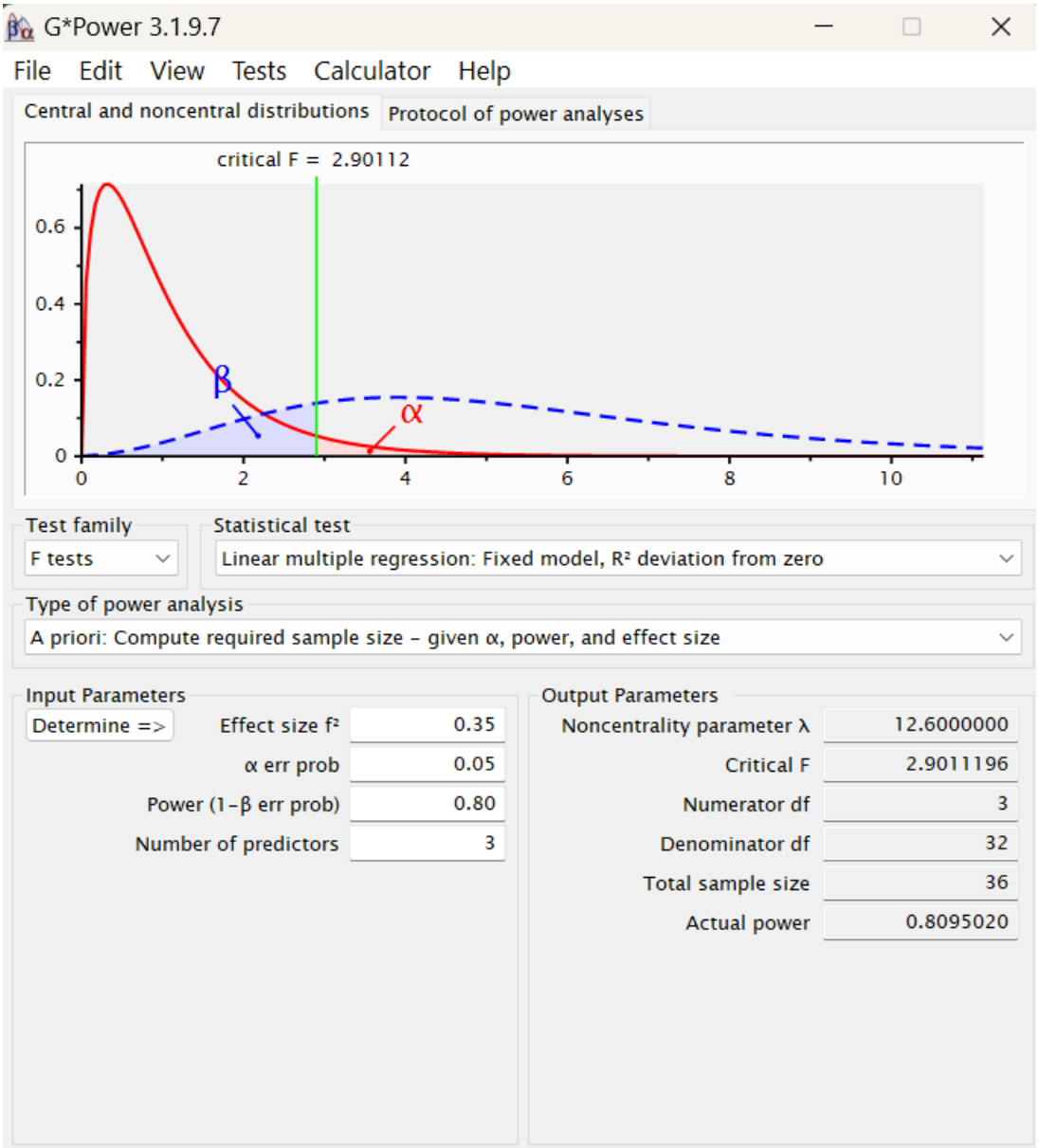
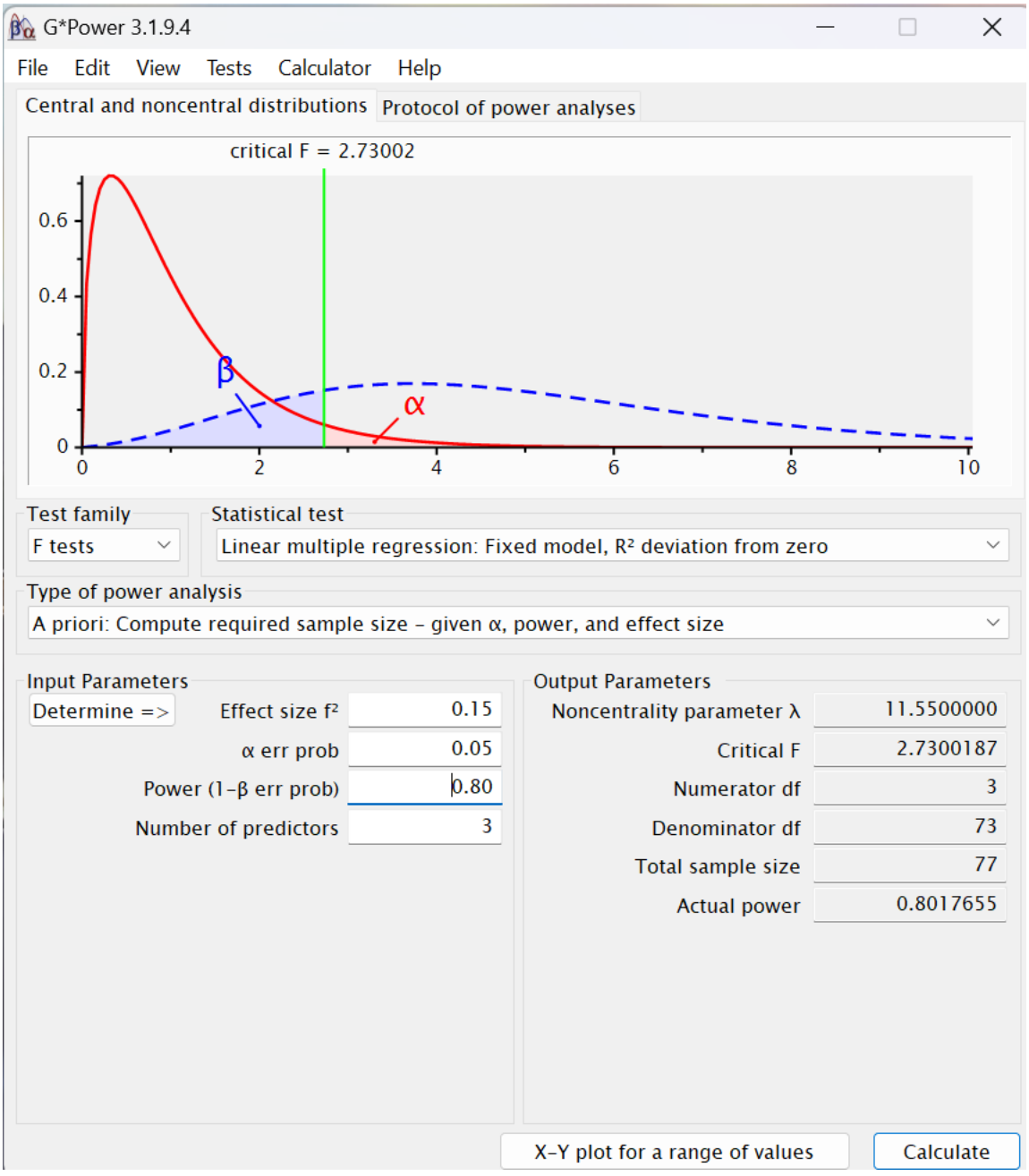


Figure 2

Power Analysis for Multiple Linear Regression (Medium Effect Size-3 Predictors)



Assuming a large effect size (d = 0.35), a significance level (α) of 0.05, and considering three predictor variables, I determined that a minimum sample size of 36

states was required to achieve a statistical power of 0.80. Alternatively, assuming a medium effect size ($d = 0.15$), a significance level (α) of 0.05, and considering three predictor variables, the power analysis has indicated that a minimum sample size of 77 states is needed to achieve a statistical power of 0.80. Consequently, I aimed to collect a dataset comprising between 36 and 77 states.

Determining the ideal sample size for this study has required balancing statistical robustness with the logistical challenges of collecting data from all 50 U.S. states. The study aimed to comprehensively examine the impact of state gun laws and aggregate gender distribution on illicit firearm trafficking. Key aspects of this investigation included analyzing firearm traces and straw purchases as indicators of trafficking activities. Selecting an appropriate sample size has been essential to ensure the findings achieve adequate statistical power while remaining feasible within the practical constraints of data collection across the diverse and expansive United States.

Since both medium and large sample sizes have been deemed appropriate for this study based on the power analysis, and the number of individual U.S. states was capped at 50, selecting between these two options required nuanced consideration. The decision involved weighing the benefits of a larger sample size for increased statistical power against the practical constraints imposed by the limited number of states. Several factors have informed this methodological approach. First, a larger sample size generally provides greater statistical power, enhancing the ability to detect smaller effects or relationships. This has been particularly advantageous when the research question has required identifying subtle differences or associations. However, collecting data from a

larger sample was more resource-intensive, requiring additional time, cost, and effort. It was therefore essential to evaluate whether available resources could sufficiently support data collection on a larger scale.

Another critical consideration has been the balance between precision and generalizability. A larger sample size typically offers greater precision in estimating population parameters but can compromise generalizability if resources are stretched thin across an extensive dataset. Conversely, a medium sample size has struck a better balance, providing sufficient precision while preserving generalizability within practical limitations. Ultimately, the decision between a medium and large sample size was guided by a careful assessment of these factors in relation to the specific research question, objectives, and available resources.

The appropriate sample size for this study was medium to large, as determined through power analysis. The power analysis revealed that both a large sample of 36 and a medium sample of 77 were desirable to detect meaningful effects. However, the number was capped at 50 due to the nature of the variable involving individual U.S. states. Despite this constraint, a sample size of 50 still fell within the range of medium to large samples and has provided sufficient statistical power to explore the influence of state gun laws and aggregate gender distribution on illicit firearm trafficking. This sample size has allowed for a comprehensive examination of the research questions while accommodating the practical limitations of the study's context.

Cohen's effect size, denoted as *d*, has been a valuable statistical measure widely employed in criminology studies to quantify the practical significance of differences or

relationships between variables. Researchers in criminology have often utilized Cohen's d to provide insight into the real-world implications of their research outcomes (Cohen, 1988). Studies relating to the straw purchasing of firearms have applied Cohen's effect size as small to medium (Garcia et al., 2018; Smith et al., 2017) and medium to large (Johnson & Brown, 2020; Johnson & Smith, 2019). Thus, my decision to apply a medium to large effect size is consistent with previous research in this area.

In conclusion, power analysis stands as an indispensable pillar within my research design, serving as a guiding tool in my quest to unearth genuine effects amidst the data. It functions as a vital bridge, spanning the gap between statistical significance and practical relevance, thereby safeguarding the integrity of research outcomes. By meticulously evaluating the probability of detecting substantive effects, power analysis has provided invaluable insights, enhancing the precision and reliability of my investigation. Its judicious application has not only fortified the credibility of my findings but also imbued them with substantive meaning within the broader context of the research inquiry. Thus, power analysis emerges as an essential compass, guiding me through the complex terrain of empirical inquiry and ensuring that my scholarly endeavors resonate with both statistical acumen and real-world significance.

Instrumentation and Operationalization of Constructs

Variable Definitions, Measures, and Scales

Access to firearms: Refers to an individual's ability to obtain and possess firearms, encompassing both legal and illegal means of acquisition, and is influenced by

various factors, including firearm laws, regulations, socioeconomic status, and availability (Kleck, 2015).

Crime gun: A term commonly used in criminal justice and firearms investigations to refer to a firearm used in committing a crime or associated with criminal activities.

Crime prevention strategies: In the context of firearm trafficking and straw purchasing, involve a set of targeted measures and policies designed to deter, disrupt, and mitigate the illegal acquisition and distribution of firearms. These strategies often include enhanced law enforcement efforts, regulatory controls, public awareness campaigns, and community-based initiatives to reduce these illicit activities (ATF, 2023b).

Criminal intent: Also known as *mens rea*; refers to an individual's mental state or subjective intention to engage in actions contrary to the law. It involves a conscious and purposeful mindset where the individual knows their illegal actions and intends to commit a criminal offense (Gardner & Anderson, 2019).

Firearm: The term "firearm" means (a) any weapon (including a starter gun) which will, or is designed to, or may readily be converted to expel a projectile by the action of an explosive; (b) the frame or receiver of any such weapon; (c) any firearm muffler or firearm silencer; or (d) any destructive device. Such a term does not include an antique firearm (U.S. Code, Title 18, § 921(a)(3).

Firearm possessor: An individual possessing a firearm, often recovered at a crime scene or in connection with law enforcement.

Firearm purchaser: An individual or entity that legally acquires a firearm through a legitimate and authorized process, often involving background checks and compliance

with relevant laws and regulations. This term encompasses individuals, businesses, or organizations that go through the proper channels to obtain firearms for various purposes, including personal protection, sporting activities, or business operations (ATF, 2021).

Firearm Trace Report (Summary): A report that provides detailed information about the history and ownership of a specific firearm. It includes data such as the firearm's manufacturer, serial number, date of manufacture, initial point of sale, and subsequent transactions through licensed dealers. Law enforcement agencies often use ATF Firearms Trace Summaries to track the movement of firearms and investigate criminal activities involving firearms traced by the Bureau of Alcohol, Tobacco, Firearms and Explosives. (ATF, 2023a).

Firearm Trace Report (Summary) (Perfected): A report that provides detailed information about the history and ownership of a specific firearm. It includes data such as the firearm's manufacturer, serial number, date of manufacture, initial point of sale, and subsequent transactions through licensed dealers. Law enforcement agencies often use ATF Firearms Trace Summaries to track the movement of firearms and investigate criminal activities involving firearms traced by the Bureau of Alcohol, Tobacco, Firearms and Explosives. A perfected firearms trace report provides comprehensive information about the firearm's journey from its manufacturer to its current possessor. This information typically includes details such as the firearm's make, model, serial number, manufacturer, and distributor. Importantly, a perfected trace report confirms the identification of the last legal purchaser of the firearm, allowing law enforcement to

establish a direct link between the firearm and its possessor at the time of the crime. (ATF, 2023a).

Firearm trafficking: Refers to the illegal and often covert activity of acquiring, transporting, selling, or transferring firearms across geographic areas or borders, typically for unlawful purposes. It involves the movement of firearms from areas with less restrictive gun laws to those with stricter regulations, with the intent of evading legal restrictions or supplying firearms to prohibited individuals (Smith & Brown, 2017).

Gender dynamics: Encompass the complex interplay of social and cultural factors that shape and define the roles, behaviors, and expectations associated with individuals based on their gender identity, influencing their experiences and interactions within society (Connell, 2014).

Illegal firearm possession: Refers to the unauthorized ownership, possession, or control of firearms by individuals who are legally prohibited from acquiring or having access to firearms, often due to prior criminal convictions, restraining orders, or other legal restrictions (Cook & Goss, 2014).

Intersectionality: Intersectionality is a concept that recognizes how the interplay of multiple social categories, such as gender, race, and socioeconomic status, shapes individuals' experiences and social positions. It emphasizes that these intersecting identities can result in unique and compounded experiences of privilege and discrimination, influencing an individual's access to resources, opportunities, and social outcomes (Schwartz, 2021).

Legal framework: Governing firearm sales, possession, and transfer, encompasses a structured system of laws, regulations, and statutes established by federal, state, and local government authorities to regulate and oversee the acquisition, ownership, possession, transfer, and utilization of firearms within their respective jurisdictions. This framework includes specific regulations and ordinances relevant to Detroit's firearm policies and practices (Cook & Ludwig, 2018).

Peer influence: Refers to the impact that individuals within one's peer group, such as friends, acquaintances, or colleagues, can exert on an individual's attitudes, behaviors, or decisions. It involves the process of social interaction and conformity to group norms, which can lead to changes in one's own beliefs or actions (Matsueda & Drakulich, 2018).

Risk perception: Within the context of firearm-related behaviors, refers to an individual's subjective evaluation and cognitive assessment of the potential hazards, dangers, and adverse outcomes of firearm possession, use, or mishandling. It involves the individual's judgment regarding the likelihood and seriousness of various risks associated with firearms-related activities (Lerner et al., 2003).

Socioeconomic factors: Encompass the social and economic conditions that individuals and communities experience, including income, education, employment status, access to resources, and other related factors. These factors collectively influence individuals' well-being, opportunities, and life trajectories within a society (Gius, 2018).

Straw purchasing a firearm: (a) Straw purchasing a firearm is the unlawful act where an individual who meets the legal requirements for purchasing firearms under existing regulations acquires a firearm intending to transfer it to another person legally

prohibited from owning or buying firearms. This practice bypasses background checks and evades legal restrictions (ATF, 2023c). (b) Straw purchasing a firearm refers to the illegal act where an individual legally eligible to purchase firearms under existing laws buys a firearm on behalf of someone legally prohibited from acquiring one. The purchaser, often known as the "straw buyer," then transfers the firearm to the prohibited individual, effectively circumventing background checks and legal restrictions (Cook & Goss, 2014). (c) Straw purchase of a firearm is when the firearm was recovered from a male but was initially purchased by a female (Cook et al., 2015).

Table 1

Variable Measures and Scales

Variable	Measure	Scale
Stringency of Firearms Laws in Each State (IV)	Categorical	Ordinal
Aggregate Distribution of Male Firearm Possessors (MCGP) (IV)	Continuous	Continuous
Aggregate Distribution of Female Firearm Possessors (FCGP) (IV)	Continuous	Continuous
Total Number of Traces (DV)	Continuous	Continuous
Total Number of Perfect Traces (DV)	Continuous	Continuous
Number of Straw Purchases (DV)	Continuous	Continuous

Data Analysis Plan

I used multiple linear regression analysis to assess whether there was a significant relationship between the stringency of state gun laws, the aggregate gender distribution of firearm possessors, and the prevalence of illicit firearm trafficking. This analysis enabled the evaluation of the null hypothesis, which posited no significant relationship, against the alternative hypothesis, which suggested a significant relationship. Multiple linear regression has been widely used as a statistical method to analyze the relationship

between a DV and two or more IVs. It extends the principles of simple linear regression, which examines the relationship between a DV and a single IV, to cases where multiple predictors are involved. I used IBM Statistical Product and Service Solutions (SPSS) v28 software to analyze the data in this study.

Francis Galton, a prominent British scientist renowned for his contributions to various fields, including statistics, psychology, and genetics, has been credited with pioneering the concept of regression analysis in the late 19th century. Galton's groundbreaking work laid the foundation for the subsequent development of multiple linear regression techniques, marking a significant advancement in the field of statistical analysis (Galton, 1886).

In multiple linear regression analysis, the goal has been to develop a predictive model that best explains the variation in the dependent variable (DV) based on the predictors. This technique calculates the coefficients for each IV, indicating the strength and direction of their relationship with the DV while controlling for the effects of other predictors. Multiple linear regression is suitable when there are multiple IVs and multiple DVs. Additionally, it can control for confounding variables by including them as predictors in the model. Researchers have commonly used multiple linear regression to explore complex associations and identify significant predictors of outcomes of interest (Hair, Black, Babin, & Anderson, 2019; Field, 2013; Tabachnick & Fidell, 2019).

Before commencing any analysis, I conducted rigorous pre-processing procedures on the secondary data gathered to ensure accuracy, consistency, and reliability. This process involved several key steps to address potential issues such as outliers or missing

data elements. First, I applied data cleaning techniques to identify and rectify any inconsistencies or errors within the dataset, including checking for data entry errors, resolving discrepancies in coding or formatting, and verifying the accuracy of variable labels and values. Next, I conducted thorough data validation procedures to assess the integrity and reliability of the dataset by cross-referencing the collected data with external sources or established standards to confirm its accuracy and completeness. Any discrepancies or anomalies detected during this process were investigated and resolved accordingly.

I employed outlier detection methods to identify data points that significantly deviated from the overall pattern of the dataset. Outliers, which could distort statistical analyses, were carefully evaluated to determine their impact on the analysis, and appropriate measures were taken, such as removing or transforming them if necessary. Additionally, I addressed missing data elements through imputation techniques or exclusion criteria to ensure that all relevant information was appropriately accounted for in the analysis. Missing data has been recognized as a potential source of bias that can reduce the accuracy of statistical estimates, so I made efforts to minimize its impact on the results. Overall, I conducted thorough data cleaning, validation, outlier detection, and missing data handling procedures to enhance the accuracy, reliability, and consistency of the secondary data, thereby laying a solid foundation for subsequent analyses and interpretation.

Outliers have been defined as data points that significantly deviate from the overall pattern of the data and can have a disproportionate influence on the results of

regression analysis. Therefore, it has been essential to identify and handle outliers appropriately to ensure the validity and reliability of the regression model. In multiple linear regression, outliers could distort the estimated relationships between the IVs and the DVs, leading to biased parameter estimates and inaccurate predictions. Outliers can arise due to measurement errors, data entry mistakes, or genuine extreme observations in the data.

Addressing outliers in multiple linear regression typically involved several steps. First, I identified outliers using graphical methods (e.g., scatterplots, residual plots) and statistical techniques (e.g., Cook's distance, studentized residuals). Next, I evaluated the potential impact of outliers on the regression model by examining how their inclusion or exclusion affected the model's coefficients, goodness-of-fit measures, and predictive accuracy. Options have included excluding outliers from the analysis, transforming variables to reduce their influence, or conducting robust regression techniques that are less sensitive to outliers. I also conducted sensitivity analyses to check the strength of the regression results when outliers were present, repeating the analysis with and without outliers to assess the stability of the findings. Finally, I documented the decisions made regarding outlier handling and discussed how these decisions might have affected the interpretation of the regression results.

By addressing outliers effectively, I improved the accuracy and reliability of the multiple linear regression analysis, leading to more valid conclusions and actionable insights. Upon detecting outliers, I considered different strategies, such as trimming the dataset by removing the outliers or transforming the outlier values to align with the mean

or median of the dataset. Addressing missing data depended on the extent of the gaps. If the missing data constituted less than 3.29% of the total dataset, I chose to omit those data points. However, if the missing data exceeded 3.29%, I adopted a random imputation approach using SPSS software, as recommended by Warner (2013).

Multiple linear regression analysis relied on several key assumptions for its validity and interpretation. These assumptions have been crucial considerations in the field of regression analysis (Field, 2013; Osborne, 2014; Tabachnick & Fidell, 2019). First, the assumption of linearity posited that the relationship between each IV and the DV was linear, ensuring consistent effects across variable values. The assumption of independence presupposed that observations or cases in the dataset were independent of each other, without systematic relationships between residuals (Field, 2013). Normality, another assumption, required residuals to approximate a normal distribution, with the majority clustered around zero and fewer at the distribution extremes. Homoscedasticity demanded that the variance of residuals remain constant across IV values (Field, 2013; Tabachnick & Fidell, 2019).

Multicollinearity occurred when IVs were highly correlated, potentially inflating standard errors and affecting coefficient estimates. Furthermore, the assumption of no perfect collinearity stipulated that no IVs were perfectly correlated (Field, 2013; Tabachnick & Fidell, 2019). Lastly, the assumption of no outliers or influential cases required that no data points disproportionately affect the analysis results (Field, 2013; Osborne, 2014). These assumptions underpinned the integrity of multiple linear regression analysis, guiding me in ensuring the robustness and reliability of my findings.

Adhering to these assumptions enhanced the validity of the regression results and facilitated accurate interpretation (Field, 2013; Osborne, 2014; Tabachnick & Fidell, 2019).

In this study, I employed multiple linear regression analysis to explore the complex dynamics of illicit firearm trafficking across 50 U.S. states. The investigation focused on elucidating the impact of three IVs on the phenomenon: the stringency of state gun laws, the aggregate distribution of male firearm possessors, and the aggregate distribution of female firearm possessors. The study aimed to understand how these factors influenced three primary outcome measures: the total number of firearm traces, the incidence of perfected traces, and the frequency of straw purchases. Through multiple linear regression, I sought to disentangle the complex interactions between these IVs and the DVs, providing insights into the underlying dynamics driving illicit firearm trafficking.

The multiple linear regression equation for this study incorporated each DV as a separate outcome variable and included all IVs as predictor variables. This equation estimated how changes in the IVs were associated with changes in each DV while controlling for the effects of other variables in the model. Each regression coefficient in the model represented the estimated change in the DV for a one-unit change in the corresponding IV, while holding other variables constant. The *p*-value associated with each regression coefficient indicated the probability of observing the estimated coefficient value or more extreme values under the assumption that the null hypothesis was true. A small *p*-value (< 0.05) suggested that the regression coefficient was

statistically significant. Metrics such as R-squared (R^2) evaluated the overall fit of the regression model, denoting the proportion of variance in the DV explained by the IVs.

As previously discussed, it was essential to meticulously address the assumptions of multiple linear regression, including linearity, independence, normality of residuals, homoscedasticity, absence of multicollinearity, and influential outliers, given the complexity of the model with multiple IVs and DVs. Interpreting the results entailed evaluating the significance of each IV's effect on each DV and assessing the practical implications of these findings for understanding illicit firearm trafficking across U.S. states. Overall, multiple linear regression analysis served as a robust method for exploring the relationships between multiple IVs and DVs in this research, facilitating valuable insights into the factors influencing illicit firearm trafficking.

Mathematically:

Null Hypothesis (H_0) : $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$

Alternative Hypothesis (H_A): At least one β_i is not equal to 0

In the multiple linear regression model, the regression coefficients ($\beta_1, \beta_2, \beta_3, \beta_4$, and β_5) provided estimates of the direction and magnitude of the relationship between each IV and the DVs. These coefficients quantified how much the DV was expected to change for a one-unit increase in the corresponding IV, holding all other variables constant. For instance, a positive coefficient indicated that an increase in the IV was associated with an increase in the DV, while a negative coefficient suggested an inverse relationship.

The significance of each regression coefficient was evaluated using *p*-values, which tested the null hypothesis that the coefficient equaled zero. A small *p*-value (< 0.05) provided evidence to reject the null hypothesis, indicating that the corresponding IV had a statistically significant effect on the DV. Conversely, a *p*-value greater than 0.05 suggested insufficient evidence to reject the null hypothesis, implying no significant relationship between the IV and the DV.

Additionally, the overall fit of the regression model was assessed using metrics such as R^2, which denoted the proportion of variance in the DV explained by the IVs collectively. An R^2 value closer to 1 indicated that the model explained a greater proportion of the variance, while lower values suggested that additional factors not included in the model might influence the DV. These metrics, along with the regression coefficients and their significance levels, provided comprehensive insights into the relationships being examined in this study.

Research Questions and Hypotheses

This study was structured around three primary research questions, each examining key factors influencing illicit firearm trafficking:

RQ1a: How does the stringency of state gun laws influence the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor)?

Null Hypothesis ($H_0$1a): There is no statistically significant relationship between the stringency of state gun laws, measured on a categorical scale from permissive to stringent, and the prevalence of illicit firearm trafficking, as measured by the total

number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor).

Alternative Hypothesis (H_A1a): There is a statistically significant relationship between the stringency of state gun laws, measured on a categorical scale from permissive to stringent, and the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor).

RQ1b: How does the aggregate gender distribution of male firearm possessors influence the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor)?

Null Hypothesis ($H_0 1b$): There is no statistically significant relationship between the aggregate gender distribution of male firearm possessors influence and the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor).

Alternative Hypothesis (H_A1b): There is a statistically significant relationship between the aggregate gender distribution of male firearm possessors influence and the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor).

RQ1c: How does the aggregate gender distribution of female firearm possessors influence the prevalence of illicit firearm trafficking, as measured by the total number of

firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor)?

Null Hypothesis ($H_0$1c): There is no statistically significant relationship between the aggregate gender distribution of female firearm possessors influence and the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor).

Alternative Hypothesis (H_A1c): There is a statistically significant relationship between the aggregate gender distribution of female firearm possessors influence and the prevalence of illicit firearm trafficking, as measured by the total number of firearm traces, perfected firearm traces, and straw purchases (different purchaser and possessor).

Threats to Validity

Threats to External Validity

In this section, I examined the crucial influence of research design on the external validity of investigations into the impact of the stringency of state gun laws and the aggregate gender distribution of male and female firearm possessors on the prevalence of illicit firearm trafficking. External validity refers to the extent to which research findings can be generalized across diverse contexts, including different times, settings, or populations (Shadish et al., 2002). My aim was to ensure that the results could be generalized to the broader population, even if that population was not explicitly studied. The closer a study resembles real-world conditions, the stronger its external validity becomes (Trochim & Donnelly, 2008).

In the context of investigating the influence of the stringency of state gun laws and the aggregate gender distribution of male and female firearm possessors on the prevalence of illicit firearm trafficking, research design and the management of threats to external validity have emerged as critical considerations. Selecting an appropriate research design has played a pivotal role in shaping the quality and generalizability of my study's findings. For example, in exploring the relationships outlined in my research questions, I determined that a quantitative cross-sectional correlational design provided a structured approach for comprehensive data collection and analysis (Babbie, 2017).

While investigating my research question, I identified one potential external threat to validity: the experimenter effect, where my influence could inadvertently affect participants or data. To mitigate this threat, I have utilized well-defined variable definitions derived from existing studies on firearm straw purchasing by males and females (Trochim & Donnelly, 2008). By incorporating these established definitions, I have aimed to minimize the risk of experimenter-induced bias and enhance the external validity of my findings

Threats to Internal Validity

Internal validity, a cornerstone of research methodology, denotes the degree to which observed effects accurately reflect the influence of manipulated or measured variables, free from interference by confounding factors. In the context of my research question, meticulous consideration of potential threats to internal validity was imperative. These threats included selection bias, where nonrandom participant selection could skew sample representation; history, referring to external events impacting study outcomes;

maturation, involving changes in participants over time; instrumentation, resulting from measurement inconsistencies; and regression to the mean, where extreme scores tended to normalize irrespective of interventions. By addressing these threats through rigorous design and methodology, I have aimed to fortify the internal validity of my study, ensuring that research outcomes reliably reflect the effects of the variables under examination. Such vigilance not only bolstered the credibility of my findings but also advanced scientific knowledge by fostering valid conclusions within the research domain.

Instrumentation was another potential threat to internal validity, arising from inconsistencies in the tools or methods used to measure the IVs and DVs. To address this, I ensured that all measurement tools and coding processes were standardized and validated against established methodologies to maintain consistency and reliability throughout the study (Shadish et al., 2002). Additionally, regression to the mean presented a risk, particularly if extreme values in the data tended to normalize over time, potentially distorting the observed relationships between the IVs and DVs. I mitigated this threat by carefully examining and controlling for extreme data points during the analysis, ensuring that findings accurately reflected the underlying relationships (Trochim & Donnelly, 2008). By systematically addressing these threats to internal validity, I strengthened the robustness of my study's design and ensured that the observed relationships between the IVs and DVs were not confounded by extraneous factors. These measures enhanced the credibility of my findings and supported the development of valid and actionable conclusions regarding illicit firearm trafficking across U.S. states.

Next, I addressed instrumentation concerns. Alterations in measurement methods or instruments, such as adjustments to criteria for categorizing gun laws, could have introduced bias or errors into the data. To counteract this threat, I maintained consistency in measurement procedures and validated measurement tools throughout the study (Shadish et al., 2002). Finally, addressing regression to the mean was essential. Extreme values observed in one period might naturally gravitate toward the average in subsequent periods, potentially diminishing observed effects. To tackle this challenge, I employed statistical techniques, such as controlling for baseline levels of firearm trafficking, to ensure the stability of the observed relationships (Trochim & Donnelly, 2008).

By acknowledging and addressing these potential threats to internal validity, I enhanced the credibility and reliability of my findings regarding the relationship between state gun laws, gender distribution, and illicit firearm trafficking across U.S. states.

Threats to Construct Validity

Statistical conclusion validity referred to the degree to which the conclusions drawn from a statistical analysis were accurate and reliable. Several threats could compromise statistical conclusion validity. To mitigate these threats in this quantitative analysis, which examined the impact of state gun laws and gender distribution on illicit firearm trafficking in the United States from 2017 to 2021, I took several key steps.

First, I ensured that the study had adequate statistical power to detect meaningful effects by conducting a priori power analyses and using an appropriate sample size (Cohen, 1988). A sufficient sample size reduced the risk of Type II errors and increased the likelihood of detecting true relationships between the IVs and DVs. Second, I

addressed potential issues related to data quality by performing rigorous data cleaning and validation procedures to ensure accuracy and consistency in the dataset. Third, I used statistical methods appropriate for the level of measurement and distribution of the data, ensuring that the assumptions of multiple linear regression were met. This included assessing linearity, independence, normality, homoscedasticity, and multicollinearity (Field, 2013; Tabachnick & Fidell, 2019).

Additionally, I conducted sensitivity analyses to examine the stability of the regression results under different conditions, such as the inclusion or exclusion of outliers. These analyses helped confirm the robustness of the findings and ensured that the statistical conclusions were not unduly influenced by specific data points or model assumptions. By systematically addressing these threats, I enhanced the reliability and validity of the statistical conclusions drawn from this study. I also evaluated the validity of the data source to ensure it accurately represented the variables under investigation. Construct validity was supported by the fact that the information in firearms trace reports accurately captured key constructs related to illicit firearm trafficking, such as patterns of straw purchasing and firearm recovery. Additionally, content validity was reinforced by the comprehensive nature of the trace reports, which included all relevant details needed to analyze firearm trafficking trends effectively.

To enhance the credibility of the findings, I employed rigorous data cleaning techniques to identify and address any inconsistencies or anomalies in the dataset. These procedures included cross-referencing firearms trace reports with related case details to confirm accuracy and ensure alignment across multiple records. I also accounted for

potential biases in the trace data, such as underreporting or discrepancies arising from variations in reporting practices across jurisdictions. By addressing these issues, I bolstered the overall reliability and validity of the data used in the analysis.

Furthermore, I implemented robust statistical procedures to assess the relationships between state gun laws, gender distribution, and illicit firearm trafficking. These included testing for assumptions of multiple linear regression, such as linearity, independence, normality, homoscedasticity, and multicollinearity. Each assumption was carefully evaluated to ensure the integrity of the regression results (Field, 2013; Tabachnick & Fidell, 2019). Sensitivity analyses were also conducted to examine how variations in data or methodological choices impacted the study's conclusions, providing additional confidence in the robustness of the findings. By employing these rigorous methodological approaches and leveraging reliable data sources, I ensured that the results of this study were both credible and meaningful, contributing valuable insights into the factors influencing illicit firearm trafficking across the United States.

To address these limitations and enhance construct validity, I carefully reviewed the operational definitions of the variables and ensured they aligned with the theoretical constructs being measured. For state gun laws, I supplemented the categorical classification with a review of legislative texts and enforcement data to better capture nuances in stringency and application. This approach aimed to reduce measurement bias by providing a more comprehensive understanding of the variability in gun laws across states (Shadish et al., 2002).

Regarding gender distribution, while aggregate counts of male and female firearm possessors were the primary metric, I acknowledged the limitations inherent in this binary categorization. Although data on nonbinary and transgender individuals were not available within the trace reports, I recognized this as a gap in the operationalization of gender-related variables. This limitation was documented as part of the study's scope and implications for future research. Addressing these concerns allowed for greater transparency in the methodological choices and highlighted areas where future studies could improve measurement precision (Trochim & Donnelly, 2008).

Additionally, I implemented rigorous data validation procedures to mitigate the impact of incomplete or missing information within firearms trace reports. These procedures included identifying patterns of missing data, analyzing their potential influence on the study's findings, and using imputation techniques or exclusion criteria as appropriate. By systematically addressing these threats to construct validity, I sought to ensure that the variables accurately reflected the constructs of interest and that the study's findings were meaningful and reliable. To mitigate these limitations, I implemented strategies to address potential measurement errors and enhance the validity of the secondary data. First, I conducted a thorough review of the data collection procedures and reporting practices across jurisdictions to identify potential inconsistencies or biases. This review allowed for the identification of patterns in the data that might indicate systematic errors or underreporting, which were documented and accounted for during the analysis.

Second, I employed statistical techniques to control for variations in data quality, such as sensitivity analyses that examined the impact of including or excluding data from jurisdictions with differing reporting standards. These analyses helped assess the robustness of the findings and reduced the influence of inconsistent data on the study's conclusions.

Third, I acknowledged the limitations of the temporal scope and contextualized the findings within the specific timeframe of 2017-2021. While the study focused on this period, I highlighted the potential for changes in legislation, enforcement, and social factors to influence the relationships between state gun laws, gender distribution, and illicit firearm trafficking. This acknowledgment provided transparency and set the stage for future research to examine these dynamics over extended or different time periods (Trochim & Donnelly, 2008).

By implementing these measures, I sought to minimize the impact of measurement error and temporal limitations on the validity and reliability of the study's findings. These steps ensured that the conclusions drawn were as accurate and meaningful as possible within the scope of the available data and the study's design. Recognizing the potential for measurement error and bias, I also documented the limitations in the operationalization of key variables, such as the categorization of state gun laws and the measurement of gender distribution. This transparency not only enhanced the credibility of my study but also provided a framework for future research to refine and expand upon these constructs.

To further strengthen construct validity, I triangulated findings by comparing them with existing literature and theoretical frameworks. This approach helped contextualize the results within the broader field of research on illicit firearm trafficking and validated the study's conclusions against established knowledge. For example, findings related to the influence of state gun laws aligned with prior studies that have demonstrated correlations between legislative stringency and reduced firearm trafficking (Cook & Ludwig, 2000; Webster et al., 2013). By employing these rigorous methodological approaches, I sought to minimize the influence of potential construct validity threats and ensure that the relationships observed between the IVs and DVs were meaningful and reliable. These efforts enhanced the study's contribution to understanding the complex dynamics of illicit firearm trafficking across U.S. states.

Ethical Procedures

To further ensure ethical rigor, I implemented measures to minimize any potential biases or misinterpretations that could arise during data analysis. This included conducting sensitivity analyses to account for variations in the data and documenting any assumptions or decisions made during the analytical process. By doing so, I adhered to the principle of transparency, ensuring that the conclusions drawn from the data were both credible and ethically sound. Additionally, I addressed potential ethical challenges related to the interpretation and dissemination of findings. I was mindful of how the results of this study could influence public policy, perceptions, or actions regarding state gun laws and gender distribution. Ethical considerations required careful framing of the findings to avoid stigmatizing any groups or perpetuating misconceptions. I ensured that

all interpretations and conclusions were supported by the data and aligned with the study's objectives, avoiding overgeneralizations or unwarranted claims.

This study was approved by the Institutional Review Board (IRB) of Walden University under approval number 04-25-24-0659377, granted on April 25, 2024. All procedures were conducted in accordance with the ethical standards set forth by the IRB and applicable regulations. By adhering to these ethical procedures, I reinforced the integrity of the research process and contributed to the broader field of knowledge on illicit firearm trafficking. This commitment to ethical rigor not only safeguarded the rights and privacy of individuals represented in the secondary data but also enhanced the credibility and societal relevance of my study.

Summary

In summary, Chapter 3 detailed the research design, methodology, data sources, and analytical techniques employed to examine the relationships between state gun laws, gender distribution, and illicit firearm trafficking in the United States from 2017 to 2021. This chapter also addressed considerations for ensuring validity, reliability, and ethical rigor throughout the research process, including measures taken to mitigate potential threats to internal and construct validity.

Chapter 4 transitions from methodology to analysis, presenting the results of the statistical analyses that were performed to address the research questions and hypotheses. This chapter begins by outlining the data collection and preparation processes, including descriptive statistics that summarize the dataset. Following this, I provide a detailed examination of the assumptions underlying multiple linear regression to ensure the

robustness of the analyses. The core of Chapter 4 focuses on the results of the multiple linear regression analyses, which evaluated the relationships between the IVs and DVs. These results are accompanied by visual representations, such as tables and figures, to enhance clarity and understanding. The chapter concludes by summarizing the key findings, providing a foundation for the interpretation and implications discussed in Chapter 5.

Chapter 4: Analysis

Introduction

The purpose of this study was to investigate how the stringency of state gun laws and the aggregate gender distribution of male and female firearm possessors influenced illicit firearm trafficking across 50 U.S. states using data from 2017 to 2021. To achieve this, three research questions were posed, each with corresponding null and alternative hypotheses.

The first research question (RQ1a) aimed to determine how the stringency of state gun laws, categorized into five distinct levels (stringent, moderate, limited, relaxed, and permissive), affected the prevalence of illicit firearm trafficking, as measured by firearm traces, perfected firearm traces, and straw purchases. The null hypothesis ($H_0$1a) posited that there would be no significant relationship between the stringency of state gun laws and firearm trafficking, while the alternative hypothesis (H_A1a) suggested that gun law stringency would have a significant effect on illicit firearm trafficking.

The second research question (RQ1b) explored whether the aggregate gender distribution of male firearm possessors influenced the prevalence of illicit firearm trafficking. The null hypothesis ($H_0$1b) proposed that there would be no significant relationship between male firearm possessors and firearm trafficking, while the alternative hypothesis (H_A1b) predicted that male firearm possessors would have a significant effect on illicit firearm trafficking.

The third research question (RQ1c) examined the impact of the aggregate gender distribution of female firearm possessors on illicit firearm trafficking. The null hypothesis

($H_0$1c) posited that there would be no significant relationship between female firearm possessors and firearm trafficking, whereas the alternative hypothesis (H_A1c) predicted that female firearm possessors would have a significant effect on illicit firearm trafficking.

These research questions and hypotheses framed the investigation of how both legislative and demographic factors shaped the illicit trafficking of firearms across U.S. states, using firearm traces, perfected firearm traces, and straw purchases as key indicators. The decision to use three distinct research questions, rather than the single research question originally submitted, was made to provide a more focused and nuanced analysis of each IV's effect on illicit firearm trafficking. With the separation of the stringency of state gun laws, the aggregate gender distribution of male firearm possessors, and the aggregate gender distribution of female firearm possessors into individual research questions, each variable's unique influence could be more clearly examined. This approach allowed for a deeper understanding of how each factor independently contributed to the total number of firearm traces, perfected firearm traces, and straw purchases, while avoiding the complexity of interpreting multiple IVs within a single, overarching research question.

This analysis chapter is structured to first present the complete descriptive data for all variables, providing a comprehensive foundation for the study. Following the descriptive data section, the chapter addresses the assumptions of the regression models, ensuring that key assumptions—such as linearity, normality of residuals, homoscedasticity, independence, and multicollinearity—are adequately evaluated prior to

the presentation of the regression models. For each DV (DV1a, DV1b, and DV1c), the analysis is conducted in multiple stages: First, the regression models controlling for Category A (stringent) are presented, followed by models with standardized variables, and finally, models with the removal of specific variables to address multicollinearity concerns. Subsequently, the regression analysis conducted controlling for Category E (permissive) is presented, followed by models with standardized variables and models with the removal of specific variables to address multicollinearity concerns.

For each regression model, the section includes a detailed discussion of the results, explaining how the models were tested, what steps were taken to address any violations of assumptions, and how these violations may impact the analysis. Limitations are also considered at each stage. This process is repeated for each DV, ensuring a thorough and systematic analysis for DV1a, DV1b, and DV1c.

This chapter concludes with a synthesis of the findings for each research question, summarizing the impact of the stringency of state gun laws, the aggregate gender distribution of male firearm possessors, and the aggregate gender distribution of female firearm possessors on illicit firearm trafficking. This structured approach provides clarity and depth to the analysis while ensuring that both the methodological rigor and the findings are thoroughly addressed.

Data Collection

The secondary data for this study were collected across 50 U.S. states from 2017 to 2021, focusing on variables related to illicit firearm trafficking. Data on firearm traces, perfected firearm traces, and straw purchases were obtained from the ATF and its

website, offering a detailed overview of trafficking patterns. Additionally, data on the stringency of state gun laws were sourced from the Giffords Center (www.giffords.org), which not only categorizes states based on their legislative strictness regarding firearm regulations, but also incorporates public health statistics, including firearm deaths, from the CDC. This dual approach provides a more comprehensive perspective on the impact of gun laws by combining legal frameworks and public health outcomes. Demographic data were also included, focusing on the aggregate gender distribution of male and female firearm possessors. There were no discrepancies in the data collection process, as outlined in the previous chapter. These descriptive statistics form the foundation for analyzing how legislative and demographic factors influence illicit firearm trafficking.

The sample used in this study consists of secondary data collected across all 50 U.S. states from 2017 to 2021, which provides comprehensive coverage and allows for a high degree of external validity. Because the data represent the entire population of U.S. states, the sample is fully representative of the population of interest—state-level firearm trafficking activities. By including all states and not relying on a limited sample, this approach avoids the limitations of nonprobability sampling and enhances the generalizability of the findings. The inclusion of key variables, such as firearm traces, perfected firearm traces, straw purchases, and the stringency of state gun laws, ensures that the data accurately reflect the variations in legislative and demographic factors across the country, providing a proportional and reliable basis for understanding patterns of illicit firearm trafficking.

Treatment Fidelity and Adverse Events

In the treatment of the data, a dual approach was adopted to enhance the robustness of the analysis by running the dummy variables twice—once controlling for the most restrictive category (stringent [A]) and once for the most permissive category (permissive [E]). This method allowed for a comparison of the extremes and provided a clearer understanding of how other categories of gun law stringency (moderate, limited, relaxed) compared to these extremes. Running the dummy variables for both the strictest and most lenient laws was particularly beneficial in identifying whether certain categories had a more pronounced effect on firearm trafficking.

This approach ensured robustness, as analyzing the data with different reference categories offered a more comprehensive view of the relationships between variables, reducing potential bias from focusing on a single reference group. The dual analysis strengthened the dissertation by thoroughly examining the impact of gun law stringency on firearm trafficking from different perspectives. No adverse events occurred in this study, as it involved secondary data analysis and did not implement any direct interventions or treatments involving participants.

Results

Descriptive Statistics

Descriptive statistics were calculated for the three IVs and three DVs. The results are summarized in Table 2 and Table 3.

Table 2

Descriptive Statistics for Dependent, Independent, and Dummy Variables

Variable	*N*	Minimum	Maximum	Mean	Std. deviation
Dependent variable					
Total number of traces (DV1a)	50	1,194	90,2225	54,352.98	130,242.42
Total number of perfected traces (DV1b)	50	718	14,7443	29,420.92	33,483.74
Number of straw purchases (DV1c)	50	480	86,505	17,171.98	18,522.30
Independent variables					
Dummy variables for strictness of firearms laws in each state (IV1a)					
Strictness of gun laws—Stringent (A) dummy	50	0.00	1.00	0.22	0.42
Strictness of gun laws—Moderate (B) dummy	50	0.00	1.00	0.16	0.37
Strictness of gun laws—Limited (C) dummy	50	0.00	1.00	0.08	0.27
Strictness of gun laws—Relaxed (D) dummy	50	0.00	1.00	0.12	0.33
Strictness of gun laws—Permissive (E) dummy	50	0.00	1.00	0.42	0.50
Aggregate distribution of male firearm possessors (MCGP; IV1b)	50	669	135,432	27,077.62	30,973.54
Aggregate distribution of female firearm possessors (FCGP; IV1c)	50	49	12,385	2,343.30	2,584.63

Table 3

Descriptive Statistics for Standardized Variables

Variable	*N*	Minimum	Maximum	Mean	Std. deviation
Zscore aggregate distribution of male firearm possessors (MCGP; IV1b)	50	-0.85	3.50	0.00	1.00
Zscore aggregate distribution of female firearm possessors (FCGP; IV1c)	50	-0.89	3.89	0.00	1.00

The descriptive statistics for the three DVs, three IVs, and dummy variables representing the stringency of state gun laws were calculated and summarized. For the DVs, the total number of traces (DV1a) ranged from 1,194 to 902,225, with a mean of 54,352.98 and a standard deviation of 130,242.42. The total number of perfected traces (DV1b) had a range from 718 to 147,443, with a mean of 29,420.92 and a standard deviation of 33,483.74. The number of straw purchases (DV1c) ranged from 480 to 86,505, with a mean of 17,171.98 and a standard deviation of 18,522.30.

Regarding the IVs, the stringency of state gun laws was represented by five categories. The stringent (A) category had a mean of 0.22 with a standard deviation of 0.42, while the moderate (B) category had a mean of 0.16 and a standard deviation of 0.37. The limited (C) category showed a mean of 0.08 with a standard deviation of 0.27. For the relaxed (D) category, the mean was 0.12, and the standard deviation was 0.33. The permissive (E) category had a mean of 0.42 and a standard deviation of 0.50.

In addition to the dummy variables, the aggregate distribution of firearm possessors was analyzed. The aggregate distribution of male firearm possessors (MCGP; IV1b) had a mean of 27,077.62 and a standard deviation of 30,973.54, while the aggregate distribution of female firearm possessors (FCGP; IV1c) had a mean of 2,343.30 with a standard deviation of 2,584.63. After standardizing these variables, both had a mean of 0.00 and a standard deviation of 1.00. The *Z*-score for MCGP ranged from -0.85 to 3.50, while the *Z*-score for FCGP ranged from -0.89 to 3.89. These descriptive statistics provide a detailed overview of the distributions and variability of the dependent and IVs, setting the foundation for further analysis.

Multiple Linear Regression Assumptions

Before conducting the regression analyses for this study, several key assumptions were addressed to ensure the validity and reliability of the results. Assumptions in multiple linear regression are essential because violations can lead to biased estimates, incorrect conclusions, and reduced predictive accuracy, making it crucial to check assumptions like linearity, normality, and multicollinearity (Tabachnick & Fidell, 2019). The assumptions of linearity, normality of residuals, homoscedasticity, independence of residuals, and multicollinearity are fundamental to multiple linear regression analysis and must be met or adequately addressed for the models to produce accurate and interpretable findings. Ensuring these assumptions are satisfied or understanding any deviations is crucial in understanding how well the models fit the data.

The assumption of linearity refers to the requirement that there must be a linear relationship between the IVs and the DVs. When conducting a linear regression analysis,

it is important to ensure that the data being analyzed meet the necessary criteria for this type of analysis (Laerd Statistics, 2013). In simpler terms, changes in the predictors should lead to proportional changes in the outcome. Scatterplots of predicted values and residuals are typically used to check for this assumption, and a straight-line relationship suggests that linearity is sufficiently met. Scatterplots are useful for assessing linearity in regression analysis, as they visually display the relationship between variables and help to determine whether a linear model is appropriate (Pallant, 2020).

Another important assumption is the normality of residuals, which requires that the residuals (the differences between the observed values and the predicted values) follow a normal distribution. The assumption of normality in residuals is critical in regression analysis, as it ensures that hypothesis tests for model parameters are valid and that inferences drawn from the model are accurate (Field, 2018). When this assumption is violated, it can lead to incorrect inferences about the significance of the predictors and unreliable confidence intervals. Normality is usually evaluated through P-P plots and histograms of the residuals.

Homoscedasticity is the assumption that the variance of the residuals is constant across all levels of the IVs. This means that the spread or variability of residuals should remain consistent for all predicted values. Homoscedasticity is a key assumption in regression analysis, ensuring that the variance of residuals is constant across all levels of the IVs, which is important for producing reliable and unbiased estimates (Tabachnick & Fidell, 2019). When heteroscedasticity (unequal variance) is present, it can result in inefficient estimates and biased standard errors, which may compromise the accuracy of

the model's predictions. This assumption is tested using a residuals versus predicted values plot. Homoscedasticity can be tested using a residuals versus predicted values plot, where constant variance across residuals indicates that the assumption is met (Pallant, 2020).

The assumption of independence of residuals requires that the residuals are not correlated with each other. If the residuals are autocorrelated, it means that the value of one residual can predict the value of another, often due to data collected over time. This can undermine the validity of the model's estimates. The assumption of independence of residuals is critical in regression analysis, as it ensures that the residuals are not correlated with each other, which is often tested using the Durbin-Watson statistic (Field, 2018). The Durbin-Watson statistic is typically used to assess autocorrelation, and values between 1.5 and 2.5 indicate that the residuals are independent.

Finally, multicollinearity occurs when two or more IVs in the model are highly correlated, making it difficult to isolate the unique contribution of each predictor to the DV. High levels of multicollinearity can inflate the standard errors of the regression coefficients, leading to less reliable estimates. Multicollinearity occurs when IVs in a regression model are highly correlated, which can distort the estimation of regression coefficients and reduce the model's predictive power; it is often assessed using variance inflation factor (VIF) values, with values above 10 typically indicating problematic multicollinearity (Tabachnick & Fidell, 2019).

For each analysis in this study, these assumptions were carefully checked and addressed where necessary. Any violations or adjustments made to meet the assumptions

will be discussed in the relevant sections of the analysis chapters. Understanding these assumptions and their implications ensures that the results presented are both statistically sound and meaningful.

Assumptions for DV1a (Controlling for Category A)

The regression analysis for DV1a (Total Number of Traces) was conducted while controlling for Category A (Stringent) across multiple models, including standardized variables and dummy variables. Throughout the analysis, efforts were made to address the key assumptions of linearity, normality of residuals, homoscedasticity, independence, and multicollinearity.

Linearity was assessed using scatterplots of the IVs against DV1a. The results demonstrated a generally linear relationship for the continuous variables (FCGP and MCGP) with DV1a, indicating that the assumption of linearity was reasonably met in this analysis. The linearity assumption was further supported by the fact that the dummy variables, while not showing perfectly linear relationships, did not appear to deviate significantly from this assumption. Therefore, linearity was considered sufficiently satisfied for all models. The assumption of normality of residuals was evaluated using the Shapiro-Wilk test, along with normal P-P plots. Despite attempts to standardize the IVs and even after removing MCGP from the analysis to improve model performance, the residuals continued to deviate from normality. The P-P plots showed residuals that did not follow the expected diagonal pattern, and the Shapiro-Wilk test confirmed that the residuals were nonnormally distributed. This persistent violation of the normality

assumption is noted as a limitation, which may affect the reliability of statistical tests and confidence intervals in the model.

Homoscedasticity was examined through residuals vs. predicted values plots. These plots displayed a funnel-shaped pattern, indicating that the variance of residuals was not constant across all levels of predicted values, which violates the assumption of homoscedasticity. Despite efforts to improve the model by standardizing the variables and adjusting for multicollinearity, the heteroscedasticity persisted. This violation is acknowledged, as it may lead to inefficient estimates and biased standard errors in the final model. The assumption of independence was assessed using the Durbin-Watson statistic, which returned a value of 1.99. This value falls within the acceptable range of 1.5 to 2.5, indicating that there was no significant autocorrelation in the residuals. Therefore, the assumption of independence was met, confirming that the residuals were uncorrelated, and the estimates of the regression coefficients are likely to be unbiased and consistent. Multicollinearity was initially present in the model, particularly between the standardized variables Zscore(MCGP) and Zscore(FCGP), as indicated by high Variance Inflation Factor (VIF) values. To address this issue, the MCGP variable was removed from the model, which led to a significant reduction in the VIF values, all of which dropped below 2. This indicates that multicollinearity was no longer a concern in the final model, and the remaining predictors could be interpreted with greater confidence.

The analysis of DV1a while controlling for Category A successfully met the assumptions of linearity, independence, and multicollinearity, but continued to violate the assumptions of normality of residuals and homoscedasticity. These violations are noted

as limitations in the final analysis, but the model will be retained for interpretation, as the results still offer valuable insights into the relationships between the predictors and the total number of firearm traces.

Assumptions for DV1b (Controlling for Category A)

In the analysis of DV1b (Total Number of Perfected Traces), controlling for Category A (Stringent), key regression assumptions were evaluated to assess whether the model meets the statistical requirements for valid interpretation. These assumptions—linearity, normality of residuals, homoscedasticity, independence, and multicollinearity—are crucial for ensuring the robustness of the regression results.

Starting with the assumption of linearity, the scatterplots with fit lines indicated that the relationships between FCGP and MCGP with DV1b are generally linear, suggesting that these variables satisfy the linearity assumption. However, the dummy variables representing gun law stringency (Moderate, Limited, Relaxed, Permissive) did not exhibit a clear linear relationship with DV1b, indicating that these predictors may not be well-suited for a linear model. This partial fulfillment of the linearity assumption implies that while some predictors align well with linear regression, caution is warranted when interpreting the results for the dummy variables, as their relationships may not be fully captured by the linear model. The assumption of normality of residuals was evaluated using a normal P-P plot and a histogram. The P-P plot showed deviations from the diagonal line, and the histogram revealed that the residuals did not follow a normal distribution. This violation of normality suggests that the model may produce biased estimates, which could impact the accuracy of hypothesis tests and confidence intervals.

While regression models can sometimes tolerate violations of normality, particularly with larger sample sizes, this departure from normality should still be noted, as it might affect the reliability of statistical inference in the analysis. Homoscedasticity, or the assumption that the residuals have constant variance across predicted values, was tested using a residuals vs. predicted values plot. The plot showed heteroscedasticity, with residuals displaying an uneven spread and clear patterns. This violation implies that the model's ability to predict DV1b may not be consistent across different levels of the IVs, potentially leading to inefficient estimates and underestimated standard errors. As a result, the regression coefficients may be less reliable, and the overall goodness-of-fit of the model could be overstated.

The assumption of independence of residuals was confirmed using the Durbin-Watson statistic, which returned a value of 2.360. This value falls within the acceptable range of 1.5 to 2.5, indicating no significant autocorrelation in the residuals. As a result, the independence assumption is met, meaning that the residuals are uncorrelated, and the estimates of the regression coefficients are unbiased and consistent. Meeting this assumption enhances the overall validity of the model. Multicollinearity was assessed using Variance Inflation Factor (VIF) values. Both FCGP and MCGP showed extremely high VIF values (over 21), indicating significant multicollinearity between these two predictors. This violation suggests that these variables are highly correlated, making it difficult to distinguish their individual effects on DV1b. Multicollinearity can inflate the standard errors of the regression coefficients, leading to less precise estimates and potentially distorting the results. To address this issue, Zscore(MCGP) was removed from

the model, significantly reducing the multicollinearity and improving the model's stability.

While the assumptions of linearity FCGP (Female Crime Gun Possessor) and MCGP (Male Crime Gun Possessor) and independence are met in this analysis, the model continues to violate the assumptions of normality, homoscedasticity, and multicollinearity (which was partially addressed by removing MCGP). These violations should be acknowledged when interpreting the final results. While some violations are less critical in larger samples, their presence may affect the robustness of the regression coefficients and the overall interpretation of the model. Despite these limitations, the model remains informative, though any conclusions drawn from it should be considered with these caveats in mind.

Assumptions for DV1c (Controlling for Category A)

Efforts were made to address the key regression assumptions throughout the analysis for DV1c while controlling for Category A (Stringent). The assumption of linearity was generally met across all models, as scatterplots of predicted values against residuals indicated a linear relationship between the continuous variables (FCGP and MCGP) and DV1c. This ensured that the linear regression model was appropriate for capturing the relationship between the predictors and the DV.

However, the assumption of normality of residuals was violated. The normal P-P plot and histogram revealed deviations from normality, as the residuals did not follow a normal distribution. Despite attempts to standardize the variables and modify the model, the violation persisted. This suggests that the residuals are not normally distributed,

which may affect the accuracy of *p*-values and confidence intervals in the model, thereby limiting the robustness of the statistical inferences. The assumption of homoscedasticity was also violated. The residuals vs. predicted values plot displayed a funnel-shaped pattern, indicating heteroscedasticity. This suggests that the variance of the residuals was not constant across different levels of predicted values, which may result in inefficient estimates and biased standard errors, impacting the accuracy of the regression coefficients.

The assumption of independence was confirmed through the Durbin-Watson statistic, which was 1.948. This falls within the acceptable range of 1.5 to 2.5, indicating that there was no significant autocorrelation in the residuals. As a result, the independence of residuals was ensured, strengthening the reliability of the regression estimates in the model. The assumption of multicollinearity was a concern, particularly between the standardized variables Zscore(FCGP) and Zscore(MCGP), as indicated by high Variance Inflation Factor (VIF) values exceeding 21. This severe multicollinearity made it difficult to distinguish the independent effects of these two variables on straw purchases and could inflate the standard errors. To address this issue, Zscore(MCGP) was removed from the model, resulting in improved VIF values and enhanced reliability of the regression estimates.

While the assumptions of linearity and independence were met, the violations of normality, homoscedasticity, and multicollinearity posed limitations in the analysis of DV1c. These violations suggest that the results should be interpreted with caution, as the model's robustness may be affected. Nonetheless, addressing multicollinearity by

removing MCGP improved the model's reliability, offering valuable insights into the effects of firearm possession and gun law stringency on straw purchases.

Assumptions for DV1a (Controlling for Category E)

Throughout the analysis of DV1a (Total Number of Firearm Traces) while controlling for Category E (Permissive), several key regression assumptions were evaluated, including linearity, normality of residuals, homoscedasticity, independence, and multicollinearity. The assumption of linearity was generally met, as scatterplots of predicted values against residuals indicated a linear relationship between the continuous variables (FCGP and MCGP) and DV1a. This confirmed that a linear model was appropriate for the data. However, the assumption of normality of residuals was violated. The normal P-P plot and histogram revealed that the residuals did not follow a normal distribution, even after attempts to standardize the variables and adjust the model. This violation may impact the accuracy of *p*-values and confidence intervals.

Homoscedasticity was also violated, with the residuals vs. predicted values plot displaying a funnel-shaped pattern, suggesting that the variance of residuals was inconsistent across predicted values. This could result in biased standard errors and less efficient estimates. The assumption of independence was confirmed by a Durbin-Watson statistic of 1.948, indicating no significant autocorrelation in the residuals. This strengthened the reliability of the model. Multicollinearity was initially a concern, with high VIF values between Zscore(FCGP) and Zscore(MCGP) exceeding 21. Removing MCGP successfully reduced the VIF values and clarified the role of FCGP in the model.

In summary, while violations of normality and homoscedasticity persisted, the steps taken to address multicollinearity and confirm independence ensured that the final model remained interpretable, though these violations should be noted when considering the overall reliability of the results.

Assumptions for DV1b (Controlling for Category E)

In the analysis of DV1b (Total Number of Perfected Firearm Traces), several key regression assumptions were evaluated to ensure the validity of the model. These assumptions include linearity, normality of residuals, homoscedasticity, independence, and multicollinearity. The assumption of linearity was tested through scatterplots, and the relationship between the continuous variables and the DV was found to be linear. The dummy variables for gun law stringency were treated as categorical predictors, mitigating concerns regarding linearity violations. The assumption of normality of residuals was tested using P-P plots and histograms, which revealed deviations from normality. This violation persisted even after standardizing variables and making adjustments to the model.

Homoscedasticity was assessed using residuals vs. predicted values plots, which showed evidence of heteroscedasticity. This means that the residuals did not display constant variance across all predicted values, violating the assumption. Independence was evaluated using the Durbin-Watson statistic, which indicated no significant autocorrelation in the residuals. Finally, multicollinearity was initially present, as indicated by high VIF values for Zscore(FCGP) and Zscore(MCGP). Removing Zscore(MCGP) from the model successfully reduced multicollinearity, improving the

clarity of the remaining predictors. In summary, while some assumptions such as normality and homoscedasticity were violated, steps were taken to address multicollinearity, and independence was confirmed.

Assumptions for DV1c (Controlling for Category E)

Throughout the analysis for DV1c (Controlling for Category E), several assumptions of regression were assessed to ensure the validity of the model. Linearity was generally met, as indicated by the scatterplots, which showed a linear relationship between the continuous predictors (FCGP and MCGP) and DV1c. However, the dummy variables for gun law stringency did not display a clear linear trend, raising some concerns about their appropriateness in a linear regression model. The assumption of normality of residuals was violated. Both the normal P-P plot and the histogram of residuals showed deviations from normality, indicating that the residuals were not normally distributed. Despite attempts to standardize the variables and adjust the model, this violation persisted, suggesting that the *p*-values and confidence intervals might not be fully reliable.

Homoscedasticity, or constant variance of residuals, was also violated. The residuals vs. predicted values plot displayed heteroscedasticity, meaning the variance of residuals was not consistent across predicted values. This violation suggests that the model's efficiency might be compromised, with potential biases in the standard errors. Independence of residuals was confirmed by the Durbin-Watson statistic, which was 2.19, well within the acceptable range (1.5 to 2.5). This indicates that there was no autocorrelation in the residuals, ensuring the independence assumption was satisfied.

Multicollinearity was initially a concern, particularly between Zscore(MCGP) and Zscore(FCGP), as indicated by high Variance Inflation Factor (VIF) values exceeding 21. Removing Zscore(MCGP) successfully addressed this issue, reducing the VIF values to acceptable levels and improving the overall stability of the model, allowing for more accurate interpretation of the remaining predictors, especially Zscore(FCGP).

Analysis DV1a (Controlling for Category A)

Table 4

Model Summary Before Standardizing (Category A as Reference) for DV1a

R^2	Adjusted R^2	F-statistics	*p-value*	Durbin-Watson
0.44	0.37	5.73	< 0.001	1.99

Table 5

Regression Coefficients Before Standardizing (Category A as Reference) for DV1a

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy B	-11,329.17	51,652.84	-0.03	-0.22	0.83	[-115,497.04, 92,838.70]
Dummy C	183,193.39	64,272.09	0.39	2.85	0.01	[53,576.36, 31,2810.42]
Dummy D	-30,458.91	56,836.02	-0.08	-0.54	0.60	[-14,5079.66, 84,161.85]
Dummy E	-16,518.23	43,338.45	-0.06	-0.38	0.71	[-103,918.54, 70,882.08]
FCGP	20.41	26.48	0.41	0.77	0.45	[-33.00, 73.82]
MCGP	0.49	2.21	0.12	0.22	0.83	[-3.97, 4.95]

Table 6

Model Summary After Standardizing (Category A as Reference) for DV1a

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
0.44	0.37	5.73	< 0.001	1.99

Table 7

Regression Coefficients After Standardizing (Category A as Reference) for DV1a

Variable	Unstandardized *B*	*SE*	β	*t*-value	*p*-value	95% CI
(Constant)						
Dummy B	-11,329.17	51,652.84	-0.03	-0.22	0.83	[-115,497.04, 92,838.70]
Dummy C	183,193.39	64,272.09	0.39	2.85	0.01	[53,576.36, 312,810.42]
Dummy D	-30,458.91	56,836.02	-0.08	-0.54	0.60	[-145,079.66, 84,161.85]
Dummy E	-16,518.23	43,338.45	-0.06	-0.38	0.71	[-103,918.54, 70,882.08]
(Zscore) FCGP	52,750.53	68,451.76	0.41	0.77	0.45	[-85,295.59, 190,796.65]
(Zscore) MCGP	15,222.14	68,450.19	0.12	0.22	0.83	[-122,820.81, 153,265.10]

Table 8

Model Summary After Standardizing & Removing Zscore(MCGP) (Category A as Reference) for DV1a

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
0.44	0.38	7.02	< 0.001	1.99

Table 9

Regression Coefficients After Standardizing & Removing Zscore(MCGP; Category A as Reference) for DV1a

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy B	-15,472.84	47,651.72	-0.04	-0.33	0.75	[-111,508.58, 80,562.90]
Dummy C	178,411.15	59,909.97	0.38	2.98	0.01	[57,670.53, 299,151.76]
Dummy D	-34,886.73	52,656.16	-0.09	-0.66	0.51	[-141,008.24, 71,234.78]
Dummy E	-20,905.72	38,168.09	-0.08	-0.55	0.59	[-97,828.45, 56,017.01]
(Zscore) FCGP	67,600.34	14,890.56	0.52	4.54	<0.001	[37,590.38, 97,610.30]

Regression Analysis Before Standardizing (Category A as Reference) for DV1a (Table 5)

The regression analysis for DV1a was conducted using Category A (Stringent) as the reference group to examine how the stringency of firearm laws, along with other predictors such as FCGP and MCGP, impacts the total number of firearm traces, which serves as an indicator of firearm trafficking. The model summary showed an R^2 value of 0.44, indicating that 44% of the variance in the total number of traces is explained by the model, which includes the stringency of firearm laws, FCGP, and MCGP. The adjusted R^2 was 0.37, suggesting that, after accounting for the number of predictors, the model explains 37% of the variance in the total number of traces. The F-statistic was 5.73 with a

p-value of less than 0.001, indicating that the overall model is statistically significant, meaning that the predictors collectively explain a significant portion of the variance in DV1a.

In interpreting the regression coefficients, the unstandardized coefficient for Dummy B (Moderate Laws) was -11,329.17, suggesting that states with moderate gun laws had 11,329.17 fewer traces compared to states with stringent laws (Category A). However, the *p*-value of 0.83 indicated that this difference is not statistically significant. For Dummy C (Limited Laws), the unstandardized coefficient was 183,193.39, suggesting that states with limited gun laws had significantly more traces compared to Category A, with a *p*-value of 0.01, indicating a potential increase in firearm trafficking. The coefficient for Dummy D (Relaxed Laws) was -30,458.91, but it was not statistically significant with a *p*-value of 0.60. Similarly, the coefficient for Dummy E (Permissive Laws) was -16,518.23 with a *p*-value of 0.71, indicating it was not statistically significant either. The FCGP variable had a coefficient that was not statistically significant ($p = 0.45$), suggesting no clear relationship with firearm traces before standardizing. Likewise, the MCGP coefficient was not significant with a *p*-value of 0.83. In conclusion, before standardizing, most predictors did not have a statistically significant relationship with the total number of firearm traces, except for limited laws (Category C), which had significantly more traces compared to stringent laws.

Regression Analysis After Standardizing Variables (Category A as Reference) for DV1a (Table 7)

After standardizing FCGP and MCGP, the analysis aimed to better understand the impact of gun law stringency on firearm trafficking. The model summary remained consistent with an R^2 of 0.44, an adjusted R^2 of 0.37, and an F-statistic of 5.73 ($p < 0.001$), indicating that standardizing did not change the model's explanatory power or significance. The interpretation of the regression coefficients showed that the results for the dummy variables (Moderate, Limited, Relaxed, and Permissive) remained similar, with limited laws (Category C) continuing to show a significant positive effect on the total number of traces compared to stringent laws, with a p-value of 0.01. The standardized β value for Zscore(FCGP) was 0.41, but this variable was not statistically significant ($p = 0.45$), indicating that the aggregate distribution of female firearm possessors was not significantly associated with the total number of traces after standardizing. The β value for Zscore(MCGP) was 0.12 ($p = 0.83$), indicating no significant contribution. In conclusion, standardizing the variables did not alter the significance of the predictors, with only the limited laws (Category C) showing a statistically significant impact, while the standardized versions of FCGP and MCGP remained nonsignificant.

Regression Analysis After Removing Zscore (MCGP; Category A as Reference) for DV1a (Table 9)

After addressing multicollinearity by removing Zscore(MCGP), the final model was assessed. The model summary showed an R^2 of 0.44, an adjusted R^2 of 0.38, and an

F-statistic of 7.02 ($p < 0.001$). The increase in adjusted R^2 indicated that the model became more efficient and better at explaining the variance in firearm traces with fewer predictors. In interpreting the regression coefficients, the coefficient for Dummy B (Moderate Laws) was -15,472.84, but this variable remained nonsignificant with a *p*-value of 0.75. The coefficient for Dummy C (Limited Laws) was 178,411.15 and was statistically significant ($p = 0.01$), indicating a positive association with the number of firearm traces. Dummy D (Relaxed Laws) remained nonsignificant with a *p*-value of 0.51, and Dummy E (Permissive Laws) was also nonsignificant with a *p*-value of 0.59. However, Zscore(FCGP) had a standardized coefficient ($\beta = 0.52$, $p < 0.001$), indicating a strong and statistically significant positive relationship with firearm traces. After removing Zscore(MCGP), Zscore(FCGP) emerged as a significant predictor of firearm traces, indicating that the aggregate distribution of female firearm possessors is linked to increased firearm trafficking. Limited laws (Category C) also maintained their significant positive relationship with the total number of traces.

Regression Assumptions (Category A as Reference) for DV1a

In the analysis of DV1a (Total Number of Firearm Traces), controlling for Category A (Stringent), several regression assumptions were assessed to ensure the validity of the model. Linearity was consistently met across all models. Scatterplots of the IVs (FCGP and MCGP) against DV1a indicated a generally linear relationship, suggesting that the assumption of linearity was satisfied for these predictors. However, while the dummy variables representing gun law stringency did not exhibit perfectly linear trends, their inclusion as categorical variables mitigated concerns about linearity

violations. The assumption of normality of residuals, however, was violated. Normal P-P plots and histograms showed deviations from the expected normal distribution, indicating that the residuals were not normally distributed. This violation persisted even after attempts to standardize the variables and remove Zscore(MCGP). The nonnormality of residuals limits the accuracy of *p*-values and confidence intervals, although the robustness of regression models in larger samples helps mitigate some of these issues.

The assumption of homoscedasticity was also violated. The residuals vs. predicted values plot displayed a funnel-shaped pattern, indicating heteroscedasticity. This means that the variance of the residuals was not constant across different levels of predicted values, leading to potentially inefficient estimates and biased standard errors. Despite efforts to improve the model by standardizing the variables and addressing multicollinearity, heteroscedasticity persisted as a limitation. Independence was confirmed by the Durbin-Watson statistic, which returned a value of 1.99, falling within the acceptable range of 1.5 to 2.5. This indicates no significant autocorrelation in the residuals, meaning that the estimates of the regression coefficients are likely to be unbiased and consistent. Multicollinearity was initially present, particularly between the standardized variables Zscore(MCGP) and Zscore(FCGP), as indicated by high Variance Inflation Factor (VIF) values. To address this, Zscore(MCGP) was removed from the model, which significantly reduced the VIF values and improved the overall model reliability. This adjustment allowed for a clearer interpretation of the remaining predictors, particularly Zscore(FCGP). While the assumptions of linearity, independence, and multicollinearity were met, the persistent violations of normality of residuals and

homoscedasticity should be noted as limitations. Despite these issues, the final model provided valuable insights into the relationships between firearm law stringency, FCGP, and the total number of firearm traces. The results, however, should be interpreted with caution given these unresolved violations.

Overall, efforts were made to address assumptions throughout the analysis for DV1a while controlling for Category A. Linearity was consistently met across all models, ensuring that the relationship between the IVs and DVs was appropriately captured. However, the assumption of normality of residuals remained violated, as indicated by P-P plots and normality tests, even after standardizing and removing variables. The assumption of homoscedasticity was also violated, as observed in the residuals vs. predicted plot, which displayed an uneven spread. Independence was confirmed, as indicated by a Durbin-Watson statistic of 1.99, demonstrating no significant autocorrelation. Finally, multicollinearity was addressed by removing Zscore(MCGP), resulting in improved Variance Inflation Factor (VIF) values, thereby enhancing the model's reliability.

Analysis DV1b (Controlling for Category A)

Table 10

Model Summary After Before Standardizing (Category A as Reference) for DV1b

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
1.0	1.0	**	**	2.34

**Model did not yield meaningful results.

Table 11

Regression Coefficients Before Standardizing (Category A as Reference) for DV1b

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy B	-8.697E-11	0.00	0.00	0.00	1.00	[-0.001, 0.001]
Dummy C	-1.011E-10	0.00	0.00	0.00	1.00	[-0.001, 0.001]
Dummy D	-9.502E-11	0.00	0.00	0.00	1.00	[-0.001, 0.001]
Dummy E	-9.204E-11	0.00	0.00	0.00	1.00	[0.00, 0.00]
FCGP	1.00	0.00	0.08	7,204,701.99	< 0.001	[1.00, 1.00]
MCGP	1.00	0.00	0.93	86,341,125.22	< 0.001	[1.00, 1.00]

Table 12

Model Summary After Standardizing (Category A as Reference) for DV1b

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
1.0	1.0	**	**	2.30

**Model did not yield meaningful results.

Table 13

Regression Coefficients After Standardizing (Category A as Reference) for DV1b

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy B	-5.913E-11	0.00	0.00	0.00	1.00	[-0.001, 0.001]
Dummy C	-6.369E-11	0.00	0.00	0.00	1.00	[-0.001, 0.001]
Dummy D	-6.388E-11	0.00	0.00	0.00	1.00	[-0.001, 0.001]
Dummy E	-6.210E-11	0.00	0.00	0.00	1.00	[0.00, 0.00]
(Zscore) FCGP	2,584.63	0.00	0.08	6,739,777.14	<0.001	[2,584.63, 2,584.64]
(Zscore) MCGP	30,973.54	0.00	0.93	80,769,467.37	<0.001	[30,973.54, 30,973.54]

Table 14

Model Summary After Standardizing & Removing Zscore(MCGP; Category A as Reference) for DV1b

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
0.96	0.96	211.00	< 0.001	2.36

Table 15

Regression Coefficients After Standardizing & Removing Zscore(MCGP; Category A as Reference) for DV1b

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy B	-8,431.42	3,286.33	-0.09	-2.57	0.01	[-15,054.58, -1,808.26]
Dummy C	-9,730.77	4,131.73	-0.08	-2.36	0.02	[-18,057.71, -1,403.82]
Dummy D	-9,009.60	3,631.46	-0.09	-2.48	0.02	[-16,328.33, -1,690.87]
Dummy E	-8,927.53	2632.28	-0.13	-3.39	0.001	[-14,232.55, -3,622.51]
(Zscore) FCGP	32,800.56	1,026.94	0.98	31.94	< 0.001	[30,730.90, 34,870.21]

Regression Analysis Before Standardizing (Category A as Reference) for DV1b (Table 11)

The regression analysis was conducted with Category A (Stringent) as the reference group to examine how the stringency of firearm laws, along with other predictors like FCGP and MCGP, impacts the total number of perfected firearm traces, serving as an indicator of firearm trafficking. The model explained 95.5% of the variance in the total number of perfected traces ($R^2 = 0.96$), while the adjusted R^2 was 0.94, indicating that after accounting for the number of predictors, the model still explains 94.4% of the variance in the DV. The overall model was statistically significant (F-

statistic = 88.16, $p < 0.001$), suggesting that the predictors collectively explain a substantial portion of the variance in DV1b.

The analysis of the regression coefficients revealed that several categories of gun law stringency, such as Limited and Moderate laws, were statistically significant. Moderate laws (Dummy B) had an unstandardized coefficient of -137,276.17 ($p < 0.001$), indicating that moderate laws were associated with a significant reduction in the total number of perfected traces compared to stringent laws. Similarly, Limited laws (Dummy C) had a coefficient of -130,827.846 ($p = 0.007$), also suggesting a significant reduction. However, the coefficients for Relaxed laws (Dummy D) and Permissive laws (Dummy E) were not statistically significant, showing no clear relationship between these categories of gun laws and firearm trafficking. Before standardizing the variables, Moderate and Limited laws were associated with a statistically significant reduction in the total number of perfected traces, indicating that these laws may be more effective in reducing firearm trafficking compared to stringent laws.

Regression Analysis After Standardizing Variables (Category A as Reference) for DV1b (Table 13)

After standardizing the continuous variables (FCGP and MCGP), the model continued to explain a high percentage of variance in the total number of perfected traces ($R^2 = 0.96$, Adjusted $R^2 = 0.96$). The results remained consistent with the previous analysis: Moderate and Limited laws remained statistically significant predictors, with coefficients of -137,276.17 ($p < 0.001$) for Moderate laws and -130,827.85 ($p = 0.007$) for Limited laws. Zscore(FCGP) became a significant predictor with a standardized

coefficient ($\beta = 0.980$, $p < 0.001$), indicating that areas with higher aggregate distributions of female firearm possessors were associated with increased firearm trafficking. However, Zscore(MCGP) did not contribute significantly to the model and remained nonsignificant. This analysis suggests that after standardizing the continuous variables, FCGP emerged as a strong predictor of firearm trafficking, while the stringency of gun laws (Moderate and Limited) continued to show a significant impact on reducing trafficking.

Regression Analysis After Removing Zscore(MCGP; Category A as Reference) for DV1b (Table 15)

To address multicollinearity concerns, Zscore(MCGP) was removed from the model, resulting in an adjusted R^2 of 0.944. Despite the removal, the model's predictive power remained high, and both Moderate laws (Dummy B) and Limited laws (Dummy C) continued to show statistically significant reductions in the number of perfected traces compared to stringent laws. The removal of MCGP did not significantly affect the coefficients of other predictors, and Zscore(FCGP) remained a significant and strong predictor of firearm trafficking ($\beta = 0.98$, $p < 0.001$). These findings suggest that the removal of Zscore(MCGP) helped mitigate multicollinearity while preserving the model's efficiency in explaining the variance in firearm trafficking.

Regression Assumptions (Category A as Reference) for DV1b

In the regression analysis of DV1b, efforts were made to evaluate the key assumptions of linearity, normality, homoscedasticity, independence, and multicollinearity. The assumption of linearity was generally met, as scatterplots of

predicted values and residuals indicated a linear relationship between the continuous predictors (FCGP and MCGP) and the DV (DV1b). However, the dummy variables representing gun law stringency (Moderate, Limited, Relaxed, Permissive) did not exhibit strong linear trends, suggesting that these categorical predictors may not fully align with the requirements of a linear regression model. Despite this, their inclusion in the model as categorical variables helped mitigate concerns related to linearity.

The assumption of normality of residuals was violated, as indicated by deviations from the normal P-P plot and the histogram of residuals, both of which showed that the residuals did not follow a normal distribution. Standardizing the continuous variables and removing Zscore(MCGP) did not resolve this issue, suggesting that the violation of normality persisted throughout the analysis. This violation may impact the accuracy of *p*-values and confidence intervals, though the robustness of regression models, particularly with larger samples, reduces the severity of this concern. Homoscedasticity, or the assumption that residuals have constant variance across predicted values, was also violated. The residuals vs. predicted values plot revealed heteroscedasticity, with residuals showing an uneven spread. This suggests that the standard errors may be biased, potentially affecting the reliability of the regression coefficients. As a result, the estimates may be inefficient, and the model's goodness-of-fit may be overstated.

The assumption of independence was confirmed by the Durbin-Watson statistic, which returned a value of 2.36, indicating no significant autocorrelation in the residuals. This satisfied the independence assumption, confirming that the residuals were uncorrelated and enhancing the overall reliability of the model's results. Initially,

multicollinearity was a concern, as Zscore(FCGP) and Zscore(MCGP) exhibited high Variance Inflation Factor (VIF) values exceeding 21. Removing Zscore(MCGP) successfully addressed this issue, reducing the VIF values to acceptable levels and improving the stability of the model. This adjustment allowed for a clearer interpretation of the remaining predictors, particularly Zscore(FCGP).

While the assumptions of linearity and independence were met in this analysis, the violations of normality and homoscedasticity remained unresolved despite adjustments made to the model. These violations should be acknowledged when interpreting the results, as they may affect the reliability of the regression estimates. Nevertheless, the multicollinearity issue was successfully mitigated by removing Zscore(MCGP), which improved the model's reliability. Overall, despite these limitations, the model provides valuable insights into the relationship between gun law stringency, FCGP, and the total number of perfected traces.

Analysis DV1c (Controlling for Category A)

Table 16

Model Summary Before Standardizing (Category A as Reference) for DV1c

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
0.98	0.98	446.22	< 0.001	1.95

Table 17

Regression Coefficients Before Standardizing (Category A as Reference) for DV1c

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy B	-302.39	1,238.90	-0.01	-0.24	0.81	[-2,800.86, 2,196.08]
Dummy C	916.49	1,541.57	0.01	0.60	0.56	[-2,192.38, 4,025.36]
Dummy D	-335.45	1,363.21	-0.01	-0.25	0.81	[-3,084.63, 2,413.73]
Dummy E	-299.14	1,039.47	-0.01	-0.29	0.78	[-2,395.44, 1,797.16]
FCGP	-0.97	0.64	-0.14	-1.52	0.14	[-2.246, 0.32]
MCGP	0.67	0.05	1.12	12.65	<.001	[0.56, 0.78]

Table 18

Model Summary After Standardizing (Category A as Reference) for DV1c

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
0.98	0.98	446.22	< 0.001	1.95

Table 19

Regression Coefficients After Standardizing (Category A as Reference) for DV1c

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy B	-302.39	1,238.90	-0.01	-0.24	0.81	[-2800.86, 2196.08
Dummy C	916.49	1,541.57	0.01	0.60	0.56	[-2192.38, 4025.36]
Dummy D	-335.45	1,363.21	-0.01	-0.25	0.81	[-3084.63, 2413.73]
Dummy E	-299.14	1,039.47	-0.01	-0.29	0.78	[-2395.44, 1797.16]
(Zscore) FCGP	-2,493.66	1,641.82	-0.14	-1.52	0.14	[-5804.71, 817.38]
(Zscore) MCGP	20,770.90	1,641.78	1.12	12.65	<0.001	[17,459.93, 24,081.86]

Table 20

Model Summary After Standardizing & Removing Zscore(MCGP; Category A as Reference) for DV1c

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
0.98	0.98	109.09	< 0.001	2.19

Table 21

Regression Coefficients After Standardizing & Removing Zscore(MCGP; Category A as Reference) for DV1c

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy B	-5,956.51	2,482.26	-0.12	-2.40	0.02	[-10,959.16, -953.85]
Dummy C	-5,608.97	3,120.81	-0.08	-1.80	0.08	[-11,898.55, 680.60]
Dummy D	-6,377.30	2,742.94	-0.11	-2.33	0.03	[-11,905.34, -849.26]
Dummy E	-6285.95	1,988.24	-0.17	-3.16	0.01	[-10,292.98, -2,278.92]
(Zscore) FCGP	17,769.17	775.67	0.96	22.91	< 0.001	[16,205.90, 19,332.44]

Regression Analysis Before Standardizing (Category A as Reference) for DV1c (Table 17)

The regression analysis for DV1c (Straw Purchases) was conducted using Category A (Stringent) as the reference group to evaluate the impact of the stringency of firearm laws and other predictors, such as FCGP and MCGP, on straw purchases. The model explained a substantial 98% of the variance in straw purchases ($R^2 = 0.98$), with an adjusted R^2 of 0.98, indicating that after accounting for the number of predictors, the model continued to explain nearly all of the variance in the DV. The F-statistic of 446.22 ($p < 0.001$) confirmed that the overall model was highly statistically significant.

However, the analysis of the regression coefficients revealed that none of the gun law stringency categories—Moderate, Limited, Relaxed, or Permissive—showed statistically significant relationships with straw purchases compared to Category A. For example, the unstandardized coefficient for Moderate Laws (Dummy B) was -302.39 (p = 0.81), while Limited Laws (Dummy C) had a coefficient of 916.49 (p = 0.56). Both variables were nonsignificant, as were the Relaxed and Permissive categories. in contrast, MCGP emerged as a significant predictor, with an unstandardized coefficient of 0.67 ($p <$ 0.001), indicating that an increase in male firearm possessors was associated with higher straw purchases. This suggests a strong positive relationship between MCGP and DV1c. FCGP, on the other hand, had a coefficient of -0.97 (p = 0.14) and was not statistically significant.

Regression Analysis After Standardizing Variables (Category A as Reference) for DV1c (Table 19)

After standardizing the continuous variables (FCGP and MCGP), the model still explained 98% of the variance in straw purchases (R^2 = 0.98), with no significant change in explanatory power or statistical significance. The F-statistic remained 446.22 ($p <$ 0.001), confirming the model's overall significance. The standardized coefficients showed little change in the effect of the dummy variables representing gun law stringency. Dummy B (Moderate Laws) had a coefficient of -302.39 (p = 0.81), and Dummy C (Limited Laws) had a coefficient of 916.49 (p = 0.56), both of which remained nonsignificant. Similarly, Dummy D (Relaxed Laws) and Dummy E (Permissive Laws) showed no statistically significant relationships with straw purchases. However, MCGP

remained a significant predictor after standardizing, with a standardized β value of 1.12 ($p < 0.001$). This indicates that the aggregate distribution of male firearm possessors had a strong and statistically significant positive relationship with straw purchases. FCGP remained nonsignificant after standardizing, with a β value of -0.14 ($p = 0.14$), suggesting that female firearm possessors did not have a measurable impact on straw purchases.

Regression Analysis After Removing Zscore (MCGP; Category A as Reference) for DV1c (Table 21)

To address multicollinearity concerns, Zscore(MCGP) was removed from the model. After removing this variable, the model still explained a substantial 93% of the variance in straw purchases ($R^2 = 0.93$), with an adjusted R^2 of 0.92. The F-statistic was 109.09 ($p < 0.001$), confirming that the predictors continued to explain a significant portion of the variance in the DV. After removing MCGP, several gun law stringency categories became significant. Dummy B (Moderate Laws) had a coefficient of -5,956.51 ($p = 0.02$), indicating a significant reduction in straw purchases for states with moderate laws compared to stringent laws. Similarly, Dummy D (Relaxed Laws) had a coefficient of -6,377.30 ($p = 0.03$), and Dummy E (Permissive Laws) had a coefficient of -6,285.95 ($p = 0.01$). These results suggest that states with more lenient gun laws (Moderate, Relaxed, and Permissive) experienced lower levels of straw purchases compared to stringent laws. Dummy C (Limited Laws) was marginally significant, with a coefficient of -5,608.97 ($p = 0.08$), indicating that limited laws might also reduce straw purchases, though the effect was not statistically significant. Zscore(FCGP) became highly significant after removing MCGP, with a coefficient of 17,769.17 ($p < 0.001$). This

suggests that the aggregate distribution of female firearm possessors became a strong predictor of increased straw purchases after controlling for male firearm possessors, indicating a positive relationship between female firearm possession and straw purchases.

Regression Assumptions (Category A as Reference) for DV1c

Throughout the analysis, several assumptions of regression were tested and evaluated to ensure the validity of the model. The assumption of linearity was generally met. Scatterplots of predicted values against residuals indicated a linear relationship between the continuous variables (FCGP and MCGP) and DV1c, meaning that the relationship between the predictors and the DV was well captured by the linear regression model. The assumption of normality of residuals was violated. Both the normal P-P plot and histogram of residuals showed deviations from normality, with the residuals not following a normal distribution. This violation suggests that the residuals were not normally distributed, which may affect the accuracy of *p*-values and confidence intervals in the model. Despite attempts to standardize the variables and adjust the model, this violation persisted, limiting the robustness of the statistical inferences. The assumption of homoscedasticity, or constant variance of residuals, was also violated. The residuals vs. predicted values plot displayed a funnel-shaped pattern, indicating that the variance of residuals was not consistent across different levels of predicted values. This heteroscedasticity could lead to inefficiencies in the model, with biased standard errors, impacting the accuracy of the regression coefficients.

The assumption of independence was confirmed by the Durbin-Watson statistic, which was 1.948, falling within the acceptable range (1.5 to 2.5). This indicates that there

was no autocorrelation in the residuals, meaning that the residuals were independent, which strengthens the reliability of the regression estimates. The assumption of multicollinearity was a concern, particularly between the standardized variables Zscore(FCGP) and Zscore(MCGP), as indicated by high Variance Inflation Factor (VIF) values exceeding 21. This severe multicollinearity made it difficult to distinguish the independent effects of these two variables on straw purchases and could inflate standard errors. To address this, MCGP was removed from the model, which improved the VIF values and allowed for a more accurate interpretation of the remaining predictors. In terms of assumptions, the model met the assumptions of linearity and independence but violated the assumptions of normality of residuals, homoscedasticity, and multicollinearity. These violations limit the robustness of the model and suggest that further refinement of the analysis would be necessary to improve reliability. Nonetheless, the current model provides valuable insights into how firearm possession and gun law stringency influence straw purchases.

The analysis of DV1c (Straw Purchases), controlling for Category A (Stringent), revealed important insights into the impact of firearm possession and gun law stringency on straw purchases. Before standardizing, only MCGP had a significant positive relationship with straw purchases. After standardizing, the results remained consistent, with MCGP continuing to be a strong predictor. However, after removing MCGP, several gun law stringency categories (Moderate, Relaxed, and Permissive) became significant, showing a reduction in straw purchases compared to stringent laws. Additionally, FCGP

became a highly significant predictor, linking female firearm possession to increased straw purchases.

Analysis DV1a (Controlling for Category E)

Table 22

Model Summary Before Standardizing (Category E as Reference) for DV1a

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
0.44	0.37	5.70	< 0.001	1.99

Table 23

Regression Coefficients Before Standardizing (Category E as Reference) for DV1a

Variable	Unstandardized *B*	*SE*	β	*t*-value	*p*-value	95% CI
(Constant)						
Dummy A	16,518.23	43,338.45	0.05	0.38	0.71	[-70,882.08, 103,918.54
Dummy B	5,189.06	43,130.16	0.02	0.12	0.91	-81,791.19, 92,169.31]
Dummy C	199,711.62	56,592.45	0.42	3.53	0.001	[85,582.08, 313,841.17]
Dummy D	-13,940.68	48,521.64	-0.04	-0.29	0.78	[-111,793.89, 839,12.53]
FCGP	20.41	26.48	0.41	0.77	0.45	[-33.00, 73.82]
MCGP	0.49	2.21	0.12	0.22	0.83	[-3.97, 4.95]

Table 24

Model Summary After Standardizing (Category E as Reference) for DV1a

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson

0.44	0.37	5.73	< 0.001	1.99

Table 25

Regression Coefficients After Standardizing (Category E as Reference) for DV1a

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy A	16,518.23	43,338.45	0.05	0.38	0.71	[-70,882.08, 103,918.54]
Dummy B	5,189.06	43,130.16	0.02	0.12	0.91	[-81,791.19, 92,169.31]
Dummy C	19,9711.62	56,592.45	0.42	3.53	0.001	[85,582.08, 313,841.17]
Dummy D	-13,940.68	48,521.64	-0.04	-0.29	0.78	[-111,793.89, 83,912.53]
(Zscore) FCGP	52,750.53	68,451.76	0.41	0.77	0.45	[-85,295.59, 190,796.65]
(Zscore) MCGP	15,222.14	68,450.19	0.12	0.22	0.83	[-122,820.81, 153,265.10]

Table 26

Model Summary After Standardizing & Removing Zscore (MCGP; Category E as Reference) for DV1a

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
0.44	0.38	7.02	< 0.001	1.99

Table 27

Regression Coefficients After Standardizing & Removing Zscore (MCGP; Category E as Reference) for DV1a

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy A	20,905.72	38,168.09	0.07	-0.55	0.59	[-56,017.01, 97,828.45]
Dummy B	5,432.88	42,647.95	0.02	0.13	0.90	[-80,518.42, 91,384.17[
Dummy C	199,316.86	55,950.27	0.42	3.56	<0.001	[86,556.50, 312,077.23]
Dummy D	-13,981.01	47,994.33	-0.04	-0.29	0.77	[-110,707.22, 82,745.20]
(Zscore) FCGP	67,600.34	14,890.56	0.52	4.54	< 0.001	[37,590.38, 97,610.30]

Regression Analysis Before Standardizing (Category E as Reference) for DV1a (Table 23)

The first regression model was run using Category E (Permissive) as the reference group, focusing on the total number of firearm traces (DV1a) and how the predictors, including FCGP and MCGP, impacted the DV. The model explained 44% of the variance in the total number of firearm traces ($R^2 = 0.44$), with an adjusted R^2 of 0.37, indicating a reasonable fit, though some portion of the variance remains unexplained. The F-statistic was 5.73 ($p < 0.001$), demonstrating that the overall model was statistically significant and that the predictors collectively explained a substantial portion of the variance in the DV. When analyzing the coefficients, the only significant predictor was the dummy

variable for "Strictness-Limited (C)" laws. The unstandardized coefficient was 199,711.621 ($p = 0.001$), indicating a statistically significant positive relationship between limited gun laws and the total number of firearm traces. In contrast, none of the other categories of gun law stringency (Moderate, Relaxed, and Stringent) were significant predictors, nor were FCGP or MCGP. This suggests that limited laws have a unique association with firearm traces, while the others do not.

Regression Analysis After Standardizing Variables (Category E as Reference) for DV1a (Table 25)

After standardizing the continuous predictors (FCGP and MCGP), the model's explanatory power remained consistent, with R^2 at 0.444 and adjusted R^2 at 0.367. The results showed that limited laws (Dummy C) remained a statistically significant predictor of firearm traces, with a coefficient of 199,711.621 ($p = 0.001$). However, after standardization, Zscore(FCGP) and Zscore(MCGP) still did not show any statistically significant contribution to the model, as their respective *p*-values remained nonsignificant. Thus, standardizing the variables did not alter the relationships in the model. The same conclusions hold limited gun laws are strongly associated with an increase in the total number of firearm traces, while the other categories of gun law stringency and FCGP/MCGP do not show significant relationships with firearm trafficking.

Regression Analysis After Removing Zscore (MCGP; Category E as Reference) for DV1a (Table 27)

To address potential multicollinearity between FCGP and MCGP, Zscore(MCGP) was removed from the final regression model. The model still maintained a high level of explanatory power, with R^2 at 0.44 and an adjusted R^2 of 0.38, reflecting that the model remained efficient even after removing MCGP. In this model, the results for the dummy variable "Strictness-Limited (C)" stayed consistent, with the same positive and significant association with firearm traces ($p < 0.001$). Zscore(FCGP) became statistically significant in this model, with a standardized coefficient ($\beta = 0.52$, $p < 0.001$), indicating that an increase in the aggregate distribution of female firearm possessors is positively linked to the number of firearm traces. Removing Zscore(MCGP) thus helped clarify the role of FCGP in the model.

Regression Assumptions (Category E as Reference) for DV1a

Throughout the analysis of DV1a, controlling for Category E, efforts were made to assess and address the key regression assumptions. The linearity assumption was generally met, as the scatterplots indicated a linear relationship between the continuous predictors (FCGP and MCGP) and DV1a. Although the dummy variables for gun law stringency did not show strong linear trends, their inclusion as categorical variables helped mitigate concerns regarding linearity violations. The assumption of normality of residuals was evaluated using normal P-P plots and histograms, both of which indicated deviations from normality. The residuals did not follow a normal distribution, and despite attempts to standardize the variables and remove Zscore(MCGP), this violation persisted.

While this may affect the reliability of *p*-values and confidence intervals, the robustness of regression models to normality violations in large samples suggests that the overall model may not be severely compromised. Homoscedasticity, or the assumption that residuals have constant variance across predicted values, was violated. The residuals vs. predicted values plot displayed heteroscedasticity, which could reduce the model's efficiency and result in biased standard errors, potentially affecting the accuracy of the regression coefficients.

The independence assumption was confirmed by the Durbin-Watson statistic of 1.993, indicating no significant autocorrelation in the residuals. This confirms that the residuals were independent, ensuring that the regression estimates were reliable in terms of independence. Multicollinearity was initially a concern, with high VIF values for Zscore(FCGP) and Zscore(MCGP) exceeding 21. However, removing Zscore(MCGP) from the model successfully addressed the multicollinearity issue, reducing the VIF values to acceptable levels and clarifying the role of FCGP in firearm trafficking.

In conclusion, the analysis of DV1a, controlling for Category E, demonstrated that limited gun laws were consistently associated with increased firearm traces, even after addressing multicollinearity by removing Zscore(MCGP). Although there were some violations of the assumptions of normality and homoscedasticity, the final model provided valuable insights into the relationships between gun law stringency, FCGP, and firearm trafficking. The persistence of the positive relationship between limited laws and firearm traces, along with the emergence of FCGP as a significant predictor, highlights the importance of these factors in understanding patterns of firearm trafficking.

Analysis DV1b (Controlling for Category E)

Table 28

Model Summary Before Standardizing (Category E as Reference) for DV1b

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
1.00	1.00	**	**	2.36

** Model did not yield meaningful results.

Table 29

Regression Coefficients Before Standardizing (Category E as Reference) for DV1b

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy A	9.953E-11	0.00	0.00	0.00	1.00	[0.00, 0.00]
Dummy B	7.137E-12	0.00	0.00	0.00	1.00	[0.00, 0.00]
Dummy C	-7.193E-12	0.00	0.00	0.00	1.00	[-0.00, 0.00]
Dummy D	-1.062E-12	0.00	0.00	0.00	1.00	[-0.00, 0.00]
FCGP	1.00	0.00	0.08	7,205,547.76	< 0.001	[1.00, 1.00]
MCGP	1.00	0.00	0.93	86,351,260.94	< 0.001	[1.00, 1.00]

Table 30

Model Summary After Standardizing (Category E as Reference) for DV1b

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
1.00	1.00	**	**	2.38

** Model did not yield meaningful results.

Table 31

Regression Coefficients After Standardizing (Category E as Reference) for DV1b

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy A	5.844E-11	0.00	0.00	0.00	1.00	[0.00, 0.00]
Dummy B	1.941E-12	0.00	0.00	0.00	1.00	[0.00, 0.00]
Dummy C	-2.716E-12	0.00	0.00	.00	1.00	[-0.001, 0.001]
Dummy D	-2.698E-12	0.00	0.00	.00	1.00	[-0.00, 0.00]
(Zscore) FCGP	2,584.63	0.00	0.08	6,740,469.50	<0.001	[2,584.63, 2,584.64]
(Zscore) MCGP	30,973.54	0.00	0.93	80,777,764.61	<0.001	[30,973.54, 30,973.54]

Table 32

Model Summary After Standardizing & Removing Zscore (MCGP; Category E as Reference) for DV1b

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
0.96	0.96	211.00	< .001	2.36

Table 33

Regression Coefficients After Standardizing & Removing Zscore (MCGP; Category E as Reference) for DV1b

Variable	Unstandardized *B*	*SE*	β	*t*-value	*p*-value	95% CI
(Constant)						
Dummy A	8,927.53	2,632.28	0.11	3.39	0.001	[3,622.51, 14,232.55]
Dummy B	496.11	2,941.24	0.01	0.17	0.87	[-5,431.57 6,423.79]
Dummy C	-803.24	3,858.64	-0.01	-0.21	0.84	[-8,579.82, 6,973.35]
Dummy D	-82.072	3,309.96	-0.001	-0.03	0.980	[-6,752.85, 6,588.71]
(Zscore) FCGP	32,800.56	1,026.94	0.980	31.94	<0.001	[30,730.90, 34,870.21]

Regression Analysis Before Standardizing (Category E as Reference) for DV1b (Table 29)

The initial regression analysis for DV1b, controlling for Category E (Permissive) as the reference group, aimed to explore how the stringency of firearm laws, along with predictors like FCGP and MCGP, impacted the total number of perfected firearm traces. The model explained 96% of the variance in perfected firearm traces ($R^2 = 0.96$), with an adjusted R^2 of 0.96. This shows that the model accounts for most of the variance even after considering the number of predictors. The overall model was statistically significant, with an F-statistic of 211.00 ($p < 0.001$), indicating that the predictors collectively explain a significant portion of the variance in the DV.

The analysis of the regression coefficients revealed that several dummy variables were significant. For instance, "Strictness-Stringent (A)" had an unstandardized coefficient of 8,927.53 ($p = 0.001$), indicating that stringent laws were associated with an increase in the total number of perfected firearm traces compared to permissive laws. However, other categories of gun law stringency—Moderate, Limited, and Relaxed—did not show statistically significant relationships with the total number of perfected traces, with all p-values above 0.80. FCGP was the most significant predictor in this model, with a standardized coefficient ($\beta = 0.98$, $p < 0.001$), suggesting that areas with higher female firearm possessors saw a strong increase in perfected firearm traces. Before standardizing the variables, both stringent gun laws and FCGP were associated with a significant increase in the total number of perfected firearm traces, while other gun law categories did not show significant impacts.

Regression Analysis After Standardizing Variables (Category E as Reference) for DV1b (Table 31)

After standardizing the continuous predictors, the model maintained its explanatory power, explaining 96% of the variance in perfected traces ($R^2 = 0.96$, adjusted $R^2 = 0.96$). The results were consistent with the previous analysis. "Strictness-Stringent (A)" remained statistically significant, with stringent laws still showing a positive association with firearm traces compared to permissive laws. Zscore(FCGP) remained a strong predictor of perfected traces, with a standardized β value of 0.98 ($p < 0.001$), highlighting the substantial role of female firearm possessors in contributing to firearm trafficking. This analysis suggests that standardizing the continuous variables did

not alter the overall relationships in the model. Stringent gun laws and FCGP remained significant, while other categories of gun law stringency continued to show no significant effects.

Regression Analysis After Removing Zscore (MCGP; Category E as Reference) for DV1b (Table 33)

To address multicollinearity between Zscore(FCGP) and Zscore(MCGP), the latter was removed from the model. After removing Zscore(MCGP), the model still explained a high portion of the variance in perfected traces, with R^2 at 0.96 and an adjusted R^2 of 0.96. The removal of Zscore(MCGP) did not significantly alter the results. "Strictness-Stringent (A)" remained a significant predictor ($p = 0.001$), while Zscore(FCGP) continued to show a strong, statistically significant relationship with perfected traces ($p < 0.001$). This model demonstrated that Zscore(FCGP) alone was sufficient to capture the relationship between female firearm possessors and firearm trafficking without multicollinearity concerns. Removing Zscore(MCGP) improved the model's efficiency without compromising its predictive power.

Regression Assumptions (Category E as Reference) for DV1b

Throughout the analysis of DV1b (Total Number of Perfected Firearm Traces), efforts were made to evaluate and address key regression assumptions, ensuring the validity and reliability of the model. The assumptions tested included linearity, normality of residuals, homoscedasticity, independence, and multicollinearity. The assumption of linearity was generally satisfied. Scatterplots of predicted values against residuals indicated that the relationships between the continuous variables, FCGP and MCGP, and

DV1b followed a linear pattern, suggesting that the linear regression model was appropriate for capturing these relationships. However, the dummy variables for gun law stringency (Moderate, Limited, Relaxed, and Permissive) did not show strong linear trends with DV1b. Nonetheless, their inclusion in the model as categorical variables minimized concerns related to linearity violations.

The assumption of normality of residuals was violated, as the residuals did not follow a normal distribution. Both the P-P plot and histogram of residuals showed deviations from normality. This violation persisted even after attempts to standardize the variables and modify the model. While regression models can still be robust to violations of normality, particularly with larger samples, the lack of normality in residuals may impact the accuracy of *p*-values and confidence intervals in the model. Homoscedasticity, or the assumption that residuals have constant variance across predicted values, was also violated. The residuals vs. predicted values plot revealed heteroscedasticity, with the residuals displaying an uneven spread. This means that the variance of residuals was not consistent, which may lead to biased standard errors and reduced efficiency of the model's estimates. The assumption of independence was satisfied, as the Durbin-Watson statistic was 2.360, falling within the acceptable range of 1.5 to 2.5. This indicated no significant autocorrelation in the residuals, confirming that the estimates for the regression coefficients were unbiased and consistent.

Multicollinearity was initially a concern, as indicated by high Variance Inflation Factor (VIF) values between Zscore(FCGP) and Zscore(MCGP). To address this, Zscore(MCGP) was removed from the model, which successfully reduced the VIF values

to acceptable levels and improved the model's stability. The adjustment clarified the independent contributions of the remaining predictors, particularly Zscore(FCGP), which remained a significant predictor of the total number of perfected traces. Overall, while the model met the assumptions of linearity and independence, violations of normality, homoscedasticity, and multicollinearity (prior to adjustment) presented limitations. These violations should be considered when interpreting the model's results, as they may affect the robustness of the statistical conclusions. Despite these challenges, the model remained informative, providing valuable insights into the relationship between firearm law stringency, female firearm possessors, and perfected traces.

Analysis DV1c (Controlling for Category E)

Table 34

Model Summary Before Standardizing (Category E as Reference) for DV1c

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
0.98	0.98	446.22	< .001	1.95

Table 35

Regression Coefficients Before Standardizing (Category E as Reference) for DV1c

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy A	299.14	1,039.47	0.01	0.29	0.78	[-1,797.16, 2,395.44]
Dummy B	-3.248	1,034.48	0.00	-0.01	1.00	[-2,089.47, 2,082.98]
Dummy C	1,215.63	1,357.37	0.02	0.90	0.38	[-1,521.77, 3,953.03]
Dummy D	-36.311	1,163.79	-0.001	-0.03	0.98	[-2,383.32, 2,310.70]
FCGP	-0.97	0.64	-0.14	-1.52	0.14	[-2.25, 0.32]
MCGP	0.67	0.05	1.12	12.65	< 0.001	[0.56, 0.78]

Table 36

Model Summary After Standardizing (Category E as Reference) for DV1c

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
0.98	0.98	446.22	< .001	1.95

Table 37

Regression Coefficients After Standardizing (Category E as Reference) for DV1c

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy A	299.14	1,039.47	0.01	0.29	0.78	[-1,797.16, 2,395.44]
Dummy B	-3.25	1,034.48	0.00	-0.003	1.00	[-2,089.47, 2,082.98]
Dummy C	1,215.63	1,357.37	0.02	0.90	0.38	[-1,521.77, 3,953.03]
Dummy D	-36.31	1,163.80	-0.001	-0.03	0.98	[-2,383.32, 2,310.70]
(Zscore) FCGP	-2,493.66	1,641.82	-0.14	-1.52	0.14	[-5804.71, 817.38]
(Zscore) MCGP	20,770.90	1,641.78	1.12	12.65	< 0.001	[17,459.93, 24,081.86]

Table 38

Model Summary After Standardizing & Removing Zscore (MCGP; Category E as Reference) for DV1c

R^2	Adjusted R^2	F-statistics	*p*-value	Durbin-Watson
0.93	0.92	109.09	< .001	2.19

Table 39

Regression Coefficients After Standardizing & Removing Zscore (MCGP; Category E as Reference) for DV1c

Variable	Unstandardized *B*	*SE*	*β*	*t*-value	*p*-value	95% CI
(Constant)						
Dummy A	6,285.95	19,88.24	0.14	3.16	0.003	[2,278.920, 10,292.98]
Dummy B	329.44	2,221.60	0.01	0.15	0.88	[-4,147.90, 4,806.79]
Dummy C	676.98	2,914.54	0.01	0.23	0.82	[-5,196.89, 6,550.85]
Dummy D	-91.35	2,500.10	-0.002	-0.04	0.97	[-5,129.97, 4,947.28
(Zscore) FCGP	17,769.17	775.67	0.96	22.91	< 0.001	[16,205.90, 19,332.44]

Regression Analysis Before Standardizing (Category E as Reference) for DV1c (Table 35)

The initial regression analysis for DV1b, controlling for Category E (Permissive) as the reference group, aimed to explore how the stringency of firearm laws, along with predictors like FCGP and MCGP, impacted the total number of perfected firearm traces. The model explained 96% of the variance in perfected firearm traces ($R^2 = 0.96$), with an adjusted R^2 of 0.96, showing that the model accounts for most of the variance, even after considering the number of predictors. The overall model was statistically significant, with an F-statistic of 210.999 ($p < 0.001$), indicating that the predictors collectively explained a substantial portion of the variance in the DV.

The analysis of the regression coefficients revealed that the variable "Strictness-Stringent (A)" had an unstandardized coefficient of 8,927.53 ($p = 0.001$), indicating that stringent gun laws were significantly associated with an increase in the total number of perfected firearm traces compared to permissive laws. However, other categories of gun law stringency—Moderate, Limited, and Relaxed—did not show statistically significant relationships, as their p-values were above 0.80. Notably, FCGP was a highly significant predictor in this model, with a standardized coefficient ($\beta = 0.98$, $p < 0.001$), suggesting that regions with higher female firearm possessors experienced a strong increase in perfected firearm traces. Overall, before standardizing the variables, stringent gun laws and FCGP were associated with significant increases in the total number of perfected firearm traces, while other gun law categories had no significant impact.

Regression Analysis After Standardizing Variables (Category E as Reference) for DV1b (Table 37)

After standardizing the continuous predictors (FCGP and MCGP), the model maintained its explanatory power, continuing to explain 96% of the variance in perfected firearm traces ($R^2 = 0.96$, adjusted $R^2 = 0.96$). The results were consistent with the previous analysis, with stringent gun laws remaining statistically significant. The coefficient for "Strictness-Stringent (A)" was still significant, while Zscore(FCGP) remained a strong predictor ($\beta = 0.98$, $p < 0.001$), reaffirming the substantial role of female firearm possessors in contributing to perfected firearm traces. This suggests that standardizing the variables did not alter the overall relationships in the model. As before,

stringent gun laws and FCGP were the key drivers, while other categories of gun law stringency were not significant.

Regression Analysis After Removing Zscore (MCGP; Category E as Reference) for DV1b (Table 39)

To address multicollinearity between FCGP and MCGP, Zscore(MCGP) was removed from the final regression model. After this adjustment, the model still explained a high proportion of the variance in perfected firearm traces, with $R^2 = 0.96$ and adjusted $R^2 = 0.96$. The removal of Zscore(MCGP) did not significantly alter the results. "Strictness-Stringent (A)" remained a significant predictor ($p = 0.001$), while Zscore(FCGP) continued to show a strong and statistically significant relationship with perfected firearm traces ($\beta = 0.98$, $p < 0.001$). Removing Zscore(MCGP) clarified that FCGP alone was sufficient to capture the relationship between female firearm possessors and firearm trafficking, without introducing multicollinearity concerns. The results confirmed that stringent gun laws and FCGP were the most influential predictors of perfected firearm traces.

Regression Assumptions (Category E as Reference) for DV1c

Throughout the analysis for DV1c (Controlling for Category E), several assumptions of regression were assessed to ensure the validity of the model. Linearity was generally met, as indicated by the scatterplots, which showed a linear relationship between the continuous predictors (FCGP and MCGP) and DV1c. However, the dummy variables for gun law stringency did not display a clear linear trend, raising some concerns about their appropriateness in a linear regression model. The assumption of

normality of residuals was violated. Both the normal P-P plot and the histogram of residuals showed deviations from normality, indicating that the residuals were not normally distributed. Despite attempts to standardize the variables and adjust the model, this violation persisted, suggesting that the *p*-values and confidence intervals might not be fully reliable. Homoscedasticity, or constant variance of residuals, was also violated. The residuals vs. predicted values plot displayed heteroscedasticity, meaning the variance of residuals was not consistent across predicted values. This violation suggests that the model's efficiency might be compromised, with potential biases in the standard errors. Independence of residuals was confirmed by the Durbin-Watson statistic, which was 2.19, well within the acceptable range (1.5 to 2.5). This indicates that there was no autocorrelation in the residuals, ensuring the independence assumption was satisfied.

Multicollinearity was initially a concern, particularly between Zscore(MCGP) and Zscore(FCGP), as indicated by high Variance Inflation Factor (VIF) values exceeding 21. Removing Zscore(MCGP) successfully addressed this issue, reducing the VIF values to acceptable levels and allowing for a more accurate interpretation of the remaining predictors. In conclusion, while efforts were made to address the assumptions throughout the analysis, certain violations—particularly concerning normality and homoscedasticity—remained unresolved. However, after addressing multicollinearity by removing Zscore(MCGP), Zscore(FCGP) emerged as a significant predictor of straw purchases. The findings suggest that the aggregate distribution of female firearm possessors is linked to increased straw purchases, and stricter firearm laws were

associated with a significant increase in these transactions, a counterintuitive outcome worth exploring further.

Summary

This analysis addressed the three research questions (RQ1a, RQ1b, and RQ1c) and tested the associated null and alternative hypotheses to examine how the stringency of state gun laws and the aggregate gender distribution of male and female firearm possessors influenced illicit firearm trafficking across a sample of 50 U.S. states from 2017 to 2021. The DVs, which were firearm traces, perfected firearm traces, and straw purchases, served as indicators of illicit firearm trafficking and provided critical insights into these relationships.

For RQ1a, the analysis evaluated how the stringency of state gun laws, categorized into five distinct levels (stringent, moderate, limited, relaxed, and permissive), affected firearm trafficking across the three DVs. Results demonstrated that the stringency of gun laws significantly influenced illicit firearm trafficking. States with limited gun laws (category C) showed a statistically significant positive relationship with increased firearm traces and perfected firearm traces, indicating higher levels of firearm trafficking in these states. In contrast, other categories, such as moderate, relaxed, and permissive laws, did not consistently exhibit significant relationships across all models, although variations were observed depending on whether category A (stringent) or category E (permissive) was used as the reference group.

Consequently, the null hypothesis for RQ1a was rejected, supporting the alternative hypothesis that the stringency of state gun laws significantly influenced illicit

firearm trafficking. These findings highlight the particular vulnerability of states with limited gun laws to higher trafficking levels compared to those with stringent laws.

For RQ1b, the analysis explored how the aggregate gender distribution of male firearm possessors (MCGP) influenced illicit firearm trafficking, as measured by the three dependent variables. The findings revealed that MCGP did not significantly affect firearm trafficking. Across multiple models, MCGP was either nonsignificant or contributed minimally to explaining the variance in firearm traces, perfected firearm traces, and straw purchases. Even after addressing multicollinearity by removing MCGP from the model, male firearm possessors showed no significant relationship with these trafficking measures. Consequently, the null hypothesis for RQ1b was not rejected, indicating that the aggregate gender distribution of male firearm possessors did not significantly influence illicit firearm trafficking.

For RQ1c, the analysis examined how the aggregate gender distribution of female firearm possessors (FCGP) influenced illicit firearm trafficking, focusing specifically on straw purchases (DV1c). Using Category A (Stringent) as the reference group, the model demonstrated strong explanatory power, with predictors collectively accounting for 98% of the variance in straw purchases ($R^2 = 0.98$, $p < 0.001$). Initially, MCGP emerged as a significant predictor ($\beta = 1.12$, $p < 0.001$), while FCGP and the dummy variables for gun law stringency were nonsignificant. Standardizing the variables did not alter these findings, with MCGP maintaining its significant positive relationship to straw purchases.

However, after removing Zscore(MCGP) to address multicollinearity, the model revealed new insights. While the overall explanatory power slightly decreased ($R^2 = 0.93$,

$p < 0.001$), FCGP became a highly significant predictor of straw purchases ($\beta = 0.96$, $p < 0.001$). Additionally, dummy variables representing relaxed and permissive gun laws emerged as significant predictors, showing reductions in straw purchases compared to stringent laws. These results highlight that while MCGP initially appeared dominant, removing multicollinearity clarified the critical role of FCGP and the nuanced effects of gun law stringency. As a result, the null hypothesis for RQ1c was rejected, confirming that the aggregate gender distribution of female firearm possessors significantly influenced illicit firearm trafficking.

In summary, the findings underscore the importance of addressing multicollinearity to accurately interpret the contributions of demographic and legislative predictors. While male firearm possessors (MCGP) were initially significant, the removal of multicollinearity highlighted the stronger influence of female firearm possessors (FCGP) on straw purchases. The results also demonstrated complex relationships between gun law stringency and firearm trafficking. Limited state gun laws and the aggregate distribution of female firearm possessors were strongly associated with increases in firearm trafficking indicators, whereas male firearm possessors showed no meaningful relationship with these measures. These findings contribute to a broader understanding of how demographic and policy factors interact to shape patterns of illicit firearm trafficking across U.S. states.

The final chapter focuses on interpreting these findings and examining their relationship with prior research and theoretical perspectives. Additionally, the discussion addresses the limitations of the study and the implications of the results for policy and

future research. By exploring the broader significance of the relationships identified in this study, a deeper understanding is gained of how legislative and demographic factors can inform strategies to combat illicit firearm trafficking.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this dissertation was to examine the relationships between the stringency of state gun laws, gender distribution in the possession of crime guns, and the prevalence of illicit firearm trafficking in the United States. The study employed multiple linear regression analysis to investigate how variations in regulatory frameworks and demographic factors influence firearm trafficking patterns. This research was conducted to address existing gaps in the literature, particularly regarding the underexplored interactions between gun policy, demographic characteristics, and illegal firearm activity, and to inform more nuanced, evidence-based approaches to firearm regulation.

The key findings confirmed that states with more stringent gun laws generally report lower levels of firearm trafficking indicators, including firearm traces, perfected firearm traces, and straw purchases, supporting existing literature on the deterrent effects of robust regulatory measures (Matz et al., 2022; Webster & Vernick, 2023). However, the results also extended current knowledge by demonstrating that the prevalence of male possession of crime guns moderates the effectiveness of these laws. In states where crime guns are more frequently associated with male possessors, the deterrent effects of stringent laws were less pronounced, indicating that demographic factors can shape the perceived risks and consequences associated with illegal firearm activities.

These findings contribute to a more nuanced understanding of how legal and demographic variables interact to impact firearm trafficking, offering insights that align with and extend deterrence theory. In this chapter, I discuss the implications of these

findings, acknowledge the study's limitations, and propose recommendations for future research and policy development aimed at addressing firearm trafficking and enhancing public safety.

Interpretation of the Findings

The findings of this dissertation confirm, challenge, and extend the current understanding of the relationships between the stringency of state gun laws, gender distribution among firearm possessors, and illicit firearm trafficking in the United States. Through a comprehensive analysis, the study illuminates how variations in regulatory frameworks and demographic factors influence firearm trafficking patterns, providing new insights into the nuanced dynamics at play.

Consistent with the body of literature, the study confirms the deterrent effects of stringent gun laws on illegal firearm activities. The findings indicate that states with more restrictive gun regulations generally report lower levels of firearm trafficking indicators, including firearm traces, perfected firearm traces, and straw purchases. This supports existing research that shows that comprehensive firearm legislation can reduce the availability of guns in illegal markets by creating more stringent barriers to accessing firearms (Matz et al., 2022; Webster & Vernick, 2023). These results align with prior studies that argue that stricter gun laws can deter criminal behavior by increasing the perceived risks associated with acquiring and distributing illegal firearms. Thus, the findings reinforce the argument that stringent legal measures play a critical role in crime prevention and public safety, validating the broader deterrence effects discussed in the literature.

However, this dissertation extends the current knowledge base by highlighting the moderating role of gender distribution in shaping the effectiveness of regulatory frameworks. The analysis revealed that states with higher proportions of crime guns possessed by males tend to exhibit increased levels of firearm trafficking indicators, even under stringent regulatory conditions. This finding adds a significant demographic dimension to the discussion on gun control, as previous research has often overlooked the potential interactions between regulatory measures and demographic factors, particularly gender. The results suggest that the prevalence of male possession of crime guns may reflect cultural and social factors that influence firearm trafficking patterns, potentially reducing the perceived risks or penalties associated with engaging in illegal firearm activities (Boulouta & Koutoupis, 2023).

By uncovering these interactions, the findings challenge the uniform application of deterrence principles in gun control policies. While deterrence theory traditionally assumes that increasing the certainty and severity of punishment will reduce criminal behavior, this study suggests that demographic factors may moderate how individuals perceive these punitive measures. For example, in states where crime guns are more commonly associated with male possessors, there may be cultural norms or social attitudes that diminish the perceived severity or likelihood of legal repercussions. These cultural dynamics could include a higher social tolerance for certain forms of gun possession or a belief in the legitimacy of owning firearms despite legal restrictions, which may weaken the perceived deterrent effect of strict laws (Dahl & Dorr, 2021). This underscores the need for a more differentiated approach to deterrence that considers

demographic and cultural contexts, thus expanding deterrence theory beyond its traditional parameters.

Additionally, the results provide evidence that while stringent gun laws can be effective in reducing illicit firearm activity, the impact of these laws is not homogeneous across different states and populations. The finding that higher rates of male possession of crime guns may attenuate the effectiveness of regulatory frameworks suggests that deterrence is not merely a function of legal penalties but is also influenced by social and demographic factors that shape individuals' risk perceptions. This extends the literature by demonstrating that regulatory policies must be evaluated within the broader social context in which they are implemented, as certain demographic groups may perceive legal risks and benefits differently. The study thus introduces a critical dimension to existing research by indicating that the demographic characteristics associated with illegal firearm possession can affect how effectively laws deter criminal behavior.

In the context of deterrence theory, the findings support the basic premise that the certainty and severity of legal penalties can deter illegal activities. Stricter gun laws, which are associated with heightened legal consequences for illegal firearm transactions, generally correspond to lower levels of firearm trafficking, validating deterrence theory's emphasis on legal sanctions as a mechanism for crime reduction (Paternoster, 2010). However, the moderating effect of gender distribution reveals that the deterrent effect may not be as straightforward as traditionally posited. The data suggest that demographic variations, specifically the prevalence of male possession of crime guns, may influence how individuals assess the risks of engaging in illegal firearm activities. In states where

crime guns are more frequently associated with male possessors, the perceived deterrence effect of strict laws may be weakened, potentially due to cultural attitudes that legitimize firearm possession or diminish the perceived threat of legal penalties.

Moreover, the study expands deterrence theory by suggesting that the perceived efficacy of punitive measures can vary based on demographic characteristics and social contexts. This calls for a reconceptualization of deterrence in criminology, one that integrates demographic influences into the framework to better predict the outcomes of legal interventions. The study indicates that a one-size-fits-all approach to gun control may not be adequate; instead, policies should be adaptive to the social dynamics and demographic realities of specific populations. This implies that states with a higher prevalence of male possession of crime guns might benefit from targeted interventions that not only focus on the severity of penalties, but also address cultural attitudes toward firearm possession, perhaps through community-based programs or public awareness campaigns aimed at changing perceptions about the risks and consequences of illegal gun activities.

Additionally, the findings have implications for the development of more tailored gun control policies. Recognizing that demographic factors such as gender distribution can influence the deterrent effects of legal regulations suggests that policymakers should consider demographic data when crafting firearm laws. States with higher rates of male possession of crime guns might require different strategies than those with a more balanced demographic distribution, such as combining legal restrictions with educational efforts or social interventions that specifically target male populations involved in illegal

firearm possession. This multidimensional approach could help bridge the gap between legal theory and practical policy applications, ensuring that gun control measures are both effective and contextually appropriate.

Overall, the findings of this study offer a more nuanced understanding of the relationship between regulatory frameworks, demographic factors, and illegal firearm activity. By situating these results within the context of deterrence theory, the research supports the theory's foundational principles while also challenging its assumptions about uniform applicability across different populations. The study's contributions extend the literature by addressing the underexplored interactions between legal and demographic variables, providing valuable insights for both theoretical development and practical policymaking in the realm of firearm regulation.

Limitations of the Study

In reviewing the study's limitations, several key areas challenge the generalizability, validity, reliability, and trustworthiness of the findings. Recognizing these limitations is essential for contextualizing the results and guiding the interpretation and application of insights derived from the data.

Generalizability

This study's findings are primarily applicable within the U.S. context, given the unique landscape of firearm laws and cultural attitudes toward gun ownership in the country. The data derived from U.S.-specific legislation, enforcement practices, and cultural norms limit the generalizability of these findings to other nations. While analyzing all 50 U.S. states enhances internal validity within this context, the absence of

international data restricts broader applicability to regions with diverse regulatory frameworks or different firearm-related challenges.

Validity

The cross-sectional design of this study limits its capacity to capture causal relationships. As a single-time-point analysis, it provides a snapshot of firearm trafficking patterns but does not address changes over time, the potential lag in policy impact, or the dynamic responses of trafficking networks to legal modifications. This temporal limitation hinders the capacity to make causal inferences or to fully understand how changes in state gun laws or shifts in gender distribution among firearm possessors influence trafficking trends. While controlling for major variables, the study's exclusion of other potentially impactful factors—such as socioeconomic conditions and variations in state enforcement practices—may impact its internal validity, offering only a partial understanding of the nuanced factors contributing to illicit trafficking.

Reliability

Data reliability in this study is impacted by inconsistencies in firearm data reporting standards across states. Key metrics, such as "firearm trace" and "straw purchase," may differ in definition and reporting across jurisdictions, introducing potential measurement errors. These inconsistencies, along with variations in enforcement resources across states, could compromise the study's reliability by affecting the consistency of findings. Additionally, although categorizing gun laws by stringency aids in structuring the analysis, this simplification may overlook legislative nuances

among states with similar rankings, potentially obscuring critical differences in specific regulatory provisions or enforcement intensity.

Trustworthiness

Trustworthiness is constrained by the inherent difficulties in capturing accurate data on illicit firearm activities, which are often underreported. Despite the use of datasets from authoritative agencies such as the ATF and FBI, the underground nature of firearm trafficking and the likelihood of regional reporting discrepancies limit data comprehensiveness. Certain jurisdictions may underreport incidents, or lack the necessary resources for meticulous data collection, leading to an incomplete picture of firearm trafficking. These factors may underestimate the prevalence and complexities of trafficking, ultimately impacting the study's trustworthiness.

Assumptions and Statistical Limitations

Statistical limitations inherent to multiple linear regression analysis also impact the study's validity and reliability. Meeting assumptions such as linearity, normality, homoscedasticity, and independence is essential to maintain unbiased estimates; however, minor violations, particularly with nonnormally distributed residuals, were noted. These statistical concerns may compromise the accuracy of significance tests and limit the interpretive validity of the results. Acknowledging these issues is essential, as they underscore the need for careful interpretation and suggest that findings should be generalized with caution.

While the study offers valuable insights into the factors influencing firearm trafficking in the United States, these limitations indicate that findings should be

interpreted within the study's contextual and methodological constraints. Addressing these limitations in future research by incorporating longitudinal designs, exploring additional contextual variables, or adopting consistent reporting standards could strengthen the understanding of illicit firearm trafficking. Future investigations could also broaden the scope by including international comparisons or longitudinal datasets to capture policy impacts over time. Building on these reflections, the next section offers recommendations that seek to enhance the application of findings and to provide actionable insights for policymakers and stakeholders. These recommendations are intended to help bridge identified gaps, mitigate challenges, and support the formulation of more targeted and effective interventions.

Recommendations for Further Research

Given the strengths and limitations identified in this study, several recommendations are proposed to guide future research efforts aimed at enhancing the understanding of illicit firearm trafficking within the United States. These recommendations build upon the study's findings, address methodological constraints encountered during the analysis, and reflect insights from relevant literature.

First, to address the study's cross-sectional limitations, future research could adopt a longitudinal design. By analyzing data over an extended period, researchers could better understand how state gun laws and gender distribution among firearm possessors influence trafficking patterns over time. This approach would strengthen causal interpretations and capture the impacts of evolving regulatory frameworks, providing a

deeper understanding of time-sensitive variables, as supported by policy evaluation literature.

Further, incorporating additional socioeconomic and cultural factors would expand the scope of analysis, revealing a more nuanced picture of the drivers behind firearm trafficking patterns. Variables such as income inequality, educational attainment, regional cultural attitudes toward firearms, and unemployment rates are frequently identified in the literature as influential in shaping firearm-related behaviors. Including these factors could offer a richer perspective on the social dynamics contributing to illicit trafficking, while respecting the study's state-level focus.

Addressing data consistency and reporting standards is another critical area for future research. Inconsistent reporting across states, particularly in terms of straw purchases, presents a challenge for reliably assessing the prevalence of illicit firearm trafficking. Straw purchases, which can be executed by both males and females, are often difficult to ascertain because they may go unreported or underreported. Law enforcement agencies face limitations in detecting and documenting straw purchases consistently, given that these purchases may not be apparent unless tied to direct criminal investigations. Additionally, the absence of standardized protocols for conducting firearm traces on crime guns further affects data consistency; without a trace, information about a firearm's history remains unreported. Collaborating with law enforcement agencies to establish more consistent reporting practices and unified definitions could improve the accuracy and comparability of cross-state data. This aligns with calls in the literature for a more cohesive national approach to data tracking on firearm trafficking, emphasizing

the need for reliable and comprehensive data to inform evidence-based policy interventions.

To gain greater insight into the effects of regulatory frameworks, future studies could analyze specific gun laws individually rather than categorizing states by overall stringency. The literature has indicated that various measures, such as waiting periods, background checks, and restrictions on sales to high-risk individuals, have distinct impacts on firearm-related outcomes. Examining these provisions separately would allow for a more precise evaluation of which policies most effectively mitigate trafficking, yielding actionable insights for policy development.

Additionally, conducting comparative studies with countries that employ different regulatory approaches could provide valuable perspectives. While this study is U.S.-focused, international research has frequently highlighted the benefits of comparative analyses, which reveal alternative strategies and regulatory successes. By assessing how different countries' frameworks impact trafficking dynamics, future studies could refine domestic policy recommendations by drawing on global insights, even as they continue to focus on state-level factors within the U.S.

Further, a deeper examination of gender-specific patterns in trafficking behaviors would expand upon this study's exploration of gender distributions among firearm possessors. Differences in motivations, socioeconomic pressures, and peer influences for male and female participants in straw purchases have been frequently noted in gender and crime literature. Expanding research to explore these distinctions could provide insights

for more targeted public awareness and prevention strategies, helping regulatory agencies address the unique factors influencing male and female involvement in trafficking.

The recommendations outlined here identify strategic avenues for advancing research and policy efforts to address illicit firearm trafficking in the United States. These suggestions leverage the study's findings and acknowledge its limitations, providing a pathway for future studies to deepen understanding and enhance the reliability of data and policy recommendations. The following section contextualizes these recommendations into practical insights for policymakers, emphasizing the importance of refined interventions, improved data quality, and collaborative approaches in combating firearm trafficking.

Implications

The implications of this study's findings have significant potential to foster positive social change across various levels, ranging from individuals and families to broader organizational and policy contexts. By examining the role of state gun laws and gender distribution in illicit firearm trafficking, this research provides actionable insights that can influence critical areas such as public safety, community well-being, and regulatory practices.

Positive Social Change—Individual Level

At the individual level, this study's findings have important implications for public education and awareness campaigns. By understanding that illicit firearm trafficking often arises from specific demographic and regulatory conditions, policymakers and community organizations can develop targeted educational initiatives

to reduce participation in illegal firearm activities, such as straw purchases. These initiatives may empower individuals with knowledge about the legal consequences and social impacts of illicit firearm transactions, deterring potential participants and encouraging responsible firearm ownership. Furthermore, individuals who might otherwise engage in straw purchases due to economic or social pressures could benefit from alternative support systems and deterrents, reducing their involvement in activities that contribute to crime and violence.

Positive Social Change—Family Level

The family unit represents another critical sphere where positive social change can occur. The study's insights into gendered patterns of firearm possession and trafficking have the potential to inspire tailored family-focused interventions, including educational programs that address the risks and consequences of illegal firearm transactions. Families affected by or vulnerable to gun violence could benefit from community outreach programs offering guidance on identifying and preventing participation in illicit firearm activities. These interventions may not only deter involvement in trafficking but also strengthen family resilience against the risks associated with illegal firearms, fostering safer environments for children and other vulnerable family members. Furthermore, by mitigating illicit firearm trafficking, communities are more likely to experience reduced gun crime rates, indirectly creating safer spaces for families.

Positive Social Change—Organizational Level

On an organizational level, law enforcement agencies and regulatory bodies can benefit from the study's findings. Greater awareness of demographic influences on illicit firearm trafficking enables law enforcement agencies to allocate resources more effectively and implement focused strategies that address specific trafficking patterns. For example, organizations might leverage this study's findings to refine profiling and intervention techniques, prioritizing regions and demographics most susceptible to trafficking activities and optimizing their responses within legal and ethical frameworks.

Additionally, this study underscores the importance of data consistency, which could encourage law enforcement organizations to standardize reporting practices across states. Such standardization would facilitate improved collaboration and more cohesive national efforts to reduce firearm trafficking. Educational organizations and community outreach programs could also implement targeted training sessions on firearm laws and responsible ownership, enhancing public understanding of lawful firearm possession and distribution. Through these initiatives, organizational stakeholders contribute to an informed citizenry that is less likely to engage in or unwittingly support illegal firearm trafficking.

Positive Social Change—Societal and Policy Level

At the societal and policy level, this study underscores the need for cohesive and consistent firearm regulations to address and mitigate trafficking risks. Findings that highlight the effects of regulatory inconsistencies across states suggest that a more unified national approach could significantly reduce the gaps that traffickers exploit.

Policymakers may draw from this study to advocate for harmonized definitions and reporting standards across states, as well as for consistent enforcement practices that prevent illicit firearms from crossing state lines. By implementing more unified firearm policies, lawmakers can reduce illegal trafficking opportunities, enhance public safety, and contribute to a broader national framework that curbs firearm-related crime.

Additionally, this study's focus on the impact of gender distribution among firearm possessors may inspire policymakers to consider gender-sensitive interventions in firearm trafficking prevention efforts. Such approaches could include programs tailored to address the specific social and economic factors that influence male and female involvement in straw purchases, helping to reduce gendered patterns in trafficking. As these policies evolve, they contribute to a safer society and reflect a proactive stance in addressing complex trafficking issues.

The potential for positive social change derived from this study is substantial, offering insights to reduce illicit firearm trafficking and improve public safety. By influencing individuals, families, organizations, and societal frameworks, the findings provide a foundation for educational initiatives, regulatory improvements, and targeted interventions that collectively foster safer communities. Each level of implication aligns with the study's scope, ensuring that recommended actions remain directly tied to the insights gleaned from the data. These contributions, grounded in the evidence presented, promote a safer, more informed society better equipped to address the challenges associated with firearm trafficking.

Methodological, Theoretical, and Empirical Implications

This study's findings have significant implications across methodological, theoretical, and empirical domains, contributing to a deeper understanding of illicit firearm trafficking within the United States and offering pathways for refining future research and policy efforts.

Methodological Implications

Methodologically, this study highlights the value of a structured, quantitative approach to analyzing complex social issues such as firearm trafficking. By employing multiple linear regression analysis with a cross-sectional dataset from all 50 U.S. states, the research demonstrates how large-scale, state-level data can be utilized to identify trends and relationships in illicit activities. However, the study also reveals challenges related to data consistency, particularly across states with varied definitions and reporting practices for terms such as 'straw purchases' and 'firearm traces.' Future studies could address these limitations by incorporating more standardized, longitudinal data to enhance causal inferences and track changes over time.

This study further emphasizes the potential for collaborative partnerships with law enforcement agencies to improve data quality and reporting standards. Such efforts would ensure that future research can rely on more accurate and comprehensive datasets, ultimately advancing the study of firearm trafficking and informing more effective policy interventions

Theoretical Implications

Theoretically, this research contributes to criminological and public policy theories by highlighting the interplay between regulatory frameworks, demographic factors, and illicit firearm trafficking. Through the lens of Classical Deterrence Theory, the study reinforces the principle that individuals weigh the risks and benefits of illicit actions. Findings that connect state gun law stringency and gender distribution among firearm possessors with trafficking rates support the idea that stronger, consistently enforced regulations reduce incentives for illegal activities.

Additionally, the study's focus on gender distribution among firearm possessors introduces a novel dimension to deterrence theory, suggesting that gendered social dynamics, such as economic motivations and peer influences, play a critical role in criminal behavior related to firearm trafficking. These findings provide a foundation for further theoretical exploration into how gender-specific factors shape criminal decision-making within the frameworks of deterrence and social learning theories

Empirical Implications

Empirically, this study contributes valuable data to the field of firearm trafficking research, offering insights that can serve as a foundation for subsequent studies. By systematically examining the impacts of gun law stringency and gender demographics across U.S. states, the study provides a dataset that may be further analyzed or replicated with new data to track trends over time. The empirical results highlight the importance of contextual variables, such as socioeconomic factors and regional cultural norms,

suggesting that future research could incorporate these additional variables to develop a more holistic model of factors influencing firearm trafficking.

Moreover, the study identifies significant gaps in the current empirical literature, particularly regarding the gendered nature of straw purchasing and the role of state regulatory inconsistencies in enabling trafficking networks. Addressing these gaps in future research would refine our understanding of how demographic and regulatory factors intersect to shape trafficking patterns and inform strategies to mitigate firearm trafficking more effectively.

The methodological, theoretical, and empirical implications of this study highlight the complexity of addressing illicit firearm trafficking in the United States. Each set of implications provides a roadmap for future research and theory development, emphasizing the importance of data consistency, theoretical expansion, and empirical rigor. These insights not only advance academic understanding but also offer practical guidance for policymakers and law enforcement agencies striving to curb firearm trafficking through informed, evidence-based interventions.

Recommendations for Practice

The findings of this study provide several practical recommendations for policymakers, law enforcement, and community organizations to address illicit firearm trafficking more effectively. Implementing these strategies can help stakeholders develop more cohesive, data-driven approaches to enhance public safety and limit the flow of illegal firearms.

Policy-Level Recommendations

Policymakers can leverage this study's findings to advocate for more standardized firearm regulations across states. Given the study's indication that inconsistencies in gun laws enable trafficking networks, a more uniform approach to firearm regulation—particularly regarding background checks, waiting periods, and restrictions on straw purchases—could reduce trafficking opportunities across state lines. Legislators might consider promoting federal guidelines that encourage states to adopt minimum standards in these areas, creating a more unified legal framework that limits traffickers' ability to exploit regulatory gaps.

Additionally, the study underscores the importance of data consistency in understanding firearm trafficking patterns. Policymakers should support initiatives to standardize firearm-related data collection practices across states. By investing in enhanced data collection infrastructure and establishing clear metrics for reporting terms such as "straw purchase" and "firearm trace," policymakers can enable more reliable tracking of illicit firearm activities. Greater consistency in data collection would facilitate accurate assessments of trafficking trends, allowing for more informed and targeted interventions and policy decisions.

Law Enforcement Practices

Law enforcement agencies can apply this study's insights on demographic influences in firearm trafficking to develop more targeted intervention strategies. For instance, the findings related to gender distributions in straw purchasing highlight the need for gender-sensitive approaches in crime prevention. Agencies could design

awareness programs addressing the specific social and economic motivations of individuals most likely to engage in straw purchases, particularly in areas with high trafficking rates. These programs might include community outreach initiatives that educate individuals about the legal consequences of straw purchasing and provide support services offering economic alternatives for those at risk.

Additionally, law enforcement agencies could enhance collaboration with policymakers and data analysts to implement more effective tracking and reporting mechanisms. Standardizing protocols for firearm tracing and straw purchase reporting would enable agencies to monitor trafficking patterns more effectively and identify high-risk areas. A consistent and robust reporting structure would facilitate cross-agency data sharing, improving the ability to detect and respond to trafficking hotspots across jurisdictions.

Community and Educational Organizations

Community organizations and educational institutions can play a critical role in preventative efforts by using this study's findings to develop public education programs that address the dangers of illicit firearm trafficking. Programs targeting young adults and high-risk individuals could emphasize the risks associated with straw purchases, the legal consequences, and the broader impact on community safety. By raising awareness of these issues, educational organizations can deter potential participants from engaging in illegal firearm activities and promote a culture of responsible firearm ownership.

Additionally, educational institutions could incorporate material on firearm laws, trafficking, and responsible firearm ownership into school curricula and community programs. These programs, tailored to the specific demographics of each community, would help build a foundational understanding of lawful and unlawful firearm activities, ultimately discouraging future involvement in trafficking networks. Community-led interventions, in particular, could effectively address the socioeconomic and peer-related pressures that contribute to straw purchases and illicit trafficking.

Organizational Training and Development

Lastly, law enforcement and community organizations should consider integrating specialized training and professional development related to firearm trafficking detection and prevention. Law enforcement agencies could provide officers with training on recognizing the signs of straw purchasing, understanding demographic trends, and employing data-driven profiling techniques to detect trafficking networks. Training sessions focused on data collection, standardization, and analysis would ensure that officers and personnel involved in reporting have the skills necessary to contribute to a cohesive national dataset on firearm trafficking.

Community organizations could also benefit from training in collaboration with law enforcement agencies, developing expertise in public safety communication, legal education, and social service provision to address the economic and social factors associated with trafficking involvement. These partnerships would enhance community resilience, fostering safer environments less susceptible to firearm-related crimes.

The recommendations for practice underscore the importance of a multi-faceted approach to illicit firearm trafficking, combining legislative improvements, law enforcement strategies, community outreach, and organizational training. Each recommendation draws directly from the study's findings, offering practical steps that remain within the study's scope while maximizing the impact on public safety and community well-being. By integrating these recommendations into their practices, stakeholders can create a more comprehensive and effective response to the challenges of firearm trafficking in the United States.

Conclusion

This study highlights the critical role that state gun laws and demographic patterns play in influencing illicit firearm trafficking across the United States. By analyzing these relationships, it emphasizes how regulatory consistency and targeted interventions can help curb the flow of illegal firearms. The findings underscore that effective measures against firearm trafficking require not only strong legislation but also a multi-faceted approach that considers the unique social and economic pressures leading individuals into illicit activities.

In identifying these factors, this research provides a pathway toward informed, evidence-based policies that address the root causes of firearm trafficking, potentially reducing its impact on public safety and community resilience. The insights gained are not merely statistical; they serve as a call to action for policymakers, law enforcement, and community leaders to work collaboratively in creating safer communities through responsible legislation, enhanced data practices, and targeted public awareness efforts.

Ultimately, this study contributes a foundational understanding of the dynamics driving illicit firearm trafficking and lays the groundwork for meaningful social change, fostering a safer and more accountable society for all.

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Appendix A: DV1a (Controlling for Category A)

Figure A1

Histogram of Regression Standardized Residuals for Dependent Variable: TCG (Initial Model, Controlling for Category A)

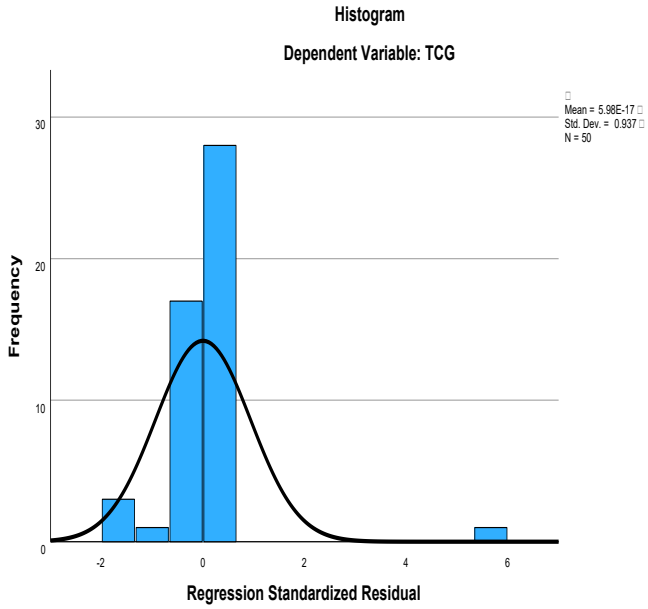


Figure A2

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: TCG (Initial Model, Controlling for Category A)

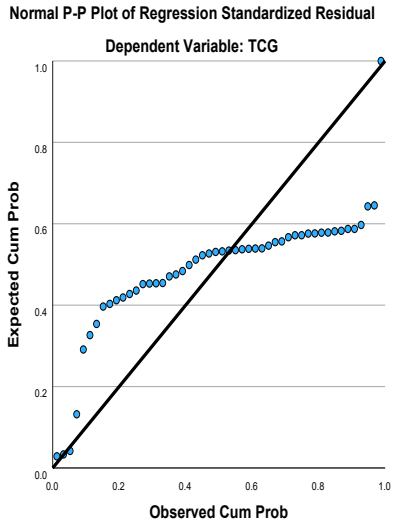


Figure A3

Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: TCG (Initial Model, Controlling for Category A)

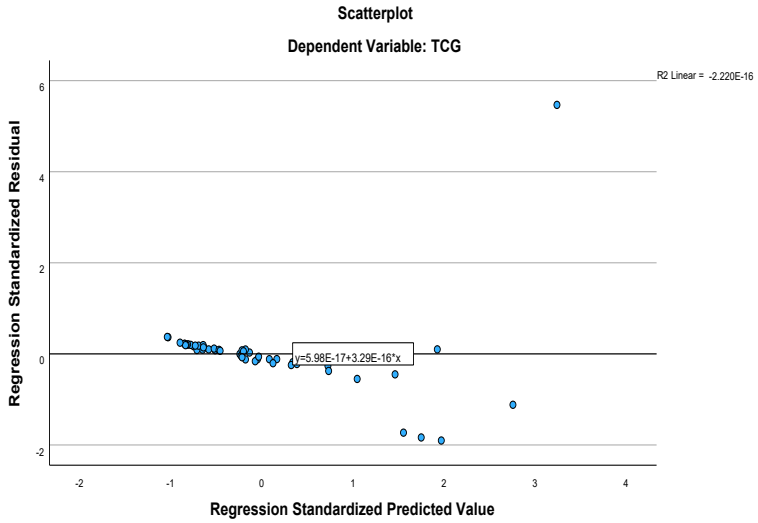


Figure A4

Histogram of Regression Standardized Residuals for Dependent Variable: TCG (Standardized Model, Controlling for Category A)

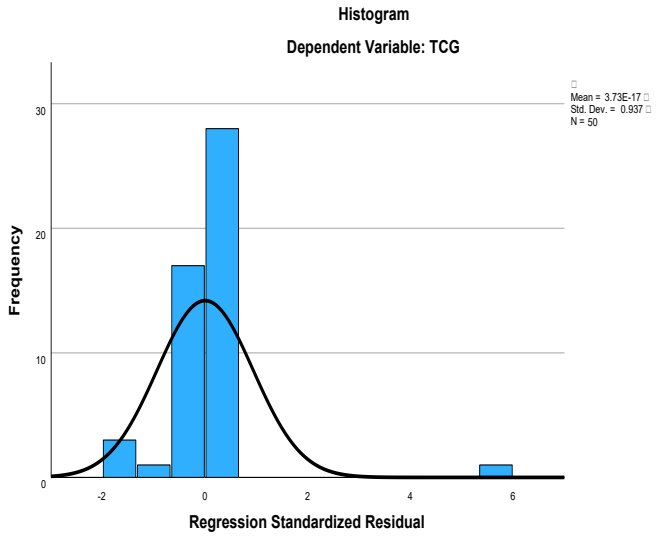


Figure A5

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: TCG (Standardized Model, Controlling for Category A)

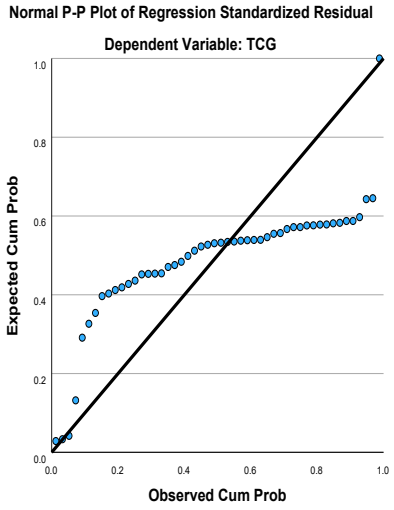


Figure A6

Scatterplot of Regression Standardized Residuals** Versus **Predicted Values for Dependent Variable: TCG (Standardized Model, Controlling for Category A)

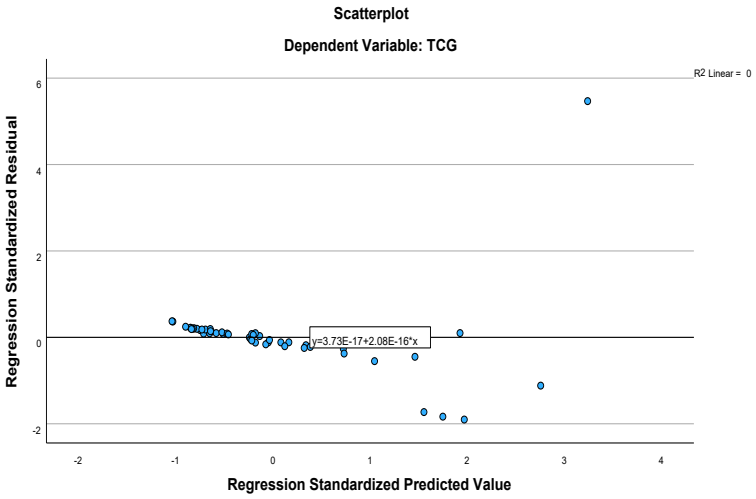


Figure A7

Histogram of Regression Standardized Residuals for Dependent Variable: TCG (MCGP Removed, Controlling for Category A)

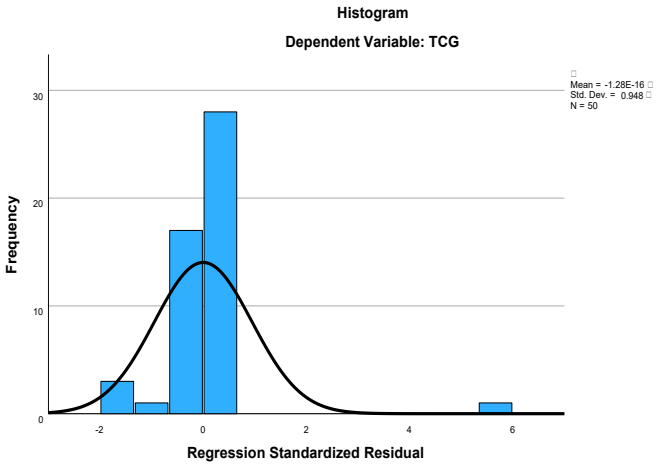


Figure A8

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: TCG (MCGP Removed, Controlling for Category A)

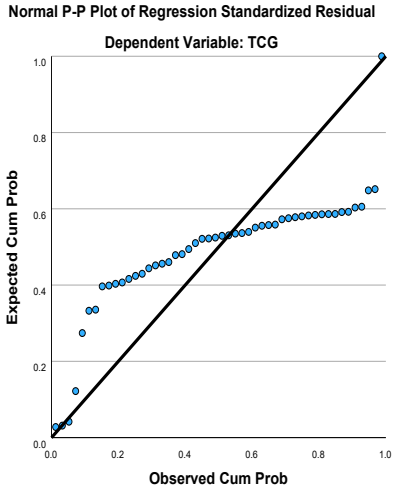
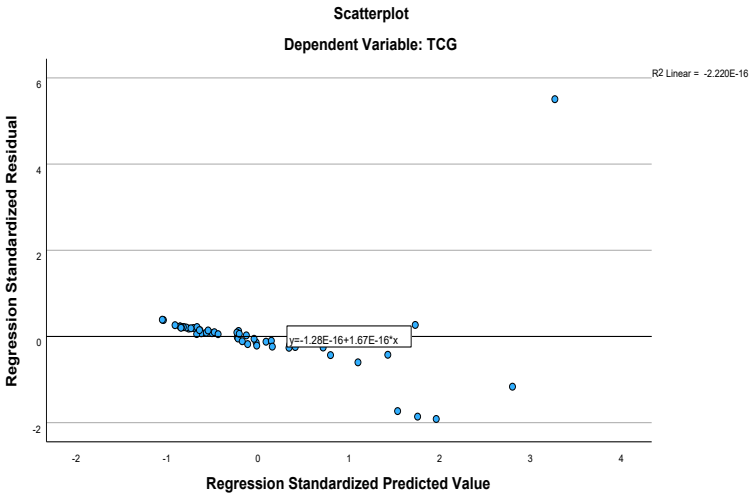


Figure A9

Scatterplot of Regression Standardized Residuals** Versus **Predicted Values for Dependent Variable: TCG (MCGP Removed, Controlling for Category A)



Appendix B: DV1b (Controlling for Category A)

Figure B1

Histogram of Regression Standardized Residuals for Dependent Variable: PTCG (Initial Model, Controlling for Category A)

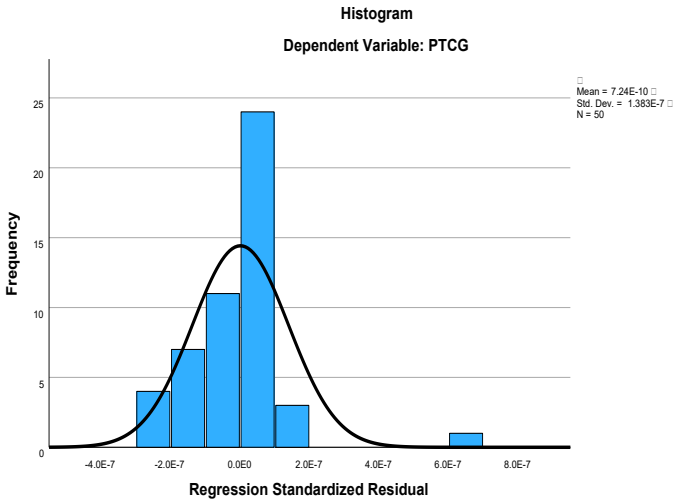


Figure B2

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PTCG (Initial Model, Controlling for Category A)

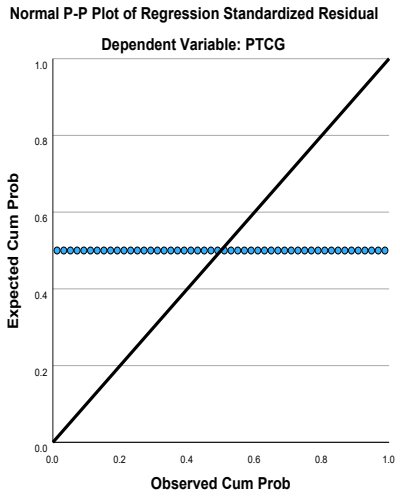


Figure B3

Scatterplot of Regression Standardized Residuals** Versus **Predicted Values for Dependent Variable: PTCG (Initial Model, Controlling for Category A)

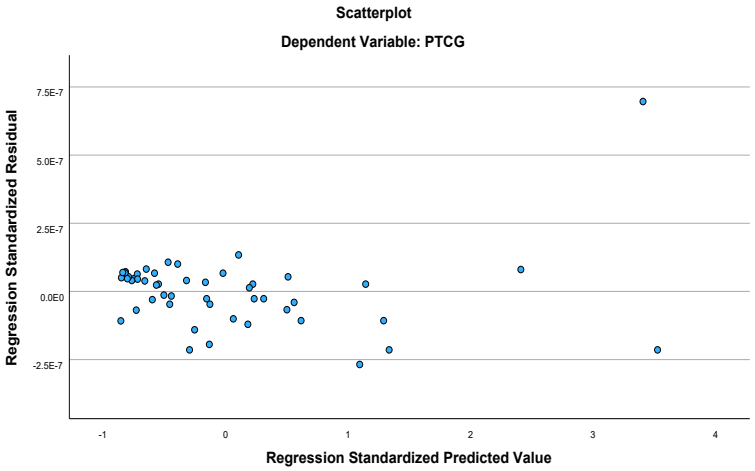


Figure B4

Histogram of Regression Standardized Residuals for Dependent Variable: PTCG (Standardized Model, Controlling for Category A)

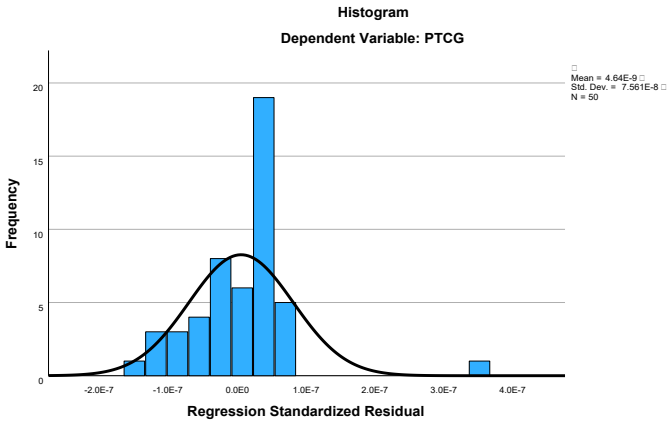


Figure B5

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PTCG (Standardized Model, Controlling for Category A)

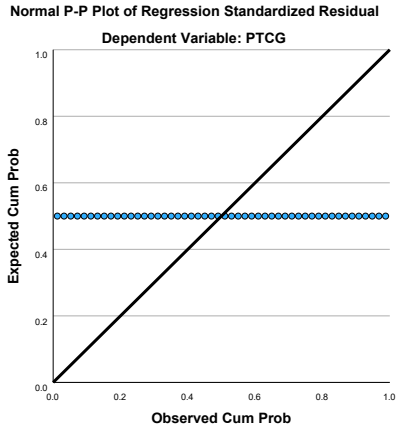


Figure B6

Scatterplot of Regression Standardized Residuals** Versus **Predicted Values for Dependent Variable: PTCG (Standardized Model, Controlling for Category A)

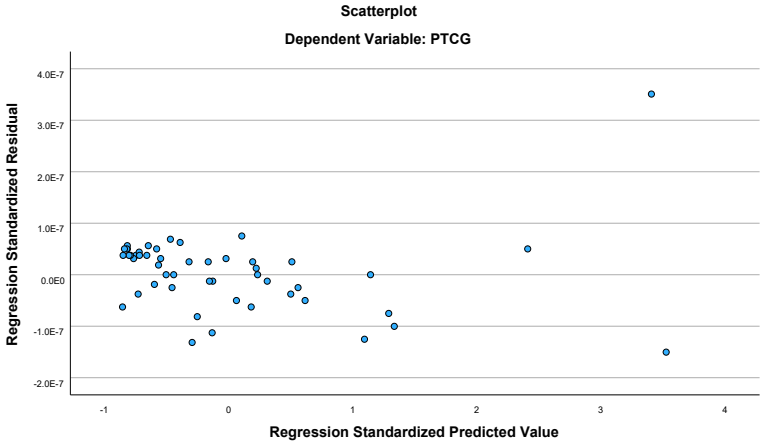


Figure B7

Histogram of Regression Standardized Residuals for Dependent Variable: PTCG (MCGP Removed, Controlling for Category A)

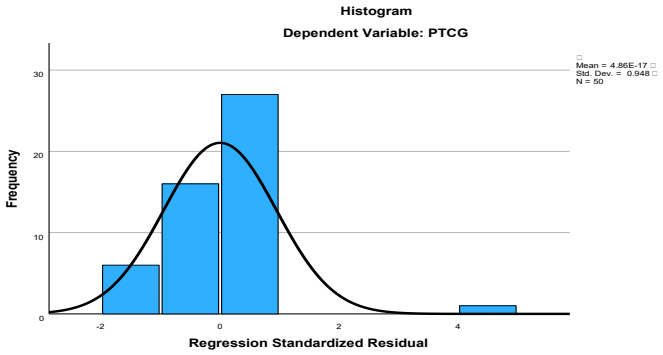


Figure B8

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PTCG (MCGP Removed, Controlling for Category A)

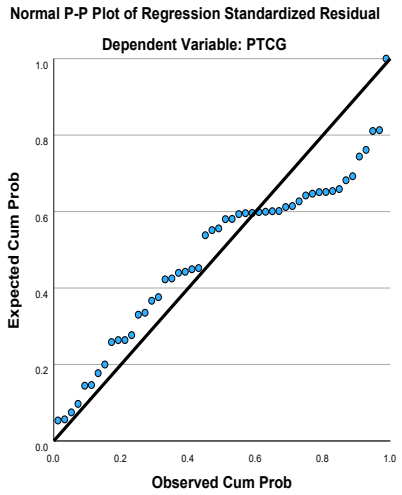
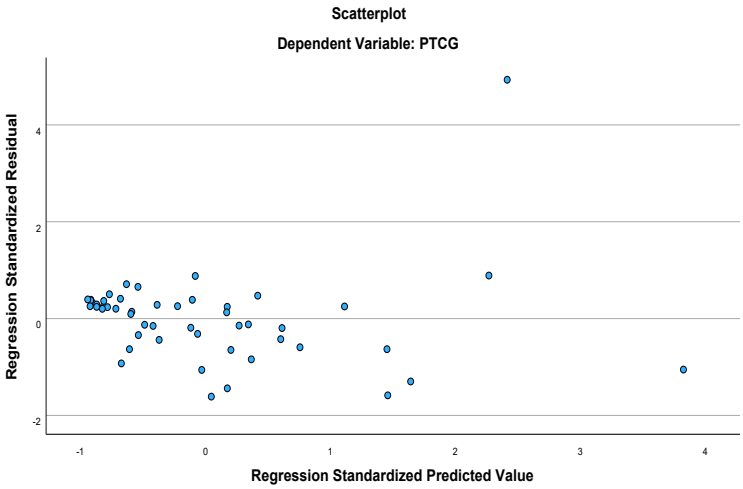


Figure B9

Scatterplot of Regression Standardized Residuals** Versus **Predicted Values for Dependent Variable: PTCG (MCGP Removed, Controlling for Category A)



Appendix C: DV1c (Controlling for Category A)

Figure C1

Histogram of Regression Standardized Residuals for Dependent Variable: PPD (Initial Model, Controlling for Category A)

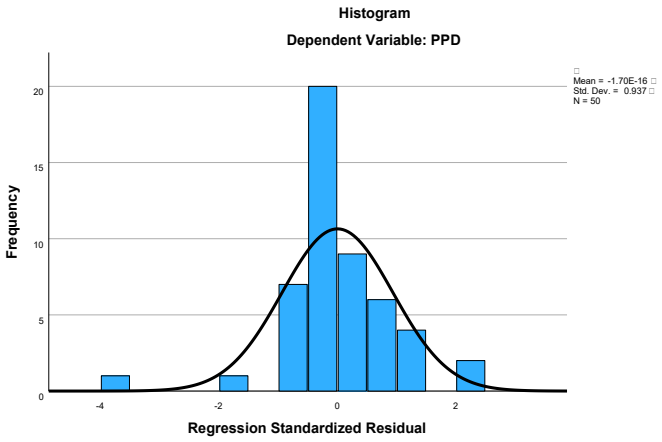


Figure C2

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PPD (Initial Model, Controlling for Category A)

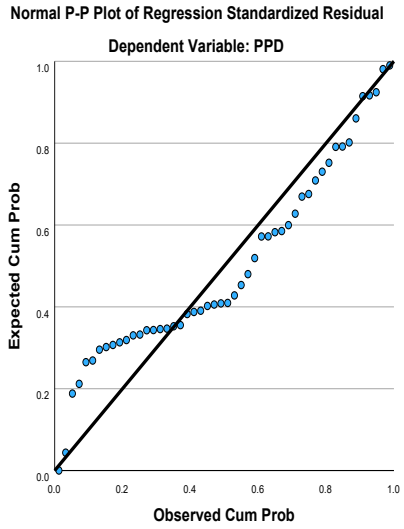


Figure C3

Scatterplot of Regression Standardized Residuals** Versus **Predicted Values for Dependent Variable: PPD (Initial Model, Controlling for Category A)

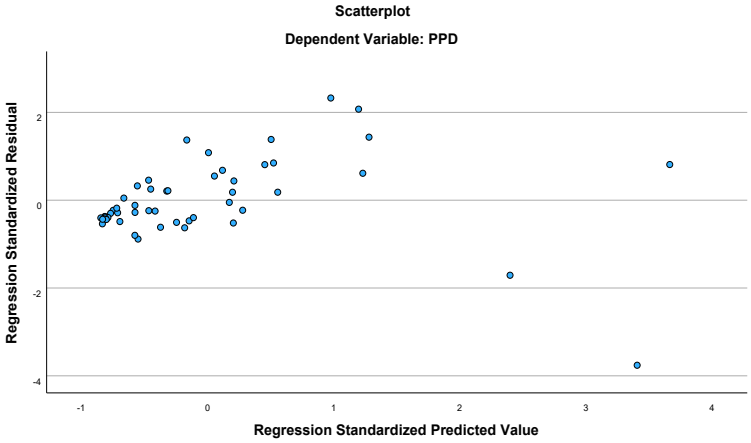


Figure C4

Histogram of Regression Standardized Residuals for Dependent Variable: PPD (Standardized Model, Controlling for Category A)

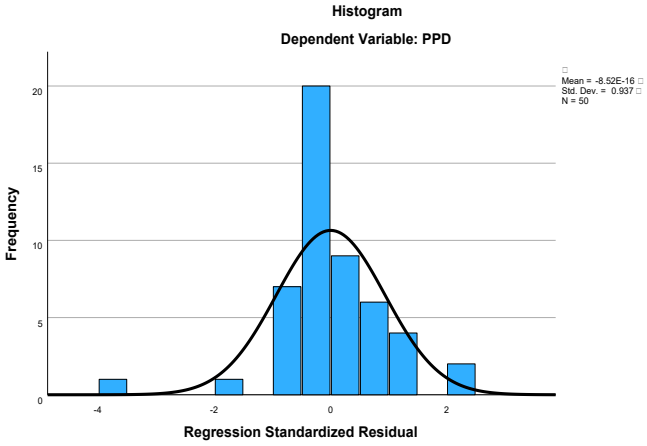


Figure C5

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PPD (Standardized Model, Controlling for Category A)

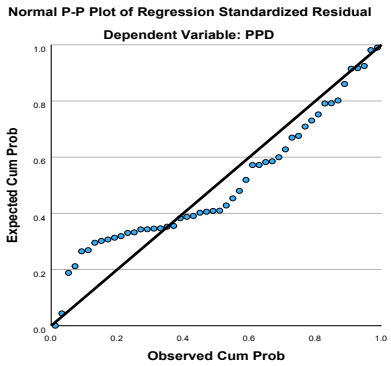


Figure C6

Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PPD (Standardized Model, Controlling for Category A)

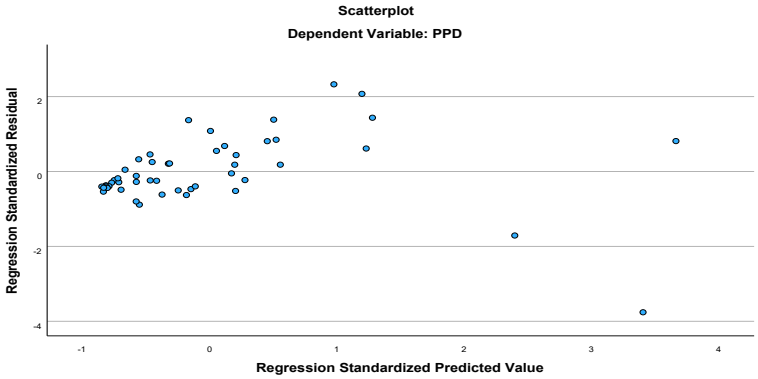


Figure C7

Histogram of Regression Standardized Residuals for Dependent Variable: PPD (MCGP Removed, Controlling for Category A)

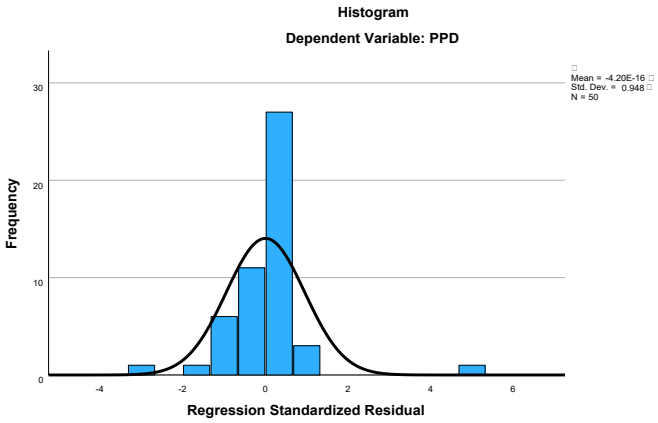


Figure C8

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PPD (MCGP Removed, Controlling for Category A)

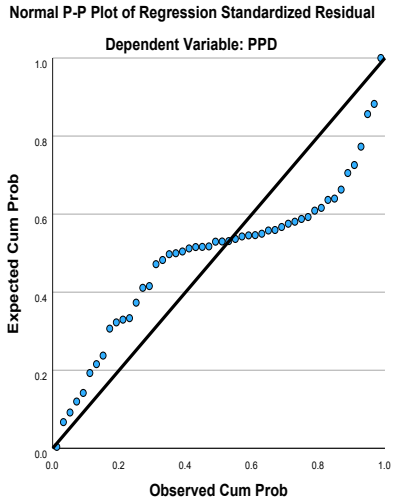
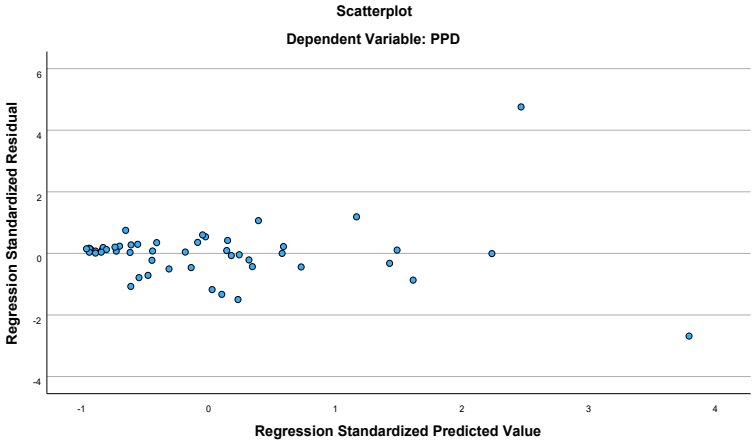


Figure C9

Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PPD (MCGP Removed, Controlling for Category A)



Appendix D: DV1a (Controlling for Category E)

Figure D1

Histogram of Regression Standardized Residuals for Dependent Variable: TCG (Initial Model, Controlling for Category E)

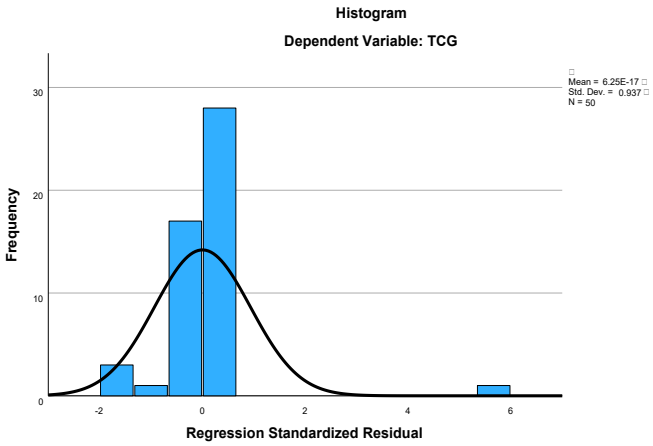


Figure D2

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: TCG (Initial Model, Controlling for Category E)

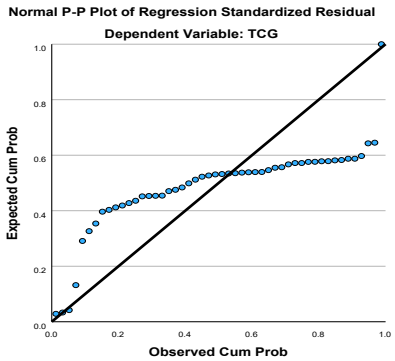


Figure D3

Scatterplot of Regression Standardized Residuals** Versus **Predicted Values for Dependent Variable: TCG (Initial Model, Controlling for Category E)

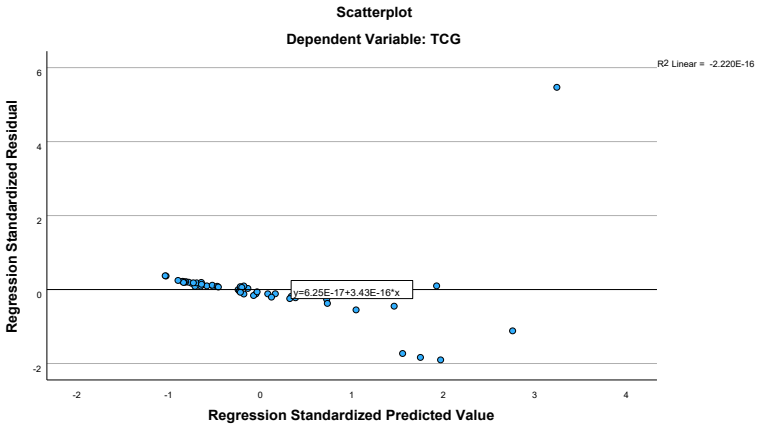


Figure D4

Histogram of Regression Standardized Residuals for Dependent Variable: TCG (Standardized Model, Controlling for Category E)

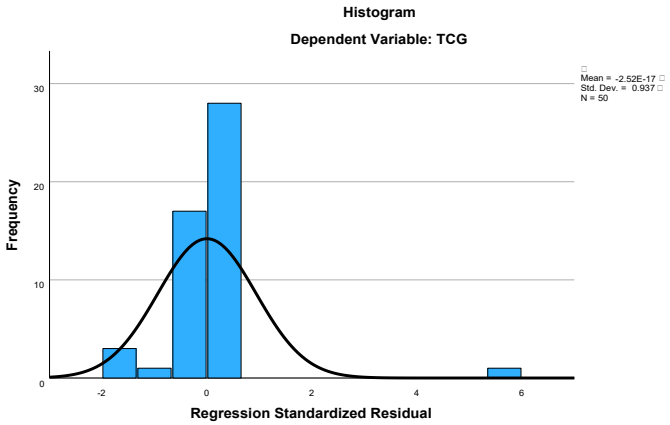


Figure D5

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: TCG (Standardized Model, Controlling for Category E)

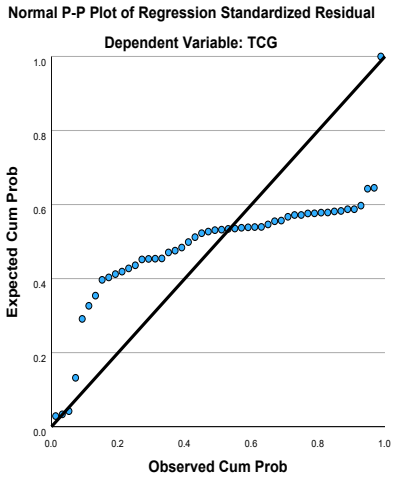


Figure D6

Scatterplot of Regression Standardized Residuals** Versus **Predicted Values for Dependent Variable: TCG (Standardized Model, Controlling for Category E)

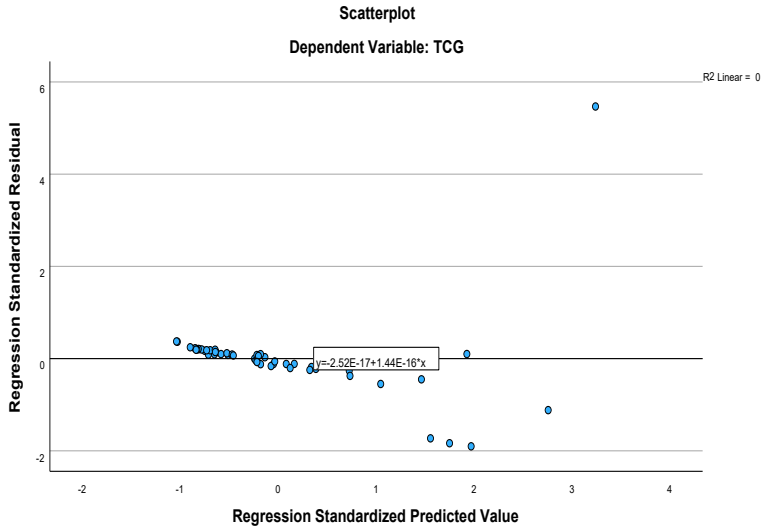


Figure D7

Histogram of Regression Standardized Residuals for Dependent Variable: TCG (MCGP Removed, Controlling for Category E)

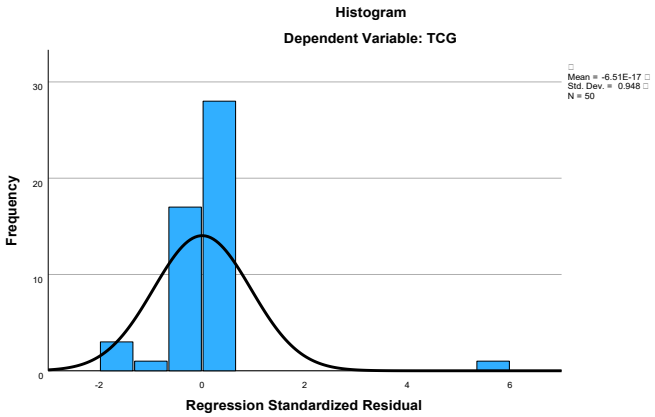


Figure D8

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: TCG (MCGP Removed, Controlling for Category E)

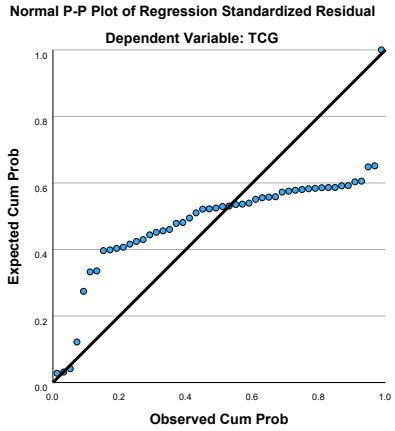
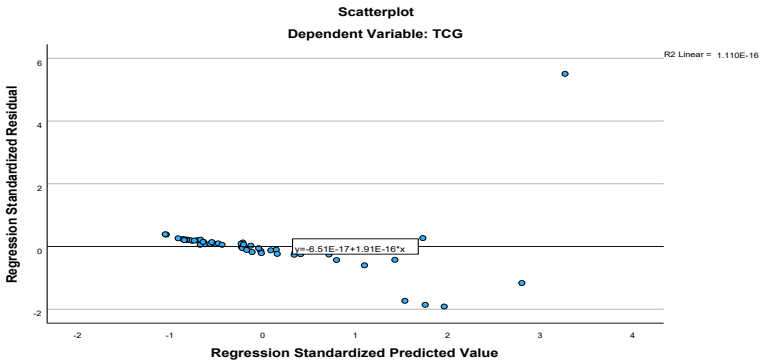


Figure D9

Scatterplot of Regression Standardized Residuals** Versus **Predicted Values for Dependent Variable: TCG (MCGP Removed, Controlling for Category E)



Appendix E: DV1b (Controlling for Category E)

Figure E1

Histogram of Regression Standardized Residuals for Dependent Variable: PTCG (Initial Model, Controlling for Category E)

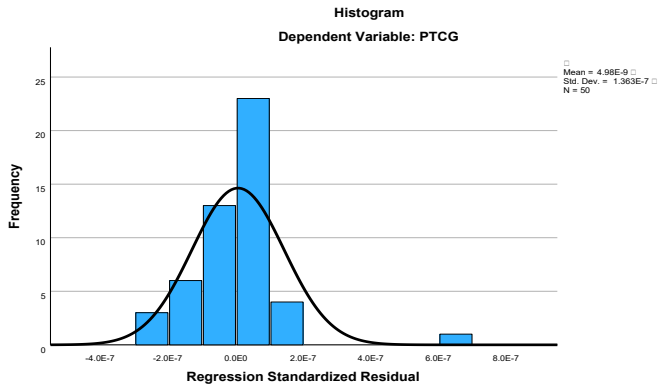


Figure E2

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PTCG (Initial Model, Controlling for Category E)

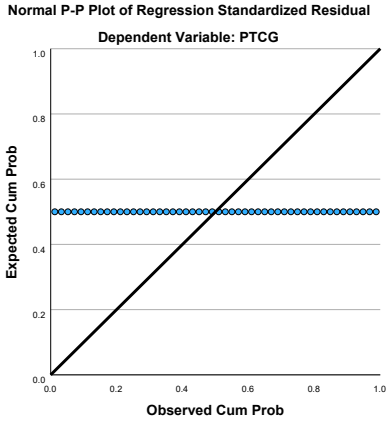


Figure E3

Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PTCG (Initial Model, Controlling for Category E)

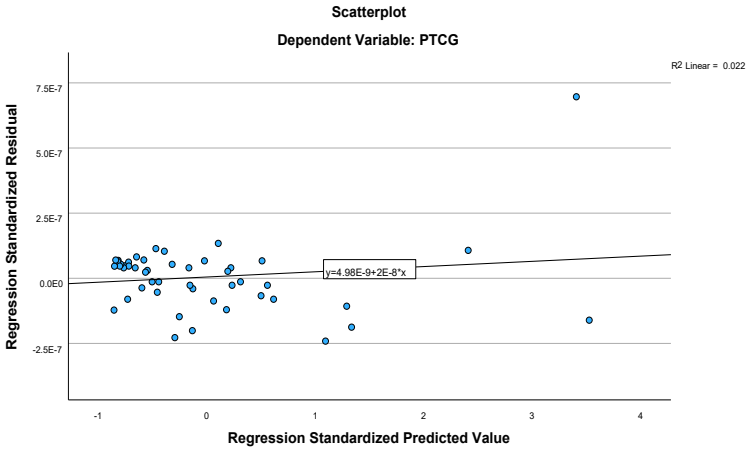


Figure E4

Histogram of Regression Standardized Residuals for Dependent Variable: PTCG (Standardized Model, Controlling for Category E)

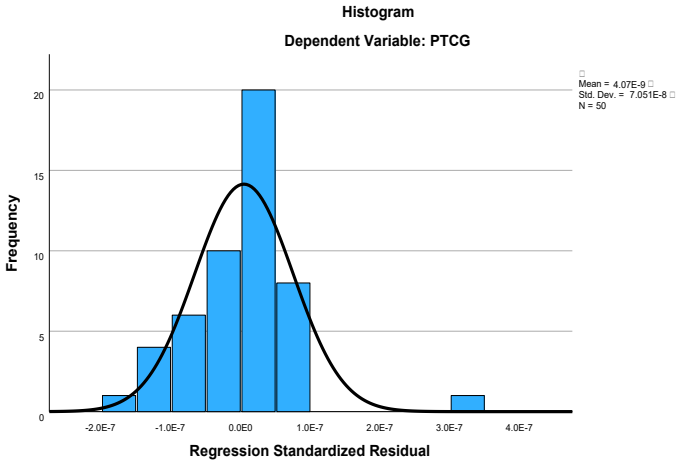


Figure E5

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PTCG (Standardized Model, Controlling for Category E)

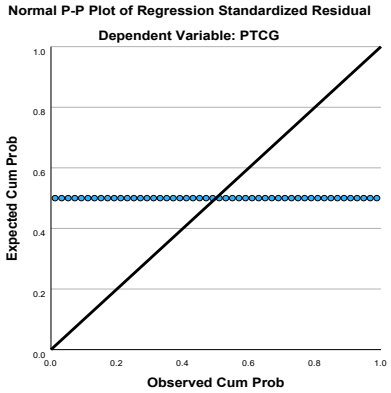


Figure E6

Scatterplot of Regression Standardized Residuals** Versus **Predicted Values for Dependent Variable: PTCG (Standardized Model, Controlling for Category E)

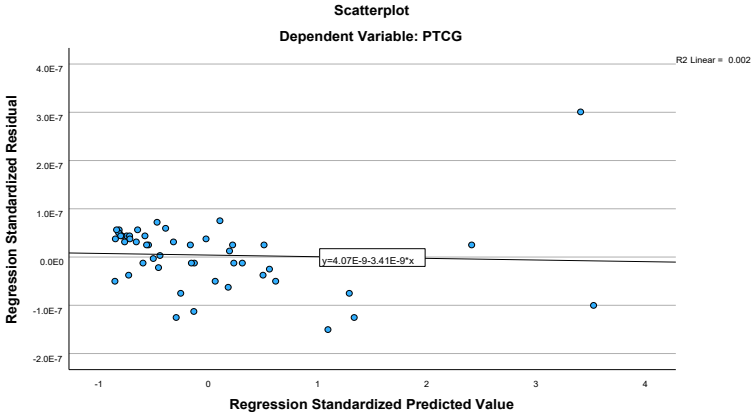


Figure E7

Histogram of Regression Standardized Residuals for Dependent Variable: PTCG (MCGP Removed, Controlling for Category E)

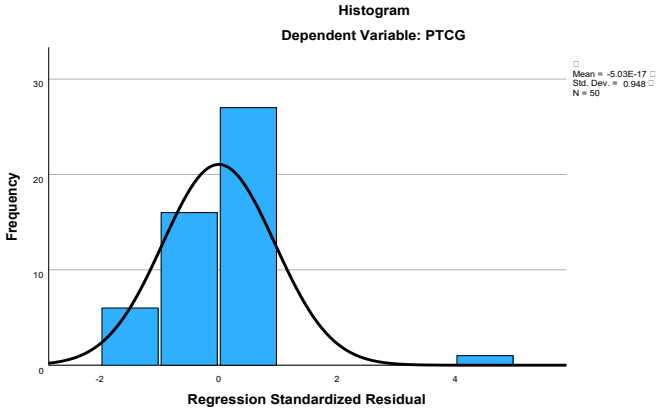


Figure E8

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PTCG (MCGP Removed, Controlling for Category E)

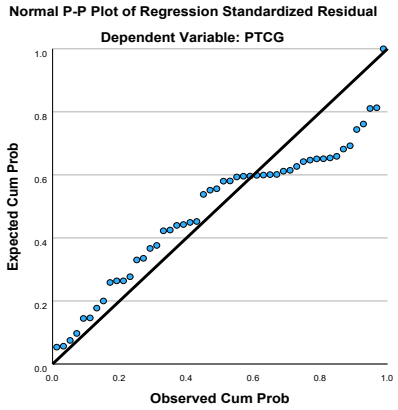
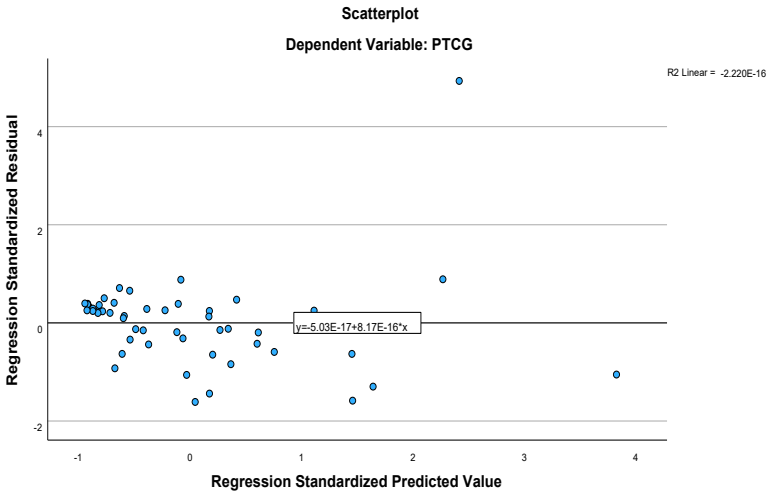


Figure E9

Scatterplot of Regression Standardized Residuals** Versus **Predicted Values for Dependent Variable: PTCG (MCGP Removed, Controlling for Category E)



Appendix F: DV1c (Controlling for Category E)

Figure F1

Histogram of Regression Standardized Residuals for Dependent Variable: PPD (Initial Model, Controlling for Category E)

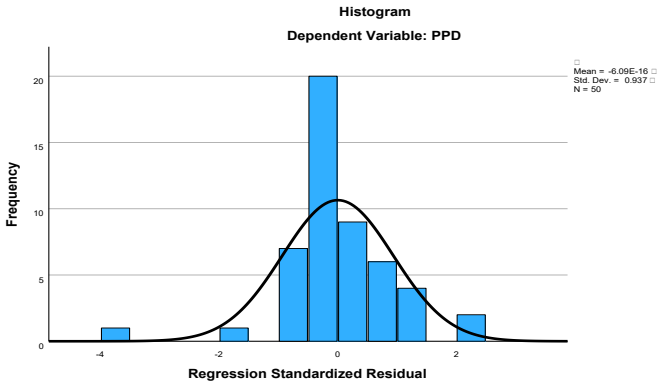


Figure F2

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PPD (Initial Model, Controlling for Category E)

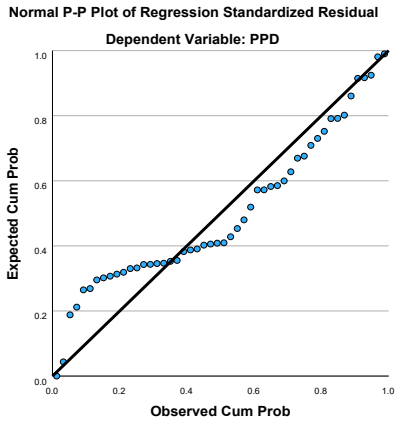


Figure F3

Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PPD (Initial Model, Controlling for Category E)

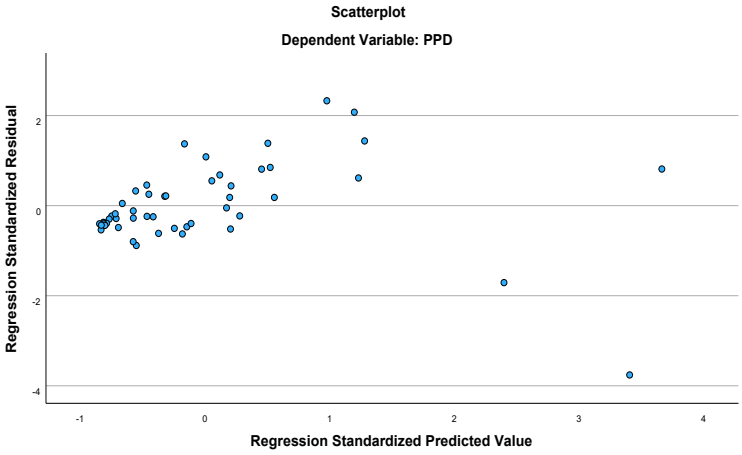


Figure F4

Histogram of Regression Standardized Residuals for Dependent Variable: PPD (Standardized Model, Controlling for Category E)

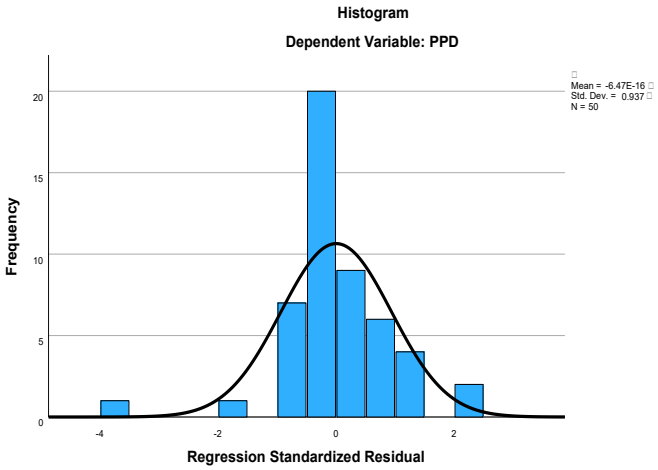


Figure F5

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PPD (Standardized Model, Controlling for Category E)

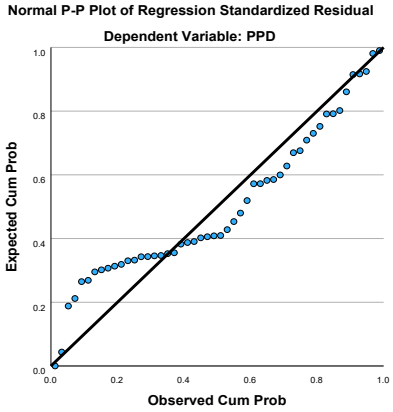


Figure F6

Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PPD (Standardized Model, Controlling for Category E)

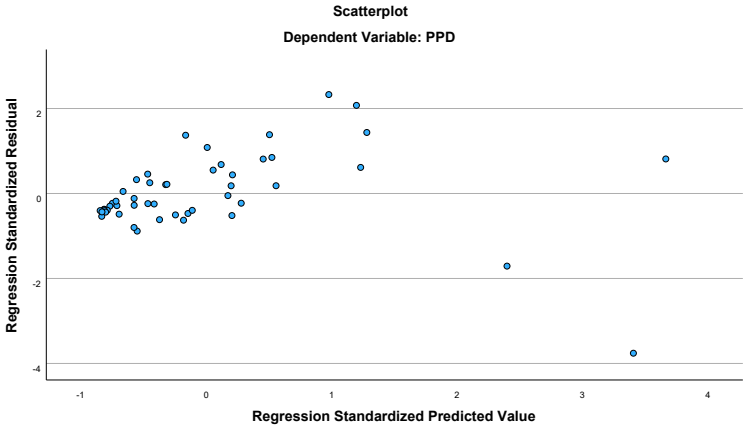


Figure F7

Histogram of Regression Standardized Residuals for Dependent Variable: PPD (MCGP Removed, Controlling for Category E)

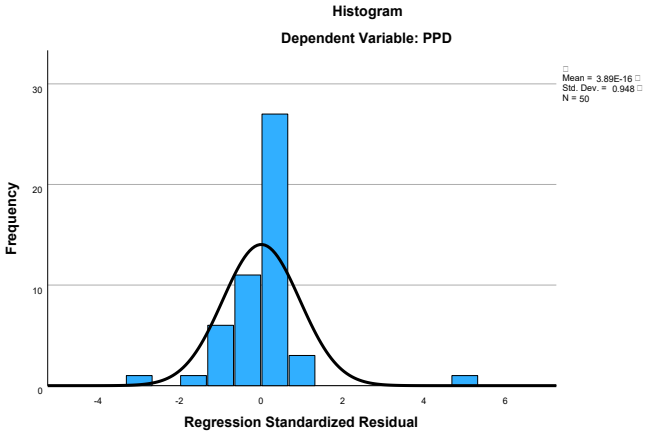


Figure F8

Normal P-P Plot of Regression Standardized Residuals for Dependent Variable: PPD (MCGP Removed, Controlling for Category E)

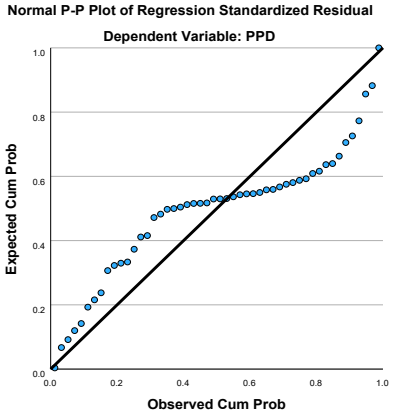


Figure F9

Scatterplot of Regression Standardized Residuals Versus Predicted Values for Dependent Variable: PPD (MCGP Removed, Controlling for Category E)