

THE SOUTHERN BUSINESS AND ECONOMIC JOURNAL

Volume 45, Number 1

2022

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Natural Field Experiment in Tourism Destination Marketing**

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The Southern Business and Economic Journal
Department of Business Administration
Auburn University at Montgomery
PO Box 244023
Montgomery, AL 36124-4023

THE SOUTHERN BUSINESS AND ECONOMIC JOURNAL

Indexed in PAIS Bulletin and EBSCO Publishers Online

ISSN: 0743779X

Volume 45, Number 1

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Revealing the Persuasive Power of Facebook: Evidence from a Natural Field Experiment In Tourism Destination Marketing

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Abstract

This study empirically tests McGuire's theory of persuasion in the tourism industry. Through a natural field experiment, we examine the persuasiveness of Facebook advertisements in driving organizational awareness for a community-wide tourism event. Analyzing the impact of a celebrity endorsement featuring A&E's Duck Dynasty Star, John Godwin, our findings reveal that advertisement pretesting, message engagement, and celebrity endorsements significantly influence organizational awareness, measured by page likes. These insights guide destination marketing organizations to reduce advertising costs and enhance social engagement. Effective planning, pretesting, and active engagement in Facebook marketing campaigns are recommended for advertisers to amplify their promotional efforts in the tourism industry.

Key Words: Destination marketing organizations (DMOs), Facebook advertisements, consumer engagement, field experiments.

Introduction

Facebook has 3 billion monthly active users who spend an average of 33 minutes daily consuming its content. TikTok follows closely at 32 minutes, trailed by Twitter at 31 minutes (Statista, 2022). Simultaneously, businesses increasingly attempt to capitalize on Facebook's popularity, with more than 200 million worldwide leveraging it to engage with its target audiences. Almost half of consumers (44 percent) acknowledge that Facebook significantly impacts their purchase decisions (Statista, 2022). The pursuit of 200 million businesses to connect with Facebook's massive consumer audience of 3 billion monthly users has sparked a thriving domain of social media research (Rahman, 2017; Voorveld, 2019; Chu et al.,

2020; Barnes, 2020a and Liadeli et al. 2023). For two reasons, the global tourism industry is one of the flourishing areas of social media research among scholars.

First, the global tourism industry is an ideal natural environment to examine how destination marketing organizations (DMOs) create social media content and advertisements to persuade consumers to visit global tourism attractions and events. Facebook alone brings together 3 billion global consumers and 200 million global businesses, including those in the global tourism industry. Second, the global tourism industry accounted for 1 in 5 jobs worldwide, 10.3 percent of all jobs (334 million), and 10.4 percent of the global gross domestic product (GDP) valued at \$10 trillion (World Travel and Tourism Council, 2019). In the U.S., the travel and tourism industry contributed more than \$3 billion (9.1 percent) to the GDP and 26.2 million jobs (11.3 percent) (World Travel and Tourism Council, 2023). DMOs could profit significantly by learning how to create more engaging social media content to persuade consumers to visit their domestic or global tourism destinations. Even a slight 1 percent improvement in using social media to persuade consumers to visit tourism destinations can result in significant revenue growth, potentially reaching millions.

The growth of Facebook and other social media platforms has provided DMOs in the hospitality, tourism, and travel fields with opportunities to communicate with consumers to boost engagement and sales directly (Dedeoglu et al., 2019; Taheri et al., 2019; Qiu et al., 2021; Liadeli et al. 2023). For instance, Oneder et al. (2020) examined how page likes on DMO Facebook pages can be a valuable predictor of tourism demand. They found across four different cities that Facebook page likes could be interpreted as a strong indicator of demand. Although Oneder et al. (2020) called for more research to examine how Facebook page likes can be used as a tourism demand indicator, much more needs to be learned about how a DMO can acquire page likes using social media content or paid advertisements. Furthermore, Voorveld (2019) has called for more research on understanding how consumers engage online with businesses in natural settings. Liadeli et al. (2023) concluded that more work should be done on how social media advertising affects consumer engagement and sales. Therefore, social media research that explores

effective methodologies of online engagement between consumers and businesses from a DMO perspective is warranted.

This study answers a direct call to social media research by Voorveld (2019), Oneder et al. (2020), Chu et al. (2020), and Liadelia et al. (2023). We examined how a DMO used Facebook in a natural field experiment to better understand the building of organizational awareness and consumer engagement to promote a community-wide tourism event. In doing so, we make four significant contributions to the social media engagement literature.

First, we utilize the seminal theoretical model developed by McGuire (1968; 1976) to understand the underlying factors that drive the persuasiveness of Facebook advertisements. McGuire's model of persuasion relies on several factors determining if a consumer will engage with an advertising message. Interestingly, Chu et al. (2020) conducted a comprehensive theoretical review of academic research on social media advertising in the hospitality, tourism, and travel industry. Based on the study of more than 190 articles, the author found that many articles did not have any explicit theoretical foundation nor found any mention of McGuire's theory of persuasion. As such, Chu et al. (2020) have called for more social media research to provide a theoretical underpinning. To our knowledge, our research is the first to operationalize McGuire's theory rigorously and provide empirical tests of his persuasion model.

Second, we quantify which of McGuire's persuasion factors drive the acquisition of increased organizational awareness and consumer engagement in a natural field experiment from a DMO's perspective in the tourism industry. We examine growth in organizational awareness as measured by Facebook page likes in response to alternative advertisements. The DMO, the Woodville Chamber of Commerce, provided the authors with promotional oversight for their annual Woodville Deer and Wildlife Festival (WDWF), a community-wide event. We examine which persuasion factors drove the acquisition of page likes on the WDWF Facebook page.

Third, the DMO hired the services of A&E's Duck Dynasty Star, John Godwin, to boost organizational awareness, consumer engagement on Facebook, and attendance at the WDWF. Qiu et al. (2021) noted that few scholars focus on how social influencers or

celebrities affect online consumer engagement in tourism. As such, our natural field experiment specifically examined the ‘celebrity effect’ on WDWF organizational awareness and engagement, as some Facebook advertisements featured John Godwin.

Finally, our research contributes to the social media theoretical literature. Results show compelling evidence that McGuire’s theory of persuasion can add to our understanding of how DMOs can use social media advertisements to boost organizational awareness and consumer engagement to promote tourism events in the U.S. Specifically, our research revealed several lessons learned to improve the effectiveness of advertisements that DMOs could use to reduce future advertising costs when promoting tourism destinations and events.

The organization of the manuscript is as follows. First, the existing literature review focuses on social media marketing and that many DMOs struggle to harness its power to promote tourism. Next, the literature review explains McGuire’s (1968; 1976) persuasion model and how message characteristics influence organizational awareness and consumer engagement. From a DMO’s perspective in the tourism industry, we examine three testable hypotheses related to the growth in organizational awareness as measured by page likes in response to alternative advertisement message characteristics. We explain the natural field experimental design and employ a negative binomial regression model to empirically identify the key factors affecting Facebook page like acquisition across varying advertisement messages. We find compelling empirical support for the validity of McGuire’s persuasion model and conclude by listing six critical lessons DMOs can use to promote tourism destinations and events.

Literature Review

Social media marketing refers to the publishing of content, listening to responses, and engaging with followers on media channels (e.g., Facebook, Twitter, LinkedIn, YouTube, TikTok, Instagram, and Snapchat) to build organizational awareness, increase sales, and drive traffic to websites (Buffer, 2020). Since some social media networks were launched in the early 2000s, Facebook and YouTube have remained the most prominent networks (Statista, 2022). A 2021 report

from the Pew Research Center indicates that 81 percent of U.S. adults say they have used YouTube, while 69 percent of U.S. adults say they have used Facebook. Instagram is the next closest at 40 percent (Gramlich, 2021).

Table 1 shows the number of active users by social media platform. Facebook is the largest social media channel, with 2.9 billion active users, followed by YouTube (2.6), WhatsApp (2.0), and Instagram (1.5). Meta dominates the digital landscape, owning three of the top four platforms: Facebook, WhatsApp, and Instagram. Meta reaches approximately 6.4 billion users compared to 2.0 billion on Google-owned YouTube (Perrin, 2021).

Table 1: Social Media Network Origins and Usage
*Statista as of January 2022

Social Media Platform	Year of Launch	Number of Active Users (in Millions)*
Facebook	2004	2,910
YouTube	2005	2,562
WhatsApp	2009	2,000
Instagram	2010	1,478
Weixin/WeChat	2011	1,263
TikTok	2016	1,000
Facebook Messenger	2011	988
Douyin	2016	600
QQ	2009	574
Sina Weibo	2009	573
Kuaishou	2011	573
Snapchat	2011	557
Telegram	2013	550
Pinterest	2010	444
Twitter	2006	436
Reddit	2005	430
Quora	2010	300

It is no surprise that with the proliferation of Facebook and YouTube, theoretical and empirical studies of brand-to-consumer

marketing have become enormous fields of study (Zeng and Gerritsen, 2014; Felix and Hinsch, 2017; Dessart, 2017; Parsons and Lepkowska-White, 2018; Schee et al. 2021 and Liadeli et al. 2023). Social media platforms give businesses, organizations, and personal brands enormous power to reach and connect with people, grow brand awareness and engagement on critical issues, and boost sales (Parsons & Lepkowska-White, 2018; Liadeli et al., 2023). Moreover, because of its two-way communication system, social media provides ample opportunity to grow any business or organization, including DMOs (Dessart, 2017; Chu et al., 2020).

Zeng and Gerritsen (2014) conducted a comprehensive review of research, including 279 journal articles, conference papers, research degree theses, electronic articles, books, and reports. The top three sources included journal articles (59 percent), conference papers (23 percent), and research degree theses (8 percent). Their review examined how social media interaction with customers has changed from Australia to the United States. These changes included buying behavior, engagement with user-generated content, marketing and destination management, crisis management, and culture and knowledge.

One of the most significant positive impacts noted by Zeng and Gerritsen (2014) was how customer interactions on social media had benefited destination-related tourism activities. Similarly, Felix and Hinsch (2017) recently noted that this new two-way communication process has helped destination marketers generate new business and build relationships with their customers in the tourism industry. How?

With social media, potential customers can read reviews left by previous paying customers, which provide information about destination amenities, customer service at resorts, food quality at restaurants, and more. In a nutshell, social media content shared by those who have already experienced a particular destination gives potential customers the advantage of going second. Potential customers can read reviews, scan social media accounts, and eagerly download brochures and other content that piques their curiosity about destinations before they choose. Zivkovic et al. (2014) discovered that approximately 50 percent of people were likely to download travel applications while searching for vacation destinations. Before

choosing a destination, potential customers can learn much from previous customers.

Despite social media's positive impact on destination-related tourism activities, most DMOs need help to capture its total value (Parsons & Lepkowska-White, 2018). In addition, implementing a successful social media strategy can be complex and daunting, from establishing an essential social media presence to creating content to increase customer engagement and trust (Barnes, 2020a).

To help with this, Parsons and Lepkowska-White (2018) proposed a new consumer engagement-social media message framework that considers the two-way communication process with customers as a strategic asset. They proposed four framework dimensions when examining the use of social media to understand engagement with consumers: messaging, monitoring, assessing, and responding. However, the most critical dimension they concluded was messaging. They concluded that a message that does not connect with customers on social media would be the death of customer interaction. Alternatively, a message that connects with customers on social media establishes the beginning of two-way communication with customers, a direct benefit for any organization.

Building two-way communications with customers also has an indirect benefit. As an organization connects with its customers on social media, those same customers tend to share content with their friends, which creates a network of connections that can benefit an organization. For example, studies by Wang and Chang (2013), Forrester (2012), Haigh et al. (2012), Lee et al. (2012), Rahman (2017), and Liadeli et al. (2023) explore the connection between Facebook page engagement with users and the impact those engagements have on the intent to purchase products or services.

Other research has focused on social friendship connections related to purchasing behavior. Wang and Chang (2013) found that product information shared with customers with solid friendship ties increased the probability of purchasing the product or service. Forrester (2012) points to the importance of brands gaining Facebook fans as they are far more likely to purchase the product or service offered than non-fans. Lee et al. (2012) found that when fans have an emotional attachment or interaction with a destination-related event, Facebook

page fans perceive more excellent value from social marketing. Similarly, Dedoglu et al. (2019) examined how consumer-generated content on social media contributed to engagement with and visitation of destination-related events.

One of the overlaps between consumer engagement and digital content marketing literature is how brands use social media to build organizational brand awareness by engaging with followers through video and image content (Parsons & Lepkowska-White 2018; Dedoglu et al. 2019) and how that content affects sales (Liadeli et al., 2023). For example, Parsons and Lepkowska-White (2018) showed how brands use social media content to generate engagement to build organizational awareness. Their social media framework highlights how four critical factors shape how an organization gains awareness on social media using specific messages to consumers.

Theoretical Framework

The first and most important factor in the Lepkowska-White (2018) framework is messaging, which means sharing a video or image along with a message on a social media platform to attract attention among an audience. Publishing a post on social media is one way to message an organization's followers and some non-followers. Second, an organization must monitor its competitive landscape on social media and observe how its competition is messaging its followers. Observing a competitor's customers' reviews and comments is one form of monitoring. Third, assessing represents how an organization listens to customer feedback on social posts. One approach is to measure post likes, shares, and comments. Fourth, responding means an organization engages with its followers after posting its content. From posting a YouTube video to sharing a job announcement on LinkedIn, responding means engaging with followers as they engage with an organization's content. An organization and its branded products and services can stay top-of-mind with followers by generating more interaction.

Parsons and Lepkowska-White's (2018) framework highlights the importance of understanding the process of engaging with content on social media, from messaging to engaging with followers. All four factors shape how much social media can generate organizational awareness. The most important aspect of their framework is that building awareness starts with the message shared with followers. If

the message does not resonate with followers, engagement suffers. To resonate, a message must be easily understandable and provide a clear benefit for a consumer to engage with or buy from an organization (Miller, 2017). Only then will followers engage. When a message resonates with followers, it also can be viewed as persuasive. In this way, a persuasive message can be considered foundational to building organizational awareness with followers on social media.

Parsons and Lepkowska-White's (2018) emphasis on messaging and connecting with fans highlight the need to understand how a message can persuade followers to listen, engage, and even buy from an organization. Message persuasiveness depends on several critical theoretical elements. McGuire (1968; 1976), known as the 'father of social cognition,' developed a theory of personality and attitude change that highlights the steps associated with increased action an audience takes as it repeatedly receives and possibly yields to a persuasive message. The steps characterize how a target audience can be influenced to action based on a message's persuasiveness. McGuire posited that an individual would potentially go through all seven steps as she is repeatedly presented with a persuasive message to take some action. These steps range from initially receiving a message, liking it, understanding, agreeing, remembering, deciding, and acting because of it. The more a message is shown to a target audience, the more persuasive it can be as an audience moves from receiving to acting (McGuire, 1968; 1976).

A persuasive message connects with a target audience, who can move from receiving a message to acting. For example, if a message from an organization is shared on social media, repeated sharing of the same message can persuade fans to move from receiving to action. One way to measure receiving and liking is by examining how many engagement actions can be attributed to a message. The level of engagement on social media, such as likes, comments, and shares, can indicate this. All other things held constant, the more persuasive a message, the greater the engagement with fans. This can translate into fans eventually buying an organization's services or products. As a result, a message that has high (low) message persuasiveness will lead consumers to engage (disengage) with the message (McGuire, 1968; 1976). Based on McGuire, the organizational awareness and an advertising message model in this study can be described as:

$$\text{Organizational Awareness} = f(\text{Message Engagement}, \text{Message Frequency}, \text{Message Source Quality}) \quad (1)$$

In this model, organizational awareness, the dependent variable, increases (decreases) if these three message persuasion factors increase (decrease), assuming other things are held constant. For advertisements on social media, a specific call-to-action is specified for consumers to click, either to learn more, buy now, or similar. When an individual is shown an advertisement, including text, video, or an image, liking a page means a follower desires to receive similar information when the organization posts content in the future. As a result, page likes are votes of confidence in the quality of the information and overall credibility of the page (Wang et al., 2023). Therefore, Facebook page likes build credible organizational awareness.

Also, when an advertisement is shown to an individual to gain a page like, the total number of page likes is shown. The number of page likes shown in advertisements serves as a bandwagon cue. These cues refer to the accumulation of system-generated information about a particular organization's total number of Facebook page likes. The greater the number of page likes, the greater the perceived information about the crowd's collective endorsement (Sundar et al., 2017) and its perceived credibility (Luo et al., 2022; Wang et al., 2023). In this study, all Facebook advertisements shown to the target audience included the same bandwagon-type information. Each advertisement included information about how many people had already liked the WDWF Facebook page.

In equation (1), message engagement is expected to affect organizational awareness positively. Engagement actions refer to the actions taken by a target audience to engage with a particular advertisement message. The more persuasive the message, the greater the advertisement engagement in liking, commenting, or sharing the post with others on Facebook. If the message is not persuasive, no action is taken to engage with the advertisement.

Message frequency is also expected to be positively related to organizational awareness. The more frequently a target audience receives a message, the more persuasive it can be (McGuire, 1968; 1976). However, if a message does not persuade a target audience to

act after a message is shown one or two times, message frequency could have a negative effect. Repeatedly showing a non-persuasive message to a target audience can annoy people. Unlike traditional media advertisements, Facebook and other social media ads are interactive. Audiences can hide, block, or report an advertisement if seen too many times. Konovalova (2016) noted how this can happen on social media platforms like Facebook. While traditional media would recommend repeating a message to increase its persuasiveness, Konovalova (2016) noted that this could have the opposite effect using Facebook ads. For this reason, message frequency could initially be positive but also turn negative if shown many times to a target audience.

Finally, message source quality is an essential factor that affects organizational awareness (McGuire, 1968; 1976). Source quality refers to expertise and trustworthiness (McGinnies & Ward, 1980; Wiener & Mowen, 1986). The idea is that experts are often more credible, trustworthy, and for these reasons, more persuasive than non-experts. McGuire (1968; 1976) posited that the most critical aspect is that an audience perceives or believes an expert truly is an expert. Trustworthiness then follows. Therefore, the more credible the source of a message, the more persuasive it can be.

Based on equation (1), the dependent variable was organizational awareness measured as DPL. Message engagement represented the number of daily advertisement likes, shares, and comments. This gives rise to our first hypothesis.

Hypothesis 1 (H1): The number of daily advertisement likes, shares, and comments will increase daily WDFW Facebook page likes (DPL), assuming all else is constant.

Message frequency was proxied by the number of daily promotional messages delivered to target audience members. As the number of daily promotional messages rises, DPL is expected to increase (McGuire, 1968; 1976) or possibly decrease beyond a frequency threshold greater than three (Konovalova, 2016). The second hypothesis is as follows.

Hypothesis 2 (H2): The number of daily times an ad is delivered to the target audience will increase daily WDWF Facebook page likes (DPL), assuming all else is constant.

Message source quality was proxied by the number of days celebrity speaker John Godwin delivered a promotional message. Because John Godwin's brand represents a credible expert in the outdoor lifestyle industry, his endorsement of the WDWF event is expected to increase DPL. This gives rise to our third hypothesis.

Hypothesis 3 (H3): The number of days the John Godwin promotional advertisement message was shown to the target audience will increase daily WDWF Facebook page likes (DPL), assuming all else is constant.

Study Design and Data

We conducted a natural field experiment in Woodville, Mississippi, in the United States. As a result, the community promoted the Woodville Deer and Wildlife Festival (WDWF). Woodville is in Southwest Mississippi, with Baton Rouge, Louisiana, only an hour away. The WDWF typically featured dozens of vendors and entertainment venues based on an outdoor lifestyle theme. The event also typically featured an outdoor personality to headline each year's event to promote attendance further and boost event revenues. In 2013, the community used its WDWF Facebook page to promote the event.

The community hired an outdoor personality named John Godwin, a reality television star from the popular Duck Dynasty Show at that time. He agreed to appear and interact with fans throughout the one-day event. This strategic move was vital to attracting a larger audience from the surrounding areas in Mississippi and Louisiana.

Before the annual WDWF event featuring John Godwin, community leaders sought to create a promotional strategy that leveraged its WDWF Facebook page. At that time, the page had approximately 5,000 fans, and community leaders planned to add more followers to the WDWF Facebook page. Unfortunately, community leaders had little Facebook advertisement experience to

promote a tourism event with an outdoor personality as the key attraction.

The community enlisted the aid of the Bricks-To-Clicks Marketing Extension Program at Mississippi State University (Barnes, 2020b). The program provides free, low-cost marketing resources to help business owners grow their audience and sales. In collaboration with the Woodville Main Street Association, Facebook advertisements were created and executed to acquire additional WDWF page likes, a necessary step to build organizational awareness to promote current and future tourism events. The first step was to define a target audience within Facebook to create and execute advertisements.

Define a Target Audience

The first step to creating a Facebook paid advertising strategy was to define a target audience and create messages with specific promotional images of John Godwin to accompany all ads served to the target audience. Four important messages were created, along with three primary images for ads (Table 2). Due to John Godwin's terms of service, only a few images were available for social media ads. Figures 1, 2, and 3 show images of John Godwin, with and without face camouflage paint, along with the WDWF logo for ads.

Figure 1: John Godwin Image: Camouflage Clothing and Face Paint



Figure 2: John Godwin Image: Camouflage Clothing and No Face Paint



Figure 3: Woodville Deer and Wildlife Festival Logo



Table 2. Facebook Audience Targeted for Page Likes on the Woodville Deer and Wildlife Festival (WDWF) Facebook Page

Source & Type of Message	Demographic or Receiver Variables	Similar Facebook Pages 'Liked'	Similar Hashtags (#)
1. Don't Miss the 2013 Woodville Deer and Wildlife Festival featuring A&E's Duck Dynasty Star John Godwin	All people living within a 150-mile radius of Woodville, 18+ age, male and female, MS over the age of 18 who are NOT fans of the Deer and Wildlife Fan Page.	Duck Dynasty, Willie Robertson, Swamp People, Gander Mountain, Ducks	#Willie Robertson, #Cabelas, #Ducks Unlimited, #National Wild Turkey Federation, #Duck
2. Fun times at the Woodville Deer and Wildlife Festival featuring A&E's Duck Dynasty Star John Godwin	Wildlife Fan Page.	Unlimited, Cabelas, BassPro	Dynasty #Mississippi #John Godwin
3. Eat Alligator at the Woodville Deer Festival with A&E's Duck Dynasty Star John Godwin			
4. Attend the Deer Festival featuring A&E's Duck Dynasty Star John Godwin			

Table 2 also shows the variables used in the Facebook ads manager tool to define the target audience. Demographic variables such as location, male and female, age greater than or equal to 18, and those who had not already liked the WDWF Facebook page were used to create a target audience.

In addition, hashtags and similar Facebook pages were used to target the Facebook audience. When selecting similar hashtags for promotion, #WillieRobertson was chosen to be included because

Willie was the main reality television star headlining A&E's Duck Dynasty. The hashtag search yielded 1.5 million conversations. At the time of the search, this meant #WillieRobertson was being used in 1.5 million Facebook conversations. Similar pages and related hashtags were selected to create a target audience of almost 340,000 people living in the 150-mile region around Woodville, Mississippi.

Launch Facebook Ads and Minimize Business Costs

The next step was to select the most successful candidate ads for the experimental period, and a pre-test experiment was conducted. The pre-test period began one week before starting the ad experiments. During the pre-test phase, all combinations of images and messages (Table 2) were shown to the target audience through Facebook page-like ads. Also, Facebook tested the response of all ads on its desktop and mobile platforms. At the end of the pre-test stage, the ads that attracted the most page likes at the least cost were identified to start the main experiment. This was a best practice recommended via consultation with Facebook ad experts. This also minimized the cost of running ads to gain Facebook page likes since less efficient and wasteful ads did not receive additional dollars at the start of the experiment.

The pre-test stage yielded four images with messages for the experiment. Figures 4, 5, and 6 show the ads and messaging used with John Godwin's image for mobile and desktop devices. Specifically, four different ads were included in the experiment. These included Mobile, Desktop 1, Desktop 2, and Desktop 3 and can be described as:

- The Mobile ad used the John Godwin image where he had face paint and the call-to-action language of "Don't Miss" (Figure 4).
- Desktop 1 used the same image and message as in the mobile ad but was served only to desktop target audience users (Figure 4).

Figure 4: Mobile and Desktop 1 Advertisements

Woodville Deer and Wildlife...
Woodville Deer Festival



Don't miss the 2013 Woodville Deer Festival featuring A&E's Duck Dynasty star John Godwin.

5,526 people like Woodville Deer and Wildlife Festival.

- Desktop 2 used the call-to-action language of “Attend” and John Godwin’s image, where he did not wear face paint (Figure 5).

Figure 5: Desktop 2 Advertisement Treatment

Woodville Deer and Wildlife...
Woodville Deer Festival



Attend the Deer Festival with A&E's Duck Dynasty Star John Godwin 10/12 with your friends!

5,526 people like Woodville Deer and Wildlife Festival.

- Desktop 3 featured the WDWF logo instead of John Godwin’s image, and the message featured the call-to-action language of “Attend” (Figure 6).

Figure 6: Desktop 3 Advertisement Treatment (October 5 to October 12)

Woodville Deer and Wildlife...
Fun times in Woodville MS



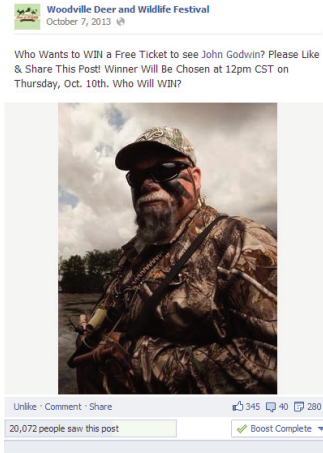
Attend the Deer Festival with A&E's Duck Dynasty Star John Godwin with your friends Oct. 12

5,526 people like Woodville Deer and Wildlife Festival.

These four ads were launched 30 days before the WDWF event. Ads began on September 13th, with the overall ad campaign ending on October 7th. During the experimental period, all four ads were re-evaluated at the end of each week to examine which ads were performing best based on the least cost per page likes metric. Once launched, Facebook's algorithm decided which ads were served to the target audience, and performance was observed and recorded among all ads. The dollar amount was set at \$25 per day for all ads to ensure that alternative investment levels would not influence ad performance outcomes. In addition, maintaining constant investment per day in ads makes efficiency comparisons among advertisements more informative. A total budget of \$1,554 was used for the experiment.

Near the weekend of the event in September, a special promotion was conducted to boost page likes among all ads. To overcome an expectation of weakening interest in the page likes for the WDWF page, a one-time promotional giveaway was conducted five days before the end of the campaign on October 7th. The WDWF posted on their page that they would give away two free tickets to see John Godwin at the event. Fans were asked to share and like the promotional posting to boost page likes and create a sense of urgency for the upcoming event. This was allowed based on Facebook rules at the time. Figure 7 shows the one-time promotional advertisement message and image used.

Figure 7: Promotional Giveaway for Festival Tickets to see A&E's Duck Dynasty Star John Godwin at the Woodville Deer and Wildlife Festival



Descriptive Statistics

Table 3 shows all daily statistics, including means, standard deviations, minimums, and maximums. All four ads (Mobile, Desktop 1-3) reached an average of 5,000 people per day, with the maximum daily number reaching more than 17,000 people. Facebook defines reach as the number of unique users viewing ad content on their desktop or mobile device (Facebook, 2021). The average number of impressions was 10,422, with a maximum number of impressions equal to more than 83,000. An impression is counted as the number of times an ad is on screen for the first time (Facebook, 2021).

Table 3: Daily Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Reach	63	5,000	3,030	2,199	17,372
Engagement Actions	63	99	63	16	310
Comments	63	2.00	4.85	0	31
Shares	63	7.61	25.69	0	169
Page Likes	63	56.06	22	4	117
Spent	63	24.66	2.39	6.18	25
Likes Spent	63	2.25	0.86	0.64	4.68
Message Source Quality Promotion	63	0.19	0.40	0	1
Channel					30
Duration	63	10.63	8.03	1	
Message Frequency	63	1.60	0.89	1	4.8
Impressions	63	10,422	14,459	2,204	83,054

On average, ads were shown 1.6 times to the target audience for almost 11 days, with an ad spend of \$25 per day. The average daily number of page likes acquired by ads equaled 56, with almost 100 target audience engagements (likes, shares, comments). The Facebook algorithm determined how to allocate ad dollars across all four ads daily, explaining why the minimum daily cost was \$6.18 and the maximum \$25. The average cost of acquiring a page like was \$2.25, with a minimum of \$0.64 and a maximum of \$4.68.

Table 3 also shows some summary statistics. The promotional message communicated on WDWF's Facebook page tagged John Godwin's Facebook page, proving that John Godwin would attend the event. John Godwin commented on the post and engaged with fans. Such a promotional message increased excitement and urgency for the target audience to like, share, and comment on the Facebook post to be registered for the free ticket giveaway. The promotion lasted approximately 5.7 days (19 percent of the 30-day promotional period).

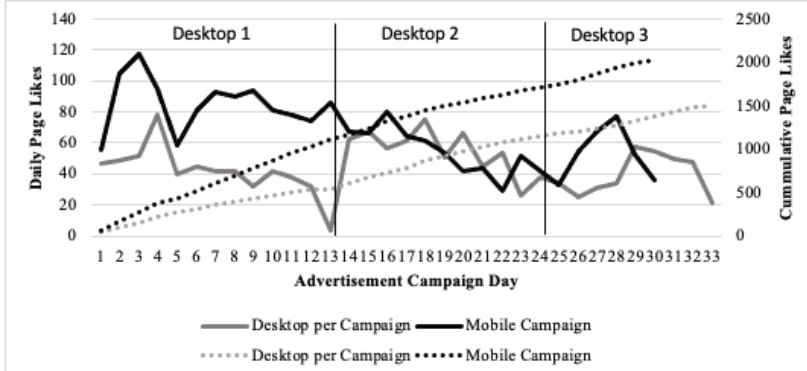
Descriptive statistics for all four ads (Mobile, Desktop 1-3) are provided in Table 4. The WDWF page likes increased by 3,532,

including likes from both mobile and desktop ads. The most significant summary result to note is the higher performance of mobile versus all other desktop ads. Consistent with the results depicted in Figure 8, mobile outperformed all other ads by generating 58 percent (2,031 of 3,532) of all new page likes. As can be seen in Figure 8, new page likes for desktop advertisements (1-3) quickly diminished. However, the degenerative process in new page likes was much slower for mobile users. Though remaining at a slower overall growth rate, the smooth progression of cumulative page likes for desktop and mobile was similar.

Table 4: Desktop and Mobile Advertisements Summary

	Desktop 1 (9/13 to 9/25)	Desktop 2 (9/25 to 10/6)	Desktop 3 (10/5 to 10/12)	Mobile (9/13 to 10/12)	Desktop vs. Mobile (9/13 to 10/12)
Advertisement Duration (days)	13	12	8	30	30
Total New Page Likes	543	636	322	2,031	1,501 vs. 2,031
Average New Page Like/Day (std)	41.77 (16.18)	53.00 (14.75)	40.25 (14.22)	67.70	50.03* vs. 67.70 (22.08)
Average Impressions/Day (std)	16,898 (6,271)	21,591 (26,918)	9,681 (11,645)	3,345	16,854* vs. 3,345 (847)
Average Frequency/Day (std)	2.30 (0.43)	2.28 (1.27)	1.68 (1.00)	1.00	2.14* vs. 1.00 (0.00)
Average Shares/Day	2.00 (4.86)	4.00 (6.95)	14.75 (39.50)	9.60	5.82 vs. 9.60 (31.13)
Total Cost (\$)	\$306	\$298	\$200	\$750	\$804 vs. \$750 (\$1,554 total)
Average \$ Cost/ New Page Like	\$0.56	\$0.47	\$0.62	\$0.37	\$0.54* vs. \$0.37
*Weighted Average					

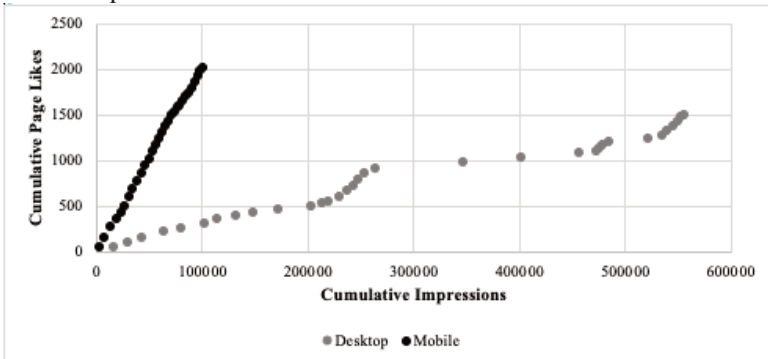
Figure 8: Facebook Daily Page Likes During Experimental Period



Note: Advertisement campaign day is larger for Desktop because optimization to a new campaign occurred mid-day.

Also, the average daily impressions were higher for desktop but were less efficient than mobile in garnering new page likes (Figure 9). This implies it took more impressions to persuade a target audience member to like the WDFW page when they were served ads on their desktop computer. When on mobile, the conversion of impressions to page likes was much higher. Additionally, a higher average daily frequency was observed for desktop than mobile (Table 4). This implies messages had to be more frequently shown to target audience members on a desktop instead of mobile to persuade them to like the page. In all, it took more effort by the Facebook algorithm (higher impressions, frequency, and ad spend) to push the desktop ads than mobile.

Figure 9. Cumulative Relationship over Time between New Page Likes and Impressions



Finally, \$1,554 was spent during the experiment across all advertisements (Table 4). The average cost per new page like for mobile (\$0.37/like) was less than for desktop (\$0.54/like). As shown in Figure 10, the cost efficiency of mobile for garnering new likes is strictly greater than desktop. When an ad receives early success during experimentation, the Facebook algorithm allocates the ad to similar audience members, typically at a faster rate than other ads. The Facebook algorithm pushes the frontrunner even more when there is an early frontrunner among ads. This reduced the cost of showing ads to the target audience as impressions are minimized to gain maximum page likes.

Empirical Modeling

The Facebook advertising campaign aimed to increase the number of new daily page likes (DPL) for the WDFW page to promote its tourism event. As was shown in the previous section, DPL increased over time because of all four ads. In this study, DPL represented the proxy for organizational awareness affected by persuasion factors (McGuire, 1968; 1976). Page likes can be viewed as unsolicited verifications (or votes of confidence) of product quality. Therefore, increasing page likes increases the likelihood that first-time viewers will also perceive any offering on a Facebook page as a quality good. Increasing page likes also stimulates the “bandwagon effect” long recognized in economics, game theory, voting literature (Leibenstein, 1950; Simon, 1954; Shapley, 1971; Marsh, 1985), and social media engagement. Wang et al. (2023) conducted a meta-analysis of 41

studies and examined 161 bandwagon effects related to boosting the credibility of social media messages. They concluded that the bandwagon effect positively and significantly boosted the credibility perceptions of social message content. While our study does not explicitly examine the bandwagon effect in Facebook advertising, we designed our experiments to negate any bandwagon effects that might skew our understanding of how Facebook page likes growth responds to alternative Facebook advertisements. Table 5 shows the empirical measures used to test hypotheses 1-3.

Table 5: Empirical Model Based on McGuire (1968; 1976)

Conceptual Variable (McGuire 1968; 1985)	Empirical Variable	Expected Sign
Organizational Awareness	Dependent Variable: daily page likes (DPL)	
Message Engagement (<i>Hypothesis 1</i>)	Number of daily advertisement likes, shares, and comments)	+
Message Frequency (<i>Hypothesis 2</i>)	Number of daily times an ad is delivered to the target audience	+ or -
Message Source Quality (<i>Hypothesis 3</i>)	Number of days John Godwin's promotional message was delivered	+
	Channel Duration: Time trend variable 1 to 30	+, -Control
	Advertisements: Mobile, Desktop 1, Desktop 2, Desktop 3	+, -Control
	Facebook Algorithm: Daily Impressions	+, - Control

Controls

Several control variables were also used in the empirical model. Ads (Mobile, Desktop 1, 2, and 3) are experimental variables of control within the Facebook ads manager. Advertisement effects represent the natural experiment, which is vital to understand advertiser strategies to promote the acquisition of page likes for the WDFW Facebook page. As discussed, desktop advertisements across time were endogenously determined via the Facebook algorithm. Because the mobile advertisement does not change over the overall campaign, the basis of comparison among ads is mobile. All other advertisement

results are about the baseline of the mobile advertisement as it ran for the entire 30-day experimental period.

Given the cumulative page like comparison depicted in Figure 8, it is expected that all desktop advertisements will have a negative impact on DPL. To account for the one-time ticket giveaway promotion featuring John Godwin, we include a dummy variable for Message Source Quality where 1 denotes the promotional message was promoted with ad dollars each day of the treatment period and 0 if no dollars were spent to promote the message. Promotion is expected to be positively related to DPL (Hypothesis 3).

Other controls included channel duration and daily impression variables (Table 5). Channel duration represents a time variable from 1 to 30. This time trend variable was included to account for any natural degenerative process unexplained in the data. For instance, social networks constrained within a targeted market are expected to reach saturation. New page likes by unaware potential consumers are thus more challenging to uncover. Finally, daily Impressions represented a control for the Facebook algorithm. Daily Impressions refer to the number of times all ads are on screen (Facebook, 2021). If advertisements were optimized to increase subsequent page likes, the expectation is that Daily Impressions is positively related to DPL, though with decreasing returns. For simplicity, the empirical model to be estimated is depicted in tabular form in Table 5, along with expected signs of the factors impacting the dependent variable DPL.

Estimation Strategy

The assumptions of ordinary least squares estimation of the empirical model require the dependent variable to be continuous and normally distributed (McCullagh & Nelder, 1989). DPL is, however, a discrete daily count data. Therefore, our estimation strategy uses a generalized linear model.¹ There are many choices of general linearized models, such as normal, gamma, Poisson, and negative binomial. The most basic model is the Poisson, but it relies on restrictive assumptions of equal conditional means and variances

¹ Given the impact any given advertisement campaign has on increasing page likes is expected to be degenerative, suggests that the empirical modeling approach would be a survival analysis. However, survival analysis would not account for the intensity of an advertisement campaign.

(Greene, 2002). We instead employ the negative binomial model as it can be derived from the Poisson when the mean parameters are not equal for all members within the sample population (Greene, 2002). In our case, the mean population of DPL is not identical across the advertisements (Table 4).

Furthermore, unlike the Poisson, the negative binomial model naturally accounts for overdispersion (Greene, 2002). If overdispersion is present, inference tests are unreliable. Overdispersion is greater than expected volatility than would otherwise be expected given the assumed distribution. Overdispersion arises, among other things, when the counts are not independent, and the experimental conditions are not perfectly under the experimenter's control. The data are collected over time and not conducted in a controlled laboratory setting, so overdispersion is expected.

Negative Binomial Regression and Hypothesis Test Results

The negative binomial regression results are provided in Table 6. The overall model is significant in explaining the variation of DPL as indicated by the significant Wald Ratio Chi-Square test. The parameter related to overdispersion, though nearly equal to zero, indicates page like counts were not independent, and the lack of experimental control was an important issue requiring econometric control.

Table 6: Negative Binomial Regression Model for Daily Page Likes
(n=63)

Variable Name	Coefficient	Robust Std. Error ^a	z	P>z	Coefficient 95% Confidence Interval
Constant	4.769***	0.229	20.75	0.000	4.320/5.220
Desktop 1 – Godwin Camo	-0.601***	0.117	-5.14	0.000	-0.830/-0.372
Desktop 2 – Godwin No Camo	-0.332***	0.131	-2.54	0.000	-0.589/-0.080
Desktop 3 - Logo	-0.838***	0.220	-3.81	0.000	-1.270/-0.407
Daily Message Engagement (H1)	0.022*	0.0009	2.27	0.023	0.0003/0.0042
Daily Message Frequency (H2)	-0.383***	0.151	-2.53	0.010	-0.680/-0.086
Daily Message Source Quality (H3)	0.298***	0.131	2.28	0.000	0.041/0.555
Channel Duration	-0.032***	0.008	-3.78	0.000	-0.484/-0.015
Daily Impressions	0.00002***	0.000	2.52	0.010	0.000/0.000
Overdispersion	0.031***				
Pseudo R ²	0.127				
Wald Ratio Chi-Square	114.56***				
Overdispersion	0.031***				
Pseudo R ²	0.127				
Wald Ratio Chi-Square	114.56***				

^a Corrected standard error for heteroskedasticity.
^b Includes Mobile – Godwin Camo and No Promotion.
***Significant at the 1% level; ** Significant at the 5% level; and *Significant at the 10% level.

Of significant interest is the impact of the various advertisements via the Facebook algorithm over time. As expected, concerning the

mobile treatment, DPL is significantly less for all desktop advertisements (Desktop 1, 2, and 3). These and the cumulative cost results depicted in Figure 10 indicate that targeting mobile devices for the event was more efficient at garnering DPL at the exact cost.

The results of hypotheses 1-3 were mostly as expected. First, the daily message engagement actions variable was positive and significant (H1) (Table 6). As the target audience took more engagement actions (likes, shares, and comments), DPL increased. McGuire's theory predicts that as a message is understood by a target audience, engagement with that message indicates a high level of message reception. When an audience member shares the content of a message, it is the highest form of endorsement that can be given on Facebook. This occurs only when a target audience member has a high message engagement and reception.

Counter to expectations, daily message frequency (H2) was negative and significant. The frequency of a message was anticipated to be positively related to DPL since the more a target audience views a message, the more persuasive it can be, other things equal. However, what else can be true is that a message shown several times to a target audience can have a negative effect on building organizational awareness. The message can be hidden, blocked, or reported by target audience members as they can interact with ads. Results indicate this could be the case.

Message source quality (H3) was found to be positive and significant. This indicator measured how a source quality speaker could affect credibility, and in this case, DPL. Recall that this ad promoted the giveaway of tickets to the tourism event in conjunction with the outdoor personality John Godwin also attending the event as a key attraction. Promoting the event with a credible speaker such as John Godwin had a positive and significant impact on DPL, other things equal. Although the promotion was implemented less than 20 percent of the time during the experiment, it nevertheless positively impacted DPL. This result supports the basic tenet of McGuire's persuasion theory in that the quality source of a credible message positively affects organizational awareness as DPL.

Also, advertisement channel duration had a negative and significant influence over DPL. Based on this result, we cannot say

that continuing to keep advertisements in front of an audience will guarantee more DPL. As previously indicated, oversaturating an audience with ads that do not persuade hurts persuasiveness in this case.

While the goal of the Facebook marketing campaign was to increase DPL to build organizational awareness to promote the WDWF event, other vital results were found. Follow-up interviews were conducted with community leaders to examine how online promotion also benefited the rural tourism event. The key results showed that the WDWF Facebook page gained 4,532 other fans over the experimental period, a sizeable building of organizational awareness for the WDWF event and other future tourism events. In addition, attendance at the WDWF event increased by approximately 30 percent from the previous year.

Discussion

In this study, we conducted a natural field experiment to uncover a method of paid advertisements used to promote a tourism event from the perspective of a DMO. This experience provided six critical lessons that could benefit DMOs using social media ads to promote tourism events.

- (1) Conduct a seven-day pre-test to eliminate ads that perform poorly. This saved significant costs as we stopped investing in ads after seven days that were performing poorly. Performance was cost per page like. The reason we recommend at least seven days is that ads need to be implemented across an entire week and weekend. People tend to behave more favorably to ads on the weekend when they have more leisure time, especially on mobile devices.

- (2) Conduct a pre-test across all Facebook delivery platforms. When we conducted this experiment, there were only two platforms: mobile and desktop. However, Facebook has expanded its delivery platforms. Nevertheless, any pre-test should explore how people respond to ads across all platforms. The cost per page like can vary significantly, as we learned when considering only mobile and desktop platforms. Our results show that mobile ads gained more page likes per dollar spent. DMOs looking to make the most of their

marketing budget should consider pretesting ad delivery platforms to reduce advertising costs to reach a greater target audience.

(3) Use a social message and authentic images. Of all 256 ads considered across four important messages with four images, the top performing ad included the words “Don’t Miss” with an image of John Godwin wearing camouflage face paint. In short, John Godwin was in his outdoor element, and the image matched the tourism event's theme. John Godwin was an authentic ambassador for the event. In addition, the message “Don’t Miss” is a social message. It reminds people that they will lose out on connecting with others if they do not attend. In this case, the loss represented not seeing John Godwin and the other venues.

(4) Consider the use of a social influencer to headline a tourism event. Using John Godwin and engaging with him on Facebook was a significant benefit. Based on the results in Table 6 (H3), such promotion significantly positively affected acquiring page likes. The trick to finding the right social influencer is to ensure that whoever is chosen can connect and interact with fans online before and during the event. John Godwin did just that.

(5) Set aside time to interact with followers on Facebook. Throughout the experiment, all ads generated likes, shares, and comments. Therefore, we made it a strategy to have the DMO interact with followers on all ads. If a follower commented, we recommended they should like the comment and comment as well. Any DMO implementing a paid advertising campaign on any social media channel should also invest in having someone interact with followers. From our experiment, engagement led to more page likes per ad (Table 5, H1).

(6) Watch ad frequency often. Based on McGuire (1968; 1976), some of our results were counterintuitive. For example, ahead of the experiment, McGuire’s model led us to believe that showing a message repeatedly would make it more persuasive. However, some messages are not as persuasive, and when repeated, people can take action to avoid them. That makes social media ads different from traditional ads on other platforms. This means any DMO implementing a paid social media campaign needs to monitor

the frequency of ad delivery often. Otherwise, an ad has the potential to annoy people and cost a DMO extra dollars that could have otherwise been reallocated to ads that perform better.

Conclusions

This study answers a direct call to social media research by Voorveld (2019), Oneder et al. (2020), Chu et al. (2020), and Liadelia et al. (2023). We examined how a DMO used Facebook advertisements in a natural field experiment to understand the building of organizational awareness and engagement to promote a community-wide tourism event.

To our knowledge, this study is the first to operationalize and empirically test McGuire's theory of persuasion (1968; 1976) to understand better the underlying factors that drive the persuasiveness of Facebook advertisements in a natural field experiment in the tourism industry. As such, we add to the growing social media research that has called for more research to be grounded in using new theoretical frameworks (Chu et al., 2020).

We also found compelling evidence that McGuire's persuasion theory contributes to our understanding of how organizational awareness can be increased using Facebook ads. Message engagement (H1) positively affected organizational awareness, measured as WDFW Facebook page likes. Further, results showed that the 'celebrity effect' of John Godwin headlining the tourism event positively and significantly impacted organizational awareness to promote the WDFW event.

Future social media research in the tourism industry will continue to examine a fundamental question: What makes a message persuasive, so consumers engage with a DMO on social media platforms? Over sixty theoretical social media messaging frameworks have been used across hundreds of studies to understand better the connection between message persuasiveness and consumer engagement ((Chu et al., 2020). This study has shown how McGuire's persuasion model can be used to understand this question when using ads on Facebook, the largest social media platform worldwide. However, DMOs looking to invest more heavily in Facebook ads

would be well-advised to understand how ads translate into increased attendance and event revenues.

Understanding the connections among ads, attendance, and event revenues could be the difference between DMOs surviving or thriving in the post-COVID-19 economy. Though increased attendance at the WDFW event was reported, more social media research is needed to explore how consumer engagement on social media translates into increased tourism revenues for DMOs.

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The Economic and Demographic Factors Influencing Deer Hunting in South Carolina

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Abstract

South Carolina Department of Natural Resources is charged with monitoring and proposing management techniques for the state's deer population. In recent years, the state has changed the regulatory structure to reflect shifts in deer populations and preferences among hunters. To understand the implications of these changes, this paper investigates the economic and demographic factors that influence the county in which a hunter harvests deer and the determinants of the harvest rates. Understanding the factors that influence an individual hunter's choices will help assess whether these changes in management techniques had impacts on the number of hunters and harvest rates.

Introduction

The South Carolina Department of Natural Resources (SCDNR) routinely conducts surveys to assess the opinions of state hunting license holders for proposed changes to deer management techniques. The deer population in South Carolina has been decreasing statewide over the last two decades. Changes in habitat due to forest consumption, urban development, and predation by coyotes have had substantial effects (SCDNR, 2021). But the major concern of the SCDNR has been the liberal harvest of bucks statewide, leading to the possible mismanagement of the population. However, to evaluate whether any changes in management techniques will be effective, it is important to examine what influences the demand for hunting in a specific location. This paper aims to investigate the economic and demographic factors that influence the county in which a hunter harvests deer and what influences the subsequent harvest rates. The consideration of these factors will help to determine whether the current structures will impact the number of hunters and harvest rates, and in turn, whether they can ultimately improve deer populations.

Background

Deer populations have high economic value. They provide use value to local ecosystems as a possible food source, in the form of recreational hunting, and to related industries (Gordon & Festa-Bianchet, 2004). A US Fish and Wildlife Survey approximated that “200 million dollars in direct retail sales are related to deer hunting in South Carolina” (SCDNR, 2021). They also provide non-use value through visual appreciation of the outdoors and wildlife in general (Decker & Connelly, 1989). Although recreational activity has declined in popularity, the increase in total population will likely mean larger numbers of participants in the future, including for hunting (Bowker et al., 2012). Both private and public lands provide important access to hunting as a source of recreation and food. However, while hunting has been shown to be a normal good, these public lands do provide hunting opportunities to individuals who may otherwise not have access to private lands (Mingie et al., 2019), especially as the cost to access private lands is rising (Shrestha & Alavalapati, 2004).

A number of studies have focused on hunter participation and demand, investigating whether factors such as license fees, demographic and economic characteristics, and resource quality affect the demand for hunting licenses. License fees do not seem to affect the sales of licenses themselves, especially for resident hunters for who license costs are typically low (Poudyal et al., 2008). Income tends to be a more important factor for non-resident licensing demand (Sun et al., 2005). For a hunter themselves, age and race are important factors for participation in hunting and fishing (Floyd & Lee, 2002). Land access can also play a role (Mozumder et al., 2007; Mingie et al., 2019), especially for those with low incomes. Access to private lands has been decreasing overall in the US (Mingie et al., 2019), even as leasing arrangements are rising in popularity. As property values increase, these leasing arrangements are becoming more expensive making them unaffordable for many (Shrestha & Alavalapati, 2004). Land quality also has been found to directly affect outcomes – especially water access and the balance between pine and hardwood forests (Munn & Hussein, 2010). Other studies investigated the demand for hunting trips finding factors such property prices, ownership and demographic characteristics to be important (Mingie et al., 2019; Offenbach & Goodwin, 1994). Most of these studies have focused on the demand as it relates to the purchase of a license or consideration of an individual’s travel demand. This paper aims to contribute to this literature by focusing on many of the similar factors

that have been proven to be important in the individual hunter's demand for hunting, such as income or age. But instead of considering the demand for a license, this paper looks at the demand for hunting in a specific county as contrasted to that county's economic and demographic characteristics. By examining the characteristics of the counties where hunters are actually harvesting deer, it is possible to determine whether these factors are a consideration for the location and harvesting rates of hunters.

Deer Hunting in South Carolina

In South Carolina, management of the deer population is dependent on the ownership of the land. Private lands are regulated by the South Carolina General Assembly and enforced by the SCDNR. Public areas, called Wildlife Managements Areas (WMAs), are regulated by the SCDNR directly. WMA lands include SCDNR owned lands, US Forest Service and state government lands leased to SCDNR, and private and corporate lands that are also leased to SCDNR. In 2021, WMA hunting lands constituted over 1 million acres scattered throughout the state, comprising approximately 5 percent of total land (DNR, 2023).

Hunting Licensing and Regulations

Regulations on all lands include restrictions on hunting seasons, harvest methods, such as weapon type, and harvest limits. Lands within the state are broken down into Game Zones, with four total across the state.

In order to hunt in South Carolina, an individual must purchase a state hunting license. To hunt deer, a licensee must also purchase a Big Game Permit. Licenses are available for residents and non-residents giving access to all 46 counties. Beginning in the 2017-2018 hunting season, all deer harvested in South Carolina, regardless of sex, must be tagged at the point of kill. Resident hunters are allocated 5 total tags, 2 antlerless and 3 antlered, with the purchase of their license and permit. For the purpose of tagging, an antlerless deer is defined as a deer with no antlers or with antlers less than 2 inches above the hairline; an antlered deer is a deer with antlers 2 inches or more above the hairline. Residents can buy additional tags in each category, but total harvest limits apply. Non-residents are not allocated tags with the purchase of the license and permit, but may purchase tags for both antlered and antlerless. Tags are applicable at different times within the season in different game zones.

Table 1 lists the prices of annual licenses and permits for the 2022-2023 season. Resident hunters also have the option to purchase a 3-year license and permit¹. As an example, a resident hunter in South Carolina can harvest two antlerless and three antlered deer for a flat price of \$18 annually during the allowed season in certain game zones. A non-resident hunter could harvest four antlerless deer for a total of \$265 or two antlerless and two antlered for \$315. Both could have the option to harvest more deer with additional tags, up to the harvest limits. Statewide, residents are limited to harvesting two antlered deer per day, or a total of five during the season, whereas non-residents are limited to two antlered deer per day, or four total all season. For antlerless deer, the statewide limit is eight antlerless deer all season for residents; six for non-residents. Any hunter who hunts on public lands, or WMAs, must acquire an additional WMA permit to access those lands. WMA lands are accessible on specific dates during the season, as determined by the SCDNR. Any limits on harvest apply to both private and public lands.

The hunting season for archery and gun hunts for antlered deer begins as early as August 15 in game zone three, with all zones allowing archery and gun hunts by October 11. The type of weapon – primitive², archery, or gun – often determines when hunting begins. In game zone two, for instance, archery hunts can begin September 15, primitive weapons hunts October 1, and gun hunts October 11. All zones end the hunting season on private lands January 1.

Table 1: South Carolina Annual License Fees, July 1, 2022 – June 30, 2023

	Resident	Non-Resident	Notes
State Hunting License	12.00	125.00	A hunting license and a big game permit are both required to hunt deer
Big Game Permit	6.00	100.00	
Deer Tags (2 antlerless, 3	included	n/a	All harvested deer require tags at point of kill

¹ Three-year licenses and permits do not offer a current cost advantage. An annual hunting license is \$12.00; a three-year license is \$36. An annual big game permit is \$6; a three-year permit is \$18.

² Primitive weapons include: “bow and arrow, crossbow, and muzzle loading shotguns and rifles/muskets with open or peep sights or scopes, which use black powder or black powder substitute” (SCDNR 2022)

unrestricted ³ antlered)			
Individual Antlerless Tags	5.00	10.00	Optional; Total harvest limits apply
Restricted Antlered Tags	5.00	n/a	Optional; max 2 tags
Unrestricted Antlered Tag	n/a	First 50.00, Second 20.00	Max 2 tags
Restricted Antlered Tag	n/a	20.00	Max 2 tags, requires \$50 unrestricted tag first
Wildlife Management Area Permit	30.50	76.00	State hunting license and big game permit also required

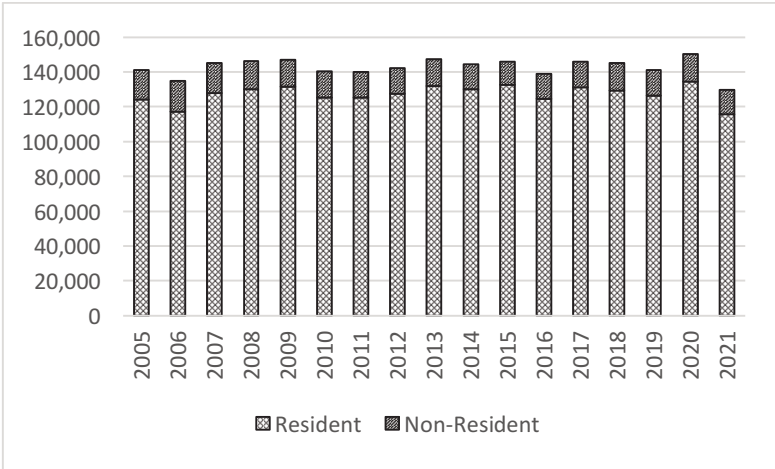
Source: South Carolina Department of Natural Resources, 2022

Deer Hunters and Harvests

Historically, resident hunters comprise an average of over 89 percent of total hunters annually from 2005 to 2021. Figure 1 is an illustration of the estimated number of active deer hunters in the state by their residency status. The number of hunters has only varied slightly over the last 15 years, with a peak in the 2020 season. Like many other outdoor recreational activities, this increase in hunter numbers is likely the result of the Covid-19 pandemic that limited other types of recreation (SCDNR, 2021). In the following year, 2021, numbers decreased as many individuals resumed activities that had otherwise been limited. Although resident hunters do vary by a large number, their percent variation across the period is smaller than their non-resident counterparts. Resident hunters vary approximately 5 percent from their average, while non-residents deviate approximately 15 percent. This variation may be attributable to the additional costs non-resident hunters face, such as travel and higher licensing fees.

Figure 1: Number of Hunters by Residency, 2005-2021

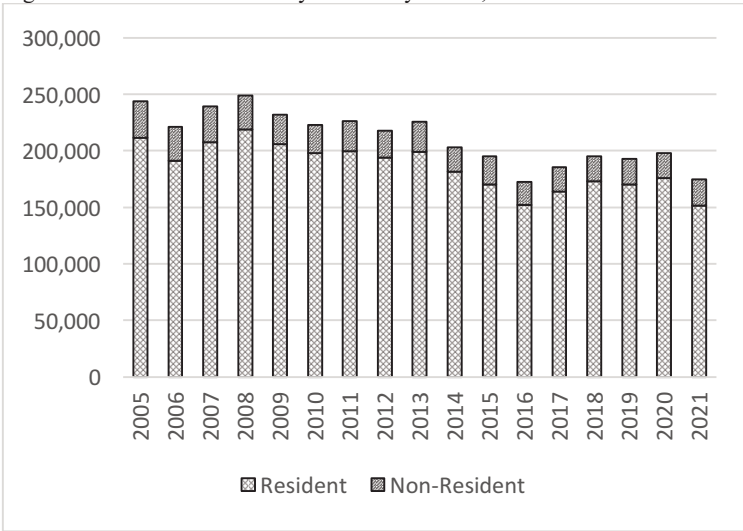
³ Restricted and unrestricted antlered tags refer to antler size – restricted is a minimum of 4 points on one side, or 12 inch inside minimum spread.



Source: South Carolina Department of Natural Resources, 2022

Annual deer harvest totals are largely from resident hunting. Figure 2 is a breakdown of the total deer harvested by residency status. For example, in 2005, a total of 244,048 deer were harvested, of which 211,750 were harvested by resident hunters. Over the period from 2005 to 2021, on average 88 percent of deer were harvested by resident hunters. This can be largely attributed to the fact that on average, resident hunters outnumber non-resident hunters over eight to one. More hunters active afield simply mean more deer harvested. However, that percent is relatively stable with a minimum of about 86 percent harvested by residents and a maximum of 89 percent across the time-period.

Figure 2: Total Deer Harvest by Residency Status, 2005-2021



Source: South Carolina Department of Natural Resources, 2022

Measures of hunting effort and success indicate that resident and non-resident attempts and outcomes are similar. Residents spend on average more days afield, defined as the number of days where any time is spent hunting. This likely reflects the convenience of a resident’s geographic location and resulting lower travel costs. Residents also spend more days to harvest a deer than non-residents, likely driven by more man days afield. Resident hunters may also be more interested in conserving local deer populations, leading them to spend more time afield to get a higher quality harvest. However, percent success indicates that resident hunters perform better, as measured by the percent of hunters harvesting a minimum of one deer during the season. Finally, deer per hunter is the average number of deer harvested per hunter during the season. Both perform almost equally well, balanced by more days afield for residents and fewer days per deer for non-residents.

SCDNR Hunter Surveys

SCDNR frequently surveys hunters regarding opinions on management techniques to determine potential policy changes. The importance of these surveys for policy is to determine political support, as these laws and regulations are enacted by the South Carolina General Assembly. A survey was given in May 2010 to licensed hunters who participated in the 2009 hunting season (SCDNR, 2010). Historically, hunters in South Carolina were only

required to use tags for antlerless deer – there were no limitations on the number of antlered deer harvested. As a result, licensed hunters in some game zones were able to harvest an unlimited number of bucks without the need for tags. This led to the concern that the lack of regulations was impacting the overall population, particularly the age structure of the male population. The male age structure affects the quality of all deer because of their contribution to the reproductive cycle. The survey was completed by telephone with a total of 3,663 interviews, and at least 600 surveys in each game zone.

Table 2: Average Measures of Hunting Effort and Success, Statewide, 2005-2021

	Resident	Non-Resident
Man Days afield per Hunter	15.39	13.85
Days per Deer	10.98	10.01
Percent Success	72.24	68.02
Deer per Hunter	1.47	1.43

Source: Author's calculations based on SCDNR Deer Harvest Reports 2005-2021

A few results are worth noting that ultimately led to changes beginning in the 2017-2018 season. First, 70 percent of hunters supported a limit on the number of bucks harvested each year (SCDNR, 2010). Results varied across game zones, but the highest support was seen in Game Zones 1 and 2. These zones already had annual limits of five bucks per hunter; the existence of the limits in these areas would imply most hunters would also support a similar statewide limit. At the time “harvest data indicate[d] that only 4 percent of hunters take more than 5 bucks annually, however, as a group these hunters take 20 percent of all the bucks in the state each year” (DNR, 2010). Given the small number of hunters harvesting a large number of bucks, it implies many hunters that responded may also have been interested in conservation. Second, if a limit were imposed, 92 percent of hunters agreed that the limit should be exactly five or fewer bucks (SCDNR, 2010). As mentioned, this was already the limit in Game Zones 1 and 2 and most hunters were already harvesting less than that total. By limiting that small percentage of hunters who harvest large numbers of bucks, it would significantly impact total harvest rates. Third, if a limit was to be put in place, 74 percent supported a tagging system for enforcement (SCDNR, 2010). This was widely supported across game zones, likely to ensure fairness to all hunters and to reduce the likelihood of illegal harvest.

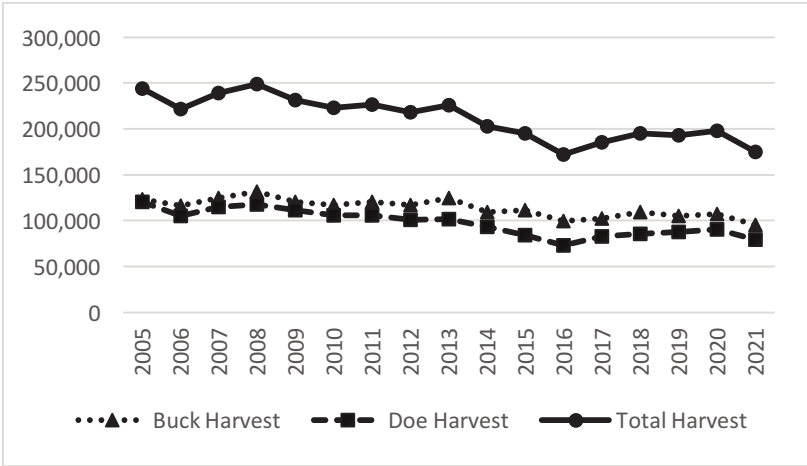
Additionally, a tagging system was already in place at the time for does, implying expanding the system for bucks would not pose a large burden on hunters because of the familiarity with the existing system. From a regulatory perspective, this would make an easy and low-cost transition for the SCDNR as well. Next, if the tagging system is used, 75 percent of hunters would be willing to pay \$10 for the buck tags (SCDNR, 2010). While this is a low price, this could help to offset the cost of enforcement for the tagging system. It also reinforces the idea that the goal of hunters is to properly manage populations, not to limit access. Finally, 62 percent of hunters supported limiting harvest based on antler criteria; this could be used in conjunction or independently of a tagging system (SCDNR, 2010). This also was equally supported across game zones, likely indicating dissatisfaction with the age and/or size of bucks harvested. Quality Deer Management (QDM) has become increasingly popular in recent years, a strategy that focuses on limiting harvesting of young bucks to balance the age structure and ensure proper sex ratios between bucks and does (Harper et al., 2012). The General Assembly of South Carolina responded to this survey by ultimately modifying the licensing and permitting requirements to what is currently in place that are described in the previous section on current licensing. These new laws did not significantly change the price of licenses, as those fees have been stable for many years, but rather imposed additional restrictions on the number and sex of the total deer harvested in a season and a tagging system for all deer.

Deer Population Trends

The population of deer in South Carolina has varied over the last 100 years. Historically, around 1900, the deer population was estimated around 20,000 (SCDNR, 2021). But by the 1930s, the boll weevil and drought conditions reduced the land dedicated to agriculture and allowed for the expansion of the deer population. However, after a stabilization in the late 1990s and a peak of approximately one million, populations began to decrease (SCDNR, 2010; 2021). In 2021, SCDNR estimated that the statewide population is about 700,000 deer (SCDNR, 2021). Many factors contributed to this decline. First, urban development changed the availability of land, along with rising population densities in areas traditionally considered habitat for deer. In 1900, the population of the South Carolina was estimated at 1.34 million people; in 2021, that estimate was 5.19 million (US Census Bureau, 1901; 2021). The pressure of the balance between wildlife and humans puts strain on deer populations. This is true across the United States historically as well, with large declines

between 1750 and 1900 as large areas of land were cleared for agriculture (SCDNR, 2021). These habitat changes have also forced deer into other geographic areas and proper management techniques have attempted to focus on this factor (Morellet et al., 2007). For example, a large number of pine stands are at an age that is poor habitat for deer. Pine stands older than 10 years are not adequate because of the lack of cover and food (SCDNR, 2010). This effect could potentially be exacerbated by the fluctuations in the economy since timber farmers will adjust the decision to cut stands depending partly on the price of timber. For timber farmers, leaving the trees in the ground could increase their revenue in the long run if prices are temporarily low. Unfortunately, these decisions could potentially have harmful effects on the deer population. The Great Recession in 2008 and the financial pressures resulting from the Covid-19 pandemic would be examples of these economic events. More recently, car accidents have become a growing concern with the increased use of rural roads because of population growth, leading to a larger number of deer fatalities and increased social costs of insurance (Rondeau & Conrad, 2003; Hussain et al., 2007). Preliminary numbers for 2021 from the South Carolina Department of Public Safety indicated deer-vehicle collisions had more than doubled from 2020 to 2021, from 2,736 to 6,409 (SCDNR, 2021). While these numbers are self-reported by drivers, this is a considerable increase in the previous year's trends of an average of about 3,000. Third, predation by coyotes has become a growing problem because of the expansion of the populations statewide since they were first documented in the Upstate in 1978 (SCDNR, 2021). Although the coyote population is not known, over 30,000 coyotes were harvested in South Carolina in 2010, but by 2021, that number has decreased to about 16,000, indicating a possible stabilization of the population (SCDNR, 2021). Most importantly, as a non-native species, coyotes are responsible for a large portion of the fawn mortality rates. One study in South Carolina estimated that while fawns generally have around a 70 percent mortality rate, up to 80 percent of those fawn mortalities are probable coyote predation (Kilgo et al., 2012). However, that study further found that trapping and killing coyotes did not have a significant effect on fawn mortality rates. Thus, improvements in the management of adult deer may be more important at improving overall deer populations (SCDNR, 2021).

Figure 3: South Carolina Estimated Deer Harvest, 2005-2021

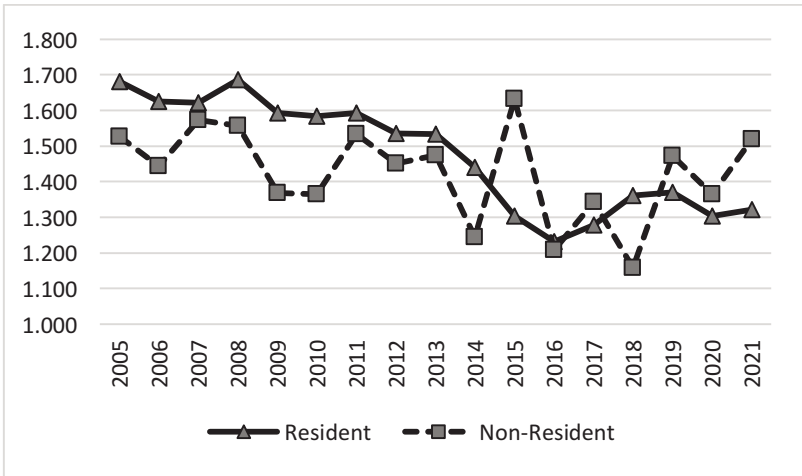


Source: South Carolina Department of Natural Resources, 2022

Finally, and of significant concern in this paper, are the liberal harvests of bucks that historically have been commonplace in South Carolina. Following a record harvest of almost 320,000 deer in 2002, overall harvest has been decreasing (SCDNR, 2020). Figure 3 illustrates the estimated deer harvest from 2005 to 2021. As can be seen in Figure 3, both buck and doe harvests, as well as total, have fallen since 2005. Beginning in 2016, there was a slight increase in harvest rates, attributed to the possible stabilization of coyote populations (SCDNR, 2020). Those rates have decreased again in the most recent year, 2021, in line with the overall decrease in the number of hunters in Figure 1. The inclusion of the tagging system beginning in 2017 did not put downward pressure on harvest rates, but it did stabilize buck harvests. It is difficult to assess though whether this improves the age structure because these data do not indicate the age of the deer harvest, only the sex.

Additional patterns can be seen when considering the number of deer harvested per hunter, illustrated in Figure 4. A general downward trend is apparent for both residents and non-residents of South Carolina. Non-residents harvests are much more volatile, however, with large differences across many seasons. Recently though, non-resident rates of harvest per hunter have begun to rise, overtaking that of residents for the last three seasons.

Figure 4: Deer Harvested per Hunter by Residency, 2005-2021



Source: South Carolina Department of Natural Resources, 2022

The tagging system for all deer implemented by regulators in the 2017-2018 season was to help increase and/or stabilize populations, particularly to decrease harvest pressure on bucks. However, it is necessary to understand what motivates hunting to ensure it will be successful (Gordon, et. al 2005). This can lead to the question of whether these changes to licensing structures will replenish or stabilize deer populations. The first part of the paper will assess the factors that influence a hunter's decision to hunt in a particular county; the second part will look the factors that influence the actual harvest rates. Together, these will help to determine whether the tagging system has successfully influenced hunter decisions.

Empirical Model and Data

Presumably, the aim of a hunter is to successfully harvest a deer – but do economic and demographic characteristics have any relationship to this choice? Equation (1) specifies the full relationship between the number of hunters that choose to hunt in a county relative to characteristics of that county. Also included is a dummy variable for the adjustment in the statewide tagging system for bucks that began in the 2017-2018 hunting season.

$$\text{Hunters}_{it} = \beta_1 \text{RGDP}_{it} + \beta_2 \text{Housing}_{it} + \beta_3 \text{PopDensity}_{it} + \beta_4 \text{Jobs}_{it} + \beta_5 \text{White}_{it} + \beta_6 \text{Male}_{it} + \beta_7 \text{Age}_{it} + \beta_8 \text{Tagging}_{it} + \beta_0 + \varepsilon_{it} \quad (1).$$

It is important to note that the price of a license is not included as a determinant of the number of hunters in a specific county. As described earlier, in South Carolina, license fees are paid at the state level. Once an individual obtains a proper license, the choice of county in which to hunt is independent of the price of the license as there are no additional licensing fees required. Thus, if an individual chooses to hunt in one county, there is no additional license cost to hunt in another county or even every other county. However, there are other potential costs such as access to land, like WMA permits or land leases. Economic variables are expected to influence a hunter's choice of county by affecting the availability and quality of land and deer. A more developed county will have a larger real GDP per capita, more housing units, a larger population, and a larger number of jobs. Other studies have found that demographic characteristics of the population affected the number of individuals who purchase hunting licenses (Poudyal, et al 2008). The inclusion here is intended to determine whether those characteristics also affect the desirability of a county for hunting deer. The role of land development may impact in a number of ways, by either affecting land quality (Munn & Hussein, 2010) or increasing the population demanding recreational activities (Mingie et al., 2019). Finally, the inclusion of the tagging dummy variable will indicate whether the imposition of that system effects the number of hunters in a county. A negative effect would indicate that the addition of the buck tagging system decreases the number of hunters.

After choosing a county in which to hunt, the success of that choice, or the total number of deer harvested, is determined by:

$$\text{Harvest}_{it} = \beta_1 \text{Beef}_{it} + \beta_2 \text{ManDays}_{it} + \beta_3 \text{Hunters}_{it} + \beta_4 \text{Tagging}_{it} + \beta_5 \text{Resident}_{it} + \beta_0 + \varepsilon_{it} \quad (2).$$

Equation (2) includes the harvest rates of deer as a function of the price of a substitute for deer meat, specifically beef. Since many hunters consider the harvesting of deer an important source of food, a substitute for a deer harvested could be the consumption of beef. The real average price of ground beef in southern urban areas is used to determine whether this effects a hunter's decision to harvest a deer. Mazza (2003) investigated the use of deer hunting as a form of subsistence, finding variations in income significantly correlated to deer harvests. In particular, as incomes fell, deer harvests tended to rise, predicting that some of the demand for deer harvest is for food. Price of beef is used here to determine whether that factor is influencing hunters choice of harvest directly. Hunter effort is the amount of time a hunter dedicates to harvesting deer, or individual

man days hunted. Since hunters cannot harvest deer with full certainty, effort of the hunter will play a role in harvest. The more effort, or man days hunted, the more deer should be harvested, all else equal. Adding to that, a larger number of hunters also should increase the total number of deer harvested. The tagging system dummy variable is also included again to determine whether its imposition impacted harvest rates. A negative value would indicate a decrease in the total harvest. Finally, because effort and success does differ among residents and non-residents, the percent of resident hunters should indicate higher rates of harvest.

Other variables were considered for inclusion in equation 2. Income, for example, is often cited as a factor for deer harvests. Sun, et al. (2005) uses income to estimate the demand for hunting licenses in British Columbia, finding that income was very inelastic for nonresident, but did not largely change demand for residents. However, the data used here represent the harvest rates of hunters who have already chosen to actively hunt – as opposed to the decision to purchase a license. Additionally, incomes attributed at the county level would not represent the hunters themselves, but rather the residents of that individual county.

Data was collected from the SCDNR, the US Bureau of Labor Statistics, the US Bureau of Economic Analysis and the US Census Bureau. Hunting data was collected on an individual county level between 2005 and 2021, representing all 46 counties in South Carolina. To collect the hunter and harvest data, SCDNR sends out a random sample of surveys at the end of each season to approximately 30,000 hunters, of which around 3-5 percent respond, varying slightly each year. Each county represents an independent count of hunters – that is, the survey asks the hunters to list all counties in which they hunt. Every county an individual hunter hunts is then included in the total count of hunters. Thus, each county level observation represents the number of licensed resident and non-resident hunters who actively hunted in that county in that season or year. It is thus possible that an individual hunter may be counted in more than one county. Also reported for each county are the number of days hunted and the number and sex of the deer harvested. Additional information about the type of weapon used and a hunter's opinion on the status of the deer population are also requested in the survey. Based on the data collected, the estimated harvest is then extrapolated out to the total number of licensed hunters in the state. The remaining variables were collected from the Bureau of Labor Statistics, the Bureau of Economic Analysis and the Census Bureau. Table 3 defines the variables and

provides summary statistics. The full panel of data represents 46 counties across 17 years, for a total of 782 observations.

Table 3: Summary Statistics, 2005-2021

<i>Variable</i>	<i>Definition</i>	<i>Mean</i>	<i>Minimum</i>	<i>Maximum</i>
<i>Hunter and Harvest Data</i>				
Hunters	<i>Number of individuals who hunt in a given county</i>	3,103	712	7,046
Harvest	<i>Number of deer harvested, total</i>	4,596	831	13,496
Man Days	<i>Number of days spent afield hunting</i>	47,225	9,360	125,918
Resident	<i>Percent of hunters who are residents of SC</i>	89	43	100
Tagging	<i>Dummy variable for introduction of buck tagging system in 2017</i>	0.3	0	1
County Acreage	<i>Number of acres in a county</i>	304,976	147,441	567,530
<i>Economic and Demographic Data</i>				
RGDP	<i>Real GDP per capita (2012 dollars)</i>	31,113	14,726	71,988
Jobs	<i>Number of jobs per 1,000 people</i>	443	276	877
Housing	<i>Number of housing units per square mile</i>	103	11.96	506
Pop	<i>Population, Total</i>	103,874	7,858	533,834
PopDensity	<i>Number of residents per square mile</i>	224	23	1160
White	<i>Percent of population described as white</i>	61	24	91
Male	<i>Percent of population described as male</i>	49	46	55
Age	<i>Percent of population aged 35-64</i>	40	34	46
Beef	<i>Average real price per pound of ground beef (2012 dollars)</i>	3.67	3.14	4.49

Note: N=782 across 46 counties.

Sources: SCDNR, BLS, BEA, Census

A comparison between individual counties in South Carolina does indicate large variation in geographic size, as well as the number of hunters who choose to actively hunt in certain counties across the time-period. Caution must be used when interpreting the statewide total number of hunters – an increase may result from an increase in

individual hunters, but it may also be individual hunters hunting in more counties (or fewer if numbers decrease). Harvest rates vary over time and county, but some of this may be attributed to the game zone in which the county is located, where additional restrictions limit harvests. Substantial differences in man days afield indicate that there may be preferences among hunters for certain counties – but also large or more rural counties may naturally attract more hunters, and thus accumulate more man days afield.

Economic and demographic data also indicate large variation across counties, representing the division of rural versus urban development. Wide differences in real GDP per capita and the number of jobs per 1,000 of the population, and even housing, show differences in the economic opportunities and development. Population and population density reinforce the rural versus urban divide. Demographic characteristics indicate less variation in the male population and those age 35-64, but substantial variation in those identified as white.

Empirical Results

Results for fixed effects regressions are given in Tables 4 and 5. Fixed effects regressions were chosen to control for a number of factors that may be consistent for individual counties across all years that cannot be quantitatively controlled in the analysis. For example, geographic features of counties, such as size or access to water, may play a role in deer populations available for hunting, but would not change during the years of observation (Munn & Hussein, 2010). Additionally, size and access to WMAs has not largely changed during the time-period observed. Thus, the availability of public lands for hunting, an important substitute for hunting on private lands (Mingie et al., 2019), would be consistent.

Table 4 illustrates the results for Equation (1). Three models of equation (1) are estimated. Equation (1a) looks only at the economic variables of the counties; Equation (1b) looks at the economic and demographic variables together. In both equations, real GDP and housing density are significant and indicate negative effects. Higher incomes and housing units in a county decrease the number of hunters. This could be an indication that more development or urbanization, whether from business or residential, could impact access to lands and reduce a hunter's desire for that particular county. Over time, this may also make more urban counties less desirable as deer populations decrease as result of development.

On the other hand, population density is positive and significant - putting upward pressure on the number of hunters. As the population rises in an area, the more individuals participate in hunting, a result found in the literature. Further, because the data indicate that a large number of the hunters in South Carolina are residents, this would put additional positive pressure. In many counties in South Carolina, development is very concentrated in small areas of the county. Because population density is not uniform across a county, larger concentrated populations could be driving these effects. To account for this, county population was also considered in the regression equation – it produced similar positive and significant results. The larger the population, the larger the number of hunters in a county.

Jobs is another measure of economic activity. Results indicate that a larger number of jobs increases the number of hunters. While at first this seems contradictory to other measures, recreational hunting has been shown to complement other areas of economic activity. While real GDP may be an indication of a county’s development, jobs may indicate more complementary services, making hunting more attractive. Another study by Hussain et al. supported this conclusion that “without wildlife-associated recreation expenditures, regional employment would...[be]...smaller” (2012).

Demographic characteristics offered mixed results. The male population and age structure of a county did not significantly affect hunting. However, the percent of the population identified as white has a significant negative effect. This measure is not indicating the percent of hunters that are identified as white, but the resident population of the county. Thus, results indicate that a larger white resident population reduces the number of hunters. In South Carolina, there is little variation across counties in age and sex of residents. However, given the summary statistics in Table 3, there is wide dispersion in race. Counties in the Game Zone 1, with the most restrictive hunting regulations, also have the largest populations that identify as white. Thus, this factor may be attributable to the variation in hunting restrictions across game zones instead of demographics themselves.

Table 4: Fixed Effects Regression Results, Dependent Variable: Number of Hunters

Explanatory Variable	(1a)	(1b)	(1c)
Real GDP	-0.015*** (0.006)	-0.013** (0.006)	
Housing Density	-10.5*** (4.24)	-9.79** (4.22)	
Population Density	8.696***	8.25***	

	(1.68)	(1.67)	
Jobs	1.24*	1.16*	
	(0.693)	(0.69)	
White		-38.8***	
		(12.8)	
Male		12.3	
		(45.8)	
Age		9.48	
		(15.3)	
Tagging	-79.7***	-58.1*	-8.81
	(31.5)	(43.7)	(27.7)
Constant	2170***	3573.7	3105
	(285)	(2663)	(15.0)
F	178.22***	169.8***	171.15***

Note: Standard errors are in parentheses below coefficient estimates. Significance at the 1%, 5%, and 10% levels is represented by ***, ** and *, respectively.

Finally, and an important result, the inclusion of the tagging system did negatively impact the number of hunters. Given the downward trend in hunting participation, this may indicate confounding factors, such as the volatility due to Covid-19. Isolating the tagging variable alone in Equation (1c), the effect becomes small and insignificant.

The results for equation 2 are illustrated in Table 5. Rising beef prices decrease harvest. Specifically, an increase in the average price of beef decreases the quantity of deer harvested. While beef is hypothesized to be a substitute for venison, lower harvests are an indication that beef and venison are not good substitutes. This is also supported in the cross-price elasticity between beef prices and deer harvests. With a value of -0.668, deer harvests and beef have an inelastic complementary relationship. Hunters may consider different types of meat complements, possibly indicating simply the preferences of food choices of hunters. Alternatively, this supports the notion that hunting is a normal good, and primarily for recreation as opposed to subsistence. Because these data reflect harvests on private lands only, an increase in beef prices could shift demand to relatively lower access cost public lands. Further analysis on WMA harvest would be necessary to confirm this substitution effect.

Table 5: Fixed Effects Regression Results, Dependent Variable: Harvest

Explanatory Variable	(1a)	Elasticity	(1b)
Beef	-836***	-0.668***	
	(57.2)		
Man Days	0.054***		
	(0.005)		
Hunters	0.704***		
	(0.093)		
Tagging	-307.5***		-684.9***

	(49.2)	(68.4)
Resident	-9.4	
	(7.3)	
Constant	3847.6***	4797.9***
	(666.1)	(37.1)
F	17.91***	83.12***

Note: Standard errors are in parentheses below coefficient estimates. Significance at the 1%, 5%, and 10% levels is represented by ***, ** and *, respectively.

Intuitively, effort, defined as man-days spent hunting, also increases harvests, as the more time in the field, the more likely you are to find a suitable kill. Finally, similar to effort, a rise in the number of hunters also increases harvests, implying a greater number of hunters in the field, the greater the number of deer harvested. Finally, the modification to the deer tagging system beginning in the 2017-2018 season had significant effects on the total number of deer harvested, decreasing harvest rates. This indicates that the tagging system implemented by SCDNR did successfully decrease the total harvest. Equation (1b) isolates the tagging variable, further affirming that negative and significant effect.

Conclusion

Reflecting on the changes to the licensing structure for hunting in South Carolina, the results of this paper indicate that incentives appear to have changed during the time of observation. The inclusion of a tagging system has decreased the number of hunters and the harvest rates across the state. Economic development and land significantly influences where hunters choose to hunt – counties with higher GDP and more residential housing see less hunting. However, population density tends to increase hunting, attributable to population growth, especially in already urbanized areas. Thus, intuitively, rural areas tend to be more popular for hunting activities than urbanized areas. Given these effects though, the inclusion of the buck tagging system has influenced the harvest rates of deer – indicating success at reducing the pressure on the current population.

A number of additional considerations should be taken into account when assessing these results. First, as the licensing structure changed in 2017, it did not change the nominal price to be licensed. In fact, real license prices have declined over the time-period observed. However, in the last 5 years of observation, a resident hunter could no longer harvest an unlimited number of bucks. Thus, for some hunters who were harvesting a large number of deer, the real price of a license per deer harvested did increase. Raising license prices could mean

fewer hunters will be able to afford to hunt, and thus, fewer will be able to afford adequate subsistence food supplies, which could also encourage some hunters to illegally harvest deer. However, the results here indicate that legal hunting may not be a subsistence source of food for legal hunters in South Carolina. While illegally harvesting deer may not change the number of deer actually harvested, it will change the need for enforcement. However, rarely do licensing systems financially cover hunting programs expenses (Sun et al., 2005). This could impose much greater financial burdens on states to prevent illegal hunting. Thus, license prices must still encourage hunters to maintain legal harvests.

Second, the data indicate that the value of recreational hunting may be beginning to outweigh subsistence hunting. From Figure 4, during the last three recorded seasons, which coincided with the time of the licensing changes, the number of deer per hunter for non-residents rose above residents, where it remains. Because of the price of a non-resident license alone, it can be assumed that income is less of a factor for non-resident than resident hunters. If non-residents are beginning to harvest more deer per hunter, it will be important to consider the balance of that change on the deer population. This could also be another indication that the new licensing structure is successful because resident hunters are now harvesting fewer deer per hunter.

Finally, as land prices rise in South Carolina due to economic and population growth, the opportunity cost of idle lands is also increasing. Hunting leases, sometimes in the form of hunt clubs, allow private landowners to rent their lands to individuals for the purpose of hunting. These lease agreements have been rising in popularity and economic value (Shrestha & Alavalapati, 2004; Mingie et al., 2019). Often these lands are actively managed and prepared for lessees, making it easier for them to harvest deer – a factor possibly attributable to the rise in the number of deer per hunter for non-residents. Annual harvest reports from SCDNR indicate that non-resident hunters do spend fewer days afield to harvest a deer than do residents (SNDNR, 2018). These lease agreements of large tracts of land may be increasing the cost to hunt statewide, making access to private lands more prohibitive for hunters constrained by income, especially residents. This also reinforces the premise that hunters are potentially beginning to value the recreational aspects of hunting as opposed to subsistence hunting. Put another way, hunting is becoming more cost prohibitive to many, for which economists and resource managers must consider the effects.

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**Federal procurement & women-owned small businesses:
A systematic review on barriers to participation in
government procurement contracts**

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Abstract

The federal government has consistently failed to meet its objective of awarding at least 5 percent of all prime procurement contracts to Women-Owned Small Businesses (WOSBs) since the policy's inception in 1994. Set-aside and sole-source contracts aimed to reduce some barriers for women entrepreneurs have proven insufficient. It shows the importance of identifying and addressing the barriers that WOSBs face while pursuing federal procurement contracts. This research paper reviews previous literature to determine the obstacles at the women-owned business and procuring entity (institutional) levels. Results reveal several obstacles, including gender discrimination, lack of networking, awareness of contracting opportunities, lack of counseling/training, significant contracts, complex tenders, excessive requirements, and other challenges. Based on the results, the study outlines implications and recommendations for WOSBs.

Keywords: Procurement, Federal Procurement, Small Businesses, Women-Owned Small Businesses (WOSBs), Small Business Administration (SBA), Barriers, United States.

Introduction

According to the World Bank organization, governments worldwide spend a combined \$9.5 trillion yearly procuring goods and services from the private sector (World Bank, 2018). Public procurement, a process by which a government entity purchases goods and services, has been deemed the globe's largest marketplace and accounts for

approximately 15 percent of the global GDP (Konanykhin, 2018). Governments procure diverse goods and services from the private sector, from chemicals to software and labor. In the United States, regulations and practices in public procurement vary between the federal, state, and local governments and reflect different needs and disparities in legal authority and fiscal capacity. In the case of the federal government, the 1997 Small Business Reauthorization Act mandated that at least 23 percent of federal contracting dollars are awarded to small businesses, which remains the current set-aside percentage goal of the federal government (CRS, 2022).

The federal government utilizes the small business definition established by the U.S Small Business Administration (SBA) agency to determine small business qualifications for contracting purposes. According to the SBA, a small business must meet basic eligibility such as: “organized for profit, has a place of business in the United States (U.S), operates primarily in the U.S, is independently owned and operated, is not dominant in its field on a national basis, maybe a sole proprietorship, partnership, corporation or any legal form” (SBA, 2016). In addition, the SBA created “size standards” which are the minimum criteria that qualify a business as small. Size standards are developed per industry and are assessed by either a maximum number of employees or annual revenue in millions of dollars (Federal Register, 2023). The federal government established several subcategories under the small business classification, including Women-Owned Small Businesses (WOSB). Specific policies are enacted to increase the utilization of women-owned firms in federal contracting and subcontracting and to encourage supplier diversity. According to the SBA, in addition to the mandated 23 percent of prime contracts set aside for small businesses, the government further mandates a goal of 5 percent of all prime and subcontracting procurement dollars for WOSBs (SBA, n.d.). This goal is crucial in supporting women entrepreneurs, particularly in under-represented industries.

Like many private small enterprises, WOSBs depend on federal government contracts for sales and revenue. Women-owned small businesses face more significant barriers to entry in pursuing entrepreneurship due to greater difficulty accessing capital and

resources (Lee & Denslow, 2004; Cardella et al., 2020). Due to the lack of funding, WOSBs also operate at a smaller scale and makeup only one-fifth of small businesses despite occupying almost half of the labor force in the United States (Stangler, 2022). To strengthen the competitiveness of women-owned small firms in the market, the U.S. Congress allocates a “fair proportion” of government contracts to WOSBs (BPC, 2021).

While the federal government has implemented policies to provide contracting business opportunities for WOSBs, the government has only met the 5 percent awarded contract goal twice (2015 and 2019) since its inception in 1994 (BPC, 2021). Failure to consistently meet this policy goal displays a lack of understanding of the barriers faced by WOSBs in pursuing federal contracts and strategy and implementation failures of initiatives created to encourage women-owned supplier firms.

This paper identifies the main barriers experienced by WOSBs in federal procurement. It would enable women-owned businesses and governments to overcome the barriers and implement best practices and strategies to create a U.S. federal procurement system that is efficient and encourages the participation of women-owned small businesses.

History of Federal Procurement

In Yukins’ “The U.S Federal Procurement System: An Introduction,” the author provides an introductory overview of the laws and policies that guide government procurement in the United States. Yukins states that “important patterns in modern federal procurement can be traced back to the Revolutionary War, when the Continental Congress several times organized, and reorganized, the procurement system to supply the Continental Army.” (Yukins, 2017). Currently, defense agencies ranging from the Army to the Defense Logistics Agency account for approximately 60 percent of federal contracting dollars in contrast to civilian agencies, which award the remaining 40 percent (GOA, 2022). During the beginning of the nation’s founding, the federal procurement system was modeled after Europe’s contracting system and “called for notice, competition, and public awards during

the solicitation and award process and was primarily focused on finding and awarding the lowest cost bids” (Yukins, 2022). Furthermore, during the country’s inception, “only men of substance and talents” were qualified to win government contracts that systematically discouraged women from entrepreneurship and public procurement (Yukins, 2022).

This system was less complex than what is present today, which utilizes various solicitation packages such as Requests for Proposals (RFPs) and Sole Source Contracts. Today’s federal procurement system lies on the bedrock of two fundamental laws: the Armed Services Procurement Act of 1947 and the Federal Property & Administrative Services Act of 1949 (GMP, 2021). The Federal Acquisition Regulation (Parts 1-53 of Title 48) provides information concerning federal procurement regulations (CRS, 2021).

History of the WOSB Program

To address the concerns of small businesses “owned and controlled by socially and economically disadvantaged individuals” in the federal procurement process, Executive Order 12138 was issued on May 18, 1979, to create a national policy to address the challenges faced by WOSBs in securing federal contracting opportunities (Dilger & Blackford, 2022). The Executive Order aimed to tackle this issue through targeted procurement opportunities for WOSB, financial assistance, and business and management training (Dilger & Blackford, 2022). Dilger and Blackford (2022) further highlight P.L 100-533, an amendment that authorized the SBA to set an annual procurement target for WOSBs. A 5 percent federal contracting target was set for WOSBs in 1994, covering all federal agency spending. Each agency must also aim to award at least 5 percent for prime contracts to WOSBs. However, critics have asserted that until recently, the SBA’s Office of Women’s Business Ownership, established in 1979, has received second-tier priority by the SBA and has only started reporting directly to the SBA Administrator in 2022 (Carrazana, 2021).

The Rationale for WOSB Set-Asides

Critics argue that creating special treatment or set-aside policies for women-owned businesses needs to be a more fair and effective use of public funds. However, proponents and the federal government retort that the preservation and expansion of free competition are essential for the economic well-being and security of the nation (BPC, 2021). Furthermore, McManus (2012) asserts the importance of WOSBs to the U.S. economy by stating that if “U.S based women-owned businesses were their own country, they would have the 5th largest GDP in the world”. Additionally, according to the SBA, women-owned firms, for which the majority can be categorized as small businesses, employed 10.1 million workers, and generated \$1.8 trillion for the U.S. economy in 2019 (SBA, 2021). Despite the gender gap in business ownership, women-owned enterprises significantly contribute to the U.S. economy, and supporting their participation in federal contracting is sound public policy.

Furthermore, it is essential to help and support WOSBs due to the significant barriers they experience. WOSBs have reduced capability to compete in a free-market economy due to several contract level and micro-economic factors, including under-representation for trade negotiations, lack of access to capital, lack of access to information, increased discrimination, and suffering a disadvantage to compete against imports (Hawkins et al., 2018).

Set-aside initiatives used to increase the participation of WOSBs provide great benefits for the federal government. For example, such initiatives increase the number of qualified firms and promote competitive bidding to the government’s benefit. Research that studied the effects of affirmative action in the procurement process at the Federal Communications Commission (FCC) found that set-asides promoted intra-and inter-group competitions among bidders and increased the government’s revenue by more than 12 percent or nearly \$45 million (Ayres & Cramton, 1996).

Methodology

The current research applies a qualitative review design to determine the barriers WOSBs face while pursuing federal procurement contracts. The qualitative methodology offers an in-depth knowledge of the subject under study through descriptive and review-based techniques (Dixon-Woods, 2010). More specifically, the study performs a systematic review involving a detailed plan and search strategy, which identifies, appraises, and synthesizes relevant studies on the barriers experienced by WOSBs in the context of public procurement.

Literature Search and Sources

Undertaking the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) approach for systematic review, the research shortlists 20 research articles and reports covering the period 2004-2023 (20 years). These studies are extracted using databases and e-libraries: Google Scholar, GW Law's scholarly commons, and the University of Wisconsin-Platteville's Karrmann Library. These have been utilized to gain access to an extensive research database to gather conclusive findings on the barriers to women's participation as federal suppliers in different parts of the world, specifically the United States. This also enables a comparison of how barriers to federal procurement experienced by WOSBs in the US are similar or different to other developed and developing countries.

Government websites and databases are also significant sources of information regarding federal procurement laws and regulations and the policies enacted to support the participation of WOSBs as federal suppliers and overcome barriers. Government websites include the Small Business Administration (SBA), the U.S. Government Accountability Office (GAO, 2022), and the Office of the United States Trade Representative. Apart from these, the World Bank Intergovernmental Public-Private Legal Resource Center, which assesses public procurement regulations and practices in 180 countries, is consulted to examine common barriers women-owned businesses face in public-private partnerships and the recommended tools offered to address these problems. Other data and statistics are

obtained from independent advocacy organizations such as the Open Contracting Partnership, which provides information regarding the implementation and progress of public procurement reform initiatives in 50 countries.

The sources have been evaluated based on the following criteria: reference type, relevance to the topic, and author's credentials. Articles written by legal scholars and U.S. federal government departments, other states, and sources in academic journal reviews are preferred for the introductory exposition of the research topic. Sources written by professionals in the field and by legal or academic publications are chosen due to credibility and reliability. In searching for information through government and other sources, preference is given to articles and reports written within the last twenty years for time relevance.

Data Extraction and Analysis

To extract relevant research material which is credible and ensure quality information for the current research, the study applied PRISMA. PRISMA helps to extract data by filtering out research articles that are inappropriate, irrelevant to the recent research problem, and do not hold quality information (Selcuk, 2019). The approach goes through four stages: identification, screening, checking eligibility, and shortlisting the studies or reports to include. Based on these stages, the study selection for the review is based on the following inclusion criteria:

1. The reports or journal articles should include information about barriers that women-owned small business experience while pursuing government procurement contracts
2. The studies part of the current research should not be published earlier than 2004, i.e., published during 2004-2023.
3. The studies have adequate citations, author names, and years of publication
4. The studies are published in the English language.
5. The reports/articles are not based on systematic review methodology.

6. The primary keywords that are part of the search strategy are federal procurement and women-owned small businesses, state procurement contracts and women-owned small businesses, procurement and transparency and WOSBs, barriers faced by WOSBs in federal procurement, women inclusion in state procurement, barriers and initiatives, limitations of women participation in federal contracts, public procurement laws, federal contracting, small business procurement, federal procurement and WOSBs, and federal procurement and minority-owned small businesses.

As per the inclusion criteria and keyword search, 20 studies have been shortlisted for review, as shown in the figure below.

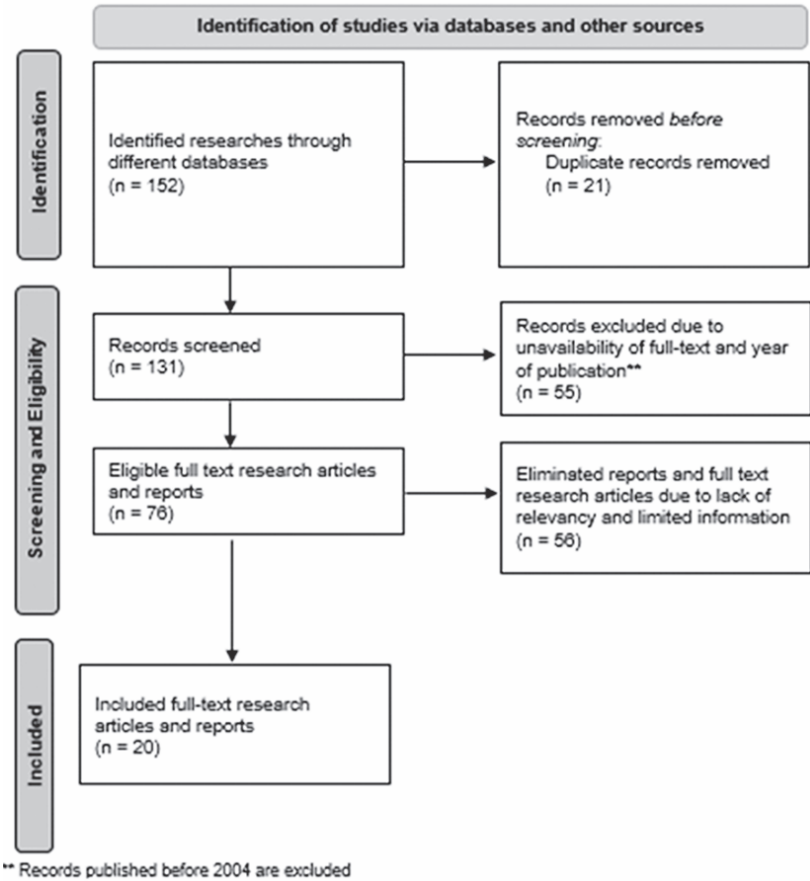


Figure 1: PRISMA Flow Diagram for Systematic Review

Initially, 152 citations were gathered, which were later reduced to 131 after excluding the duplicates. In the second stage, the remaining 131 executive summaries and abstracts were reviewed, out of which 55 studies were eliminated considering the unavailability of full-text and publication years earlier than 2004. Finally, 76 reports and studies were assessed for relevance, i.e., whether the required information about barriers faced by WOSBs in public procurement is present. In the end, 20 research articles and reports are considered the final sample for systematic review.

Results

The systematic review table presents the barriers women-owned small businesses experience while pursuing federal procurement contracts. 13 out of 20 studies are focused on US-based WOSBs. The rest of the articles/reports cover Canada, the UK, Latin America, and developing countries (global).

Table 1: Systematic Review

Authors	Year	Topic	Country	Key Findings
Atkinson and Remond	2022	Empowerment or Limitation? A Critical Exploration of American State Women-Owned Business Programs	United States	The barriers include eligibility requirements and the legal language of government programs. Financial capacity is another key aspect, where women-owned businesses are assumed credit-constrained. Organizational processes and norms also pose significant barriers to women businesses approaching government contracting. Gender discrimination and discriminatory social-cultural values undermine women's business enterprises (WBE). Other barriers include a lack of networking and counseling/training, a lack of contracting opportunities in the state, and a lack of a user-friendly database of WBEs.
Beede and Rubimovitz	2015	Utilization of Women-Owned Businesses in Federal Prime Contracting	United States	Firm age (young), firm size (small/earning less revenue), and specific industries of women-owned businesses are less likely to win contracts (federal prime contracts).
Cantwell	2014	21st-Century Barriers to Women's Entrepreneurship	United States	Women-owned businesses do not get sufficient access to venture investment and loans. There is a lack of equal access to government contracts. Further, women's businesses experience difficulties in accessing sufficient and relevant specialized business counseling and training.
Carter et al.	2015	Barriers to ethnic minority and women's enterprise: Existing evidence, policy tensions, and unsettled questions	United Kingdom	Supply-side gender discrimination is one of the main barriers that also creates hurdles in securing external finance. Demand-side risk aversion (lower uptake of debt finance) among women entrepreneurs also serves as a barrier to their business growth and subsequent loss of supplier participation. Limited market and management experience and smaller operations of women-based enterprises also act as barriers.
Clark and Moutray	2004	The future of small businesses in the US federal government marketplace	United States	Reduction in the acquisition workforce, human interventions in acquisition reforms of the 1990s, lack of serious subcontracting plans in large prime contracts, lack of accountability against large prime contractors for complying with federal subcontracting laws, and lack of initiatives, such as innovation research programs for small businesses or fortifying small business manufacturing sector.

Authors	Year	Topic	Country	Key Findings
Harrison	2017	Securing Government Contracts for Women-Owned Small Businesses	United States	One of the common barriers discussed is gender discrimination. Other factors that women business owners lack would create difficulty in winning federal contracts; these are strong work ethic, ability to adapt, awareness of limitations, ability to seek guidance, ability to network, and identifying a business niche. Related to federal contracts, the barriers include tedious, cumbersome, and meticulous processes and broken/rigged systems.
Chin	2014	Empowering Women through Public Procurement	Global	The pre-qualification process can create a barrier to entering into the public procurement system as women entrepreneurs may find it too onerous or complex. Financial requirements, such as audited financial accounts are also a significant barrier. In other words, low financial literacy can be termed as a barrier. Access to information and the limited capability of government officials and procuring entities are barriers for women-owned businesses.
Krifi and Wiel	2020	Making Public Procurement work for Women	Global	In the context of public procurement, women-owned businesses experience barriers concerning inadequate legislations and policies, misfit tender design such as large contracts and complex tenders, excessive requirements, poor practices by the government such as late payments, lack of information, and limited capability such as lack of tendering skills, etc.
Johnson	2015	Identifying barriers influencing federal government contracts for women-owned small information technology companies	United States	The potential barriers restricting women-owned small businesses (WOSBs) from achieving federal contracts are resource deficiencies, lack of WOSB relationships, the perceived failure of federal assistance programs, lack of process training and information sessions, and limited government action and accountability.
Harris	2019	Women-Owned Small Businesses and Government Contracting: A Qualitative Study	United States	WOSBs encounter barriers during the SBA federal government contracts' application process are gender discrimination, limited business outreach and network development, and pre-selection contact preference.
McMannus	2012	The anatomy of a helping hand: Women-owned small businesses and federal contract procurement	United States	The study presents several reasons for women's lagging percentage of procurements; these include contract bundling - consolidating smaller contract requirements into larger contracts, making it hard for WOSBs to file responsive bids. The federal government also perpetuates the well-known firms' use that is not WOSBs while pursuing efficiency-motivated practices for procurement.

Authors	Year	Topic	Country	Key Findings
Mee	2012	Improving opportunities for women-owned small businesses in federal contracting: Current efforts, remaining challenges, and proposals for the future	United States	Lack of awareness of and information on the availability of federal contracting opportunities, a variety of cultural and societal influences, and smaller size than men-owned businesses are among the factors that hinder the acquisition of federal contracts by WOSBs.
Orser and Weeks	2009	Procurement strategies to support women-owned enterprises	Canada	The barriers include bureaucratic resistance, limited knowledge of small businesses' procurement policy, lack of mechanisms to identify women-owned suppliers, and need for more awareness about government procurement.
Orser et al.	2019	The efficacy of gender-based federal procurement policies in the United States	United States	In the case of federal procurement, there are gender-related barriers and systematic gender differences. WOSBs are less likely to apply and win bids for US federal contracts. Other barriers include government bundle contracts and preference towards large firms.
Orser et al.	2021	Gender-responsive public procurement: strategies to support women-owned enterprises	Canada	Finding contract opportunities and the complexity of the contracting processes are the most cited obstacles to contracting. Other barriers are difficulty meeting contract requirements and long delays in receiving payment.
OCP	2020	How to empower women-led businesses and make public procurement more inclusive	Global	In public procurement, the barriers women-owned businesses face are lack of access to finance, operating on a smaller scale, gender biases and norms, perception of corruption and bias, and lack of knowledge of tender opportunities. The governments also need help to identify WOSBs, hostile perceptions impact bids, and weak feedback loops to engage diverse groups.
Robb and Rafael	2013	Access to Capital among Young Firms, Minority-Owned Firms, Women-Owned Firms, and High-Tech Firms	United States	The barriers include operating with much less capital due to disparities in the capital structure given the complicated mix of equity and debt capital reliance and lack of loan approval as women do not have a similar credit score and legal forms of organization as males. Other barriers include financial and economic crises, as women-owned businesses face more significant credit constraints in financial distress than their male counterparts.
Ruiz	2020	Inclusion of women in public procurement: The Latin American Experience	Latin America	There needs to be more data on women-owned businesses so it is hard for government entities to determine the number of women participating in the procurement processes or opportunities given to women-owned businesses. For example, the single registry of

Authors	Year	Topic	Country	Key Findings
Pennsylvania Advisory Committee	2022	Barriers Facing Minority-and-Women-Owned Businesses in Pennsylvania	United States	Barriers are broadly categorized into lack of access to critical information and business networks, lack of access to capital, prejudicial (negative) treatment of contractors and vendors against women-led businesses, and unclear contract terms as the women-led startups are small scaled mostly hence they don't have enough skilled labor to understand technicalities. Other barriers include difficulty in obtaining a bond, difficulty entering the skilled trades, prevailing wage laws, project labor agreements in states like Philadelphia, irregularities in payment for work performed, interference from labor unions, contractors' false claims of women-owned businesses' solicitation, and utilization, face difficulty in obtaining business experience and burdensome regulatory requirements.
Sirmans	2004	Federal contracting with women-owned businesses: An analysis of existing challenges and potential opportunities	United States	Women-led businesses continue to experience significant institutional barriers and discrimination in the US. Challenges arise from acquisition reforms of the 1990s where women-based firms need to compete on four factors for federal contracts: 'new micro-purchase procedures', 'a new simplified acquisition threshold', 'a new preference for commercial items purchases', and 'the advent of best value determination'. Procurement reforms have also included the expansion of innovative and flexible contract vehicles which limit the opportunities for small-scale women-led firms. Barriers also arise from competing for the socioeconomic program

Discussion and Implications

The study's objective is to identify the barriers experienced by WOSBs in pursuing federal contracts. These barriers highlight limitations at the women-owned business and procuring entity levels. According to the results, gender discrimination and discriminatory socio-cultural norms and values are among the most common barriers. Previous literature reveals that gender discrimination is evident in awarding federal contracts (Harrison, 2017). Purchasing managers are more likely to prefer, subconsciously, male suppliers over female suppliers. It is based on the stereotype that men are more competent than women in business (Harrison, 2017). As Lee and Denslow (2004) identify, one of the major problems here is lack of respect/ acceptance against women-owned businesses that could create challenges in acquiring federal procurement contracts.

Other than gender bias, inherent weaknesses of WOSBs are significant barriers to participation in federal contracts, such as limited financial capacity (credit constraints), low financial literacy, limited business outreach, lack of networking, specialized business counseling and training, small size, risk aversion, and little market and management experience. It is further argued that women-owned businesses need a strong work ethic, ability to adapt, awareness of limitations, ability to seek guidance, and identifying a business niche. It means that there are professional and resource deficiencies among WOSBs (Johnson, 2015). Moreover, lack of awareness, information on the availability of federal contracting opportunities, and access to finance are among the women-owned business-level barriers found in the previous literature. The results show that WOSBs' inherent or internal characteristics are important in inhibiting federal procurement.

Another set of barriers is at the institutional or procuring entity level. For instance, the results reveal that eligibility requirements and government programs' legal language restrict WOSBs from earning federal contracts. In other words, organizational processes challenge women businesses in approaching government contracting (Atkinson & Penrod, 2022), such as the prequalification process that could be too onerous or complex (Chin, 2014). According to Harrison (2017), federal contracts have a tedious, cumbersome, and meticulous

process. Moreover, it is believed that WOSBs lack equal access to government contracts; this, again could be attributed to gender bias or discrimination.

Previous literature has also questioned the limited capabilities of government officials and procuring entities (Chin, 2014). The lack of accountability of the public procuring entities is also a major barrier (Johnson, 2015) since accountability of the government entities may ensure fairness and impartiality towards WOSBs. There are several other institutional barriers, such as inadequate legislations and policies, misfit tender design such as large contracts and complex tenders, contract bundling, excessive requirements, and poor practices by the government such as late payments (Krift & Wiel, 2020; McManus, 2012). Furthermore, the need for mechanisms to identify women-owned suppliers is one of the challenges faced by government reformers. Many governments do not have gender-disaggregated data about suppliers and bidders (OCP, 2020; Ruiz, 2020). Acquisition reforms and procurement policies also challenge women-led businesses to increase their participation in federal procurement. According to the United Nations Office of Project Service, a public procurement system performs many practices, including publishing procurement policies and plans, disclosing evaluation criteria, advertising tender notices, establishing dispute/complaint mechanisms, publishing supplier sanction lists, and implementing conflict of interest and financial disclosure requirements (UNOPS, 2012). However, the information provided by federal agencies needs to be more specific about particular projects. The WOSBs experience difficulty obtaining specific knowledge and understanding how the bidding process works. Consequently, they miss the chance to secure a government contract (McSwigan, 2022).

While comparing WOSBs operating in the US and other countries, one of the barriers prevalent in different countries and not in the US is the need for mechanisms to identify women-owned suppliers (Orser and Weeks, 2009, OCP, 2020). For instance, in the case of Latin America, it is observed that there needs to be more data on the WOSBs, so it is hard for government entities to determine the number of women participating in the procurement processes (Ruiz, 2013).

Barriers more significant in other parts of the world include awareness of the procurement process and inadequate legislation.

The above findings are significant for theoretical development and subsequent research. The results are also crucial for policy reforms related to federal procurement for WOSBs. Moreover, scholars and practitioners in the field of small business/entrepreneurship can gain insights into the barriers to public procurement at the women-owned business level and procurement entity (government) level. They can raise awareness among women entrepreneurs about the availability of federal contracting opportunities and suggest ways to overcome barriers, especially the inherent weaknesses of WOSBs. Business counseling/training is one of the ways to overcome challenges like understanding complex tender requirements, enhancing financial literacy, networking, and addressing professional and resource deficiencies. Women entrepreneurs can benefit from resources such as the Women's Business Center (WBC), an SBA national network of business centers that provides business education and counseling to women-owned and operated firms (Carranza, 2020). The WBC offers training in management, finance, and marketing. The SBA also offers webinar training and training through its local chapters regarding the federal contracting and WOSB certification process.

The SBA also offers a mentorship program, Mentor-Protégé Program (MPP), where small businesses can partner with experienced government contractors to obtain guidance on the federal contract bidding process and general business management assistance. The program is open to all companies, and proteges can be paired with two experienced mentors in various industries for up to six years from approval (SBA, n.d.). It would prove beneficial for the SBA to modify policy and require that WOSBs are paired with at least 1 WOSBs supplier/contractor mentor. This will enable WOSBs seeking support and guidance to receive better-targeted information and counsel.

The WOSBs could be connected to valuable networks or experienced bidders. There should be free access to tender documentation, and contract notices and WOSBs should be proactively invited to bid. Moreover, the procuring entity needs to standardize documents and procedures (make them simple) and allow

sufficient time to submit tenders. Further, the procuring body should request standard and necessary certificates, and limit financial qualification levels. Overall, government behavior should be women-owned and business-friendly, considering their barriers and limitations.

Based on the findings of the study, the author summarizes the following set of recommendations that could improve WOSBs' participation in federal contracts:

1. Improve education and outreach of WOSBs about procurement opportunities via training sessions, workshops, and online resources.
2. Increase access to funds and capital by providing loans, grants, and other financial assistance.
3. Address discrimination and bias by implementing inclusion and diversity policies in the procurement process.
4. Reduce complexity and streamline the procurement process through simplified documentation requirements.
5. Connect WOSBs with industry leaders and successful entrepreneurs to create networking opportunities
6. Allow WOSBs to participate in larger contracts by removing size restrictions for small businesses.
7. Increase the number of contracts set aside for WOSBs.
8. Offer technical support and assistance to help WOSBs meet the contract requirements and navigate the procurement process.

These recommendations could support WOSBs' growth and success by creating a more level playing field.

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