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Abstract

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Pennsylvania Hall on Gettysburg Campus at twilight by A. Logan

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"Kittenish Appearance:" Western Fashion in Meiji Japan – *Harry Zhang, College of William and Mary*

The Meiji Restoration of 1868 restored political power to the Japanese emperor, and ended the Tokugawa Shogunate government that lasted for over 200 years. The arrival of the Commadore Mathew Perry's gunboat on Japanese shores and the subsequent opening up of Japan to Western trade sounded the alarm of a new era. As a result, leaders of the Meiji Restoration constructed an imperial government that was radically different from the old as they sought to modernize and integrate Japan in a world of Western powers. During the Meiji Era (1868-1912), Japan embarked on a unique period of national development. On the one hand, Japan engaged in "full-package" Westernization, imitating the West in cultural, political, and social aspects. The scale of Westernization in Meiji Japan was unprecedented in nineteenth-century Asia. On the other hand, Japan had also begun to develop its own national identity that eventually led to its rejection of the West. In the Meiji era, the enthusiasm for Westernization led not only to a new form of government, but also to changes in the social lives of the Japanese people. According to Basil Hall Chamberlain, a British scholar in Japan at the time, "to have lived through the transition stage of modern Japan makes a man feel that preternaturally old; for here he is in modern times, with the air full of talks about bicycles and bacilli and 'spheres of influence,' yet he can himself distinctly remember the Middle Ages. . . Old things pass away between a night and a morning."[1] One of such social changes was the Japanese adaptation of Western fashion. The notion that Meiji-era Japanese, especially the elites, widely adopted

[1] Irokawa Daikichi, *The Culture of the Meiji Period,* ed. Marius B. Jansen (Princeton: Princeton University Press, 1985), 71.

Western clothing is enshrined in our popular modern memory via eccentric period images of Asian faces in Victorian clothing. The reality is more complicated. In Meiji Japan, Western fashion was widely understood as a symbol of modernity and civilization along with other things Western. However, the regular wearing of Western fashion was only adopted selectively into Japanese society both among the elites and the commoners.

Before we examine the degrees to which Western fashion was accepted in various groups of Japanese, it is helpful to first understand the reason Western fashion did not take over the Japanese wardrobe: Western fashion was not the only hanging fashion in Meiji Japan. Domestic fashion was not stagnant. During the Tokugawa period, the development of cotton production and indigo dyeing had already brought a sensitivity of colorful clothing to the masses. However, free use of colors had been forbidden in order to maintain feudal social status. The Meiji Restoration abolished privileges of the Samurai class, which included their exclusive rights to certain colors. As a result, "people's power of imagination regarding color developed to a dazzling degree."[2] The influx of new, colorful fabric into the domestic market had undoubtedly offered the Japanese people many new choices in fashion that are not Western, thus minimizing the shock of Western fashion.

Clara Whitney, the daughter of an American missionary and teacher came to Japan in 1875 at the age of fifteen, and left behind a diary about her experience in Meiji Japan. The paper will draw extensively from this valuable source. Clara wrote in February of 1880 about a conversation her mother had with Mrs. Katsu, the wife of the Japanese Navy Minister, on the topic of contemporary Japanese fashion. According to Mrs. Katsu, although Japanese clothes changed little in the cut, the color as always changing. In addition to color, length of sleeves, cuts

[2] Daikichi, *The Culture,* 32.

of the neck, and the wearing of hair, hair ornaments also changed frequently. “Sometimes the marumage [was] fashionable, and sometimes no one but coolies’ wives [would] wear it.” When Mrs. Katsu went to visit a certain Mrs. Tomita, whom she described as a “very stylish lady,” Mrs. Katsu attempted to warn her about a dangling hairpin. Mrs. Tomita then told her that it was the latest fashion “for hairpin to look gracefully and carelessly stuck in, as if about to fall.” In fact, domestic Japanese fashion changed so quickly that Mrs. Katsu “disliked the new styles for they soon become old.”[3] Among the rapidly-changing domestic fashion, Western fashion was merely another (and much stranger) choice among many. This may partially explain the Japanese people’s selective attitude towards Western fashion throughout the Meiji period, in addition to the high financial cost of Western clothing and the national identity associated with Japanese clothing.

Although Western fashion had only limited influence in Meiji Japan, there were still many incentives for some to adopt Western fashion. The most important reason being Western fashion’s symbolic value of “civilization and enlightenment.” This incentive was the most obvious in uniform designs for government agencies. Desiring to demonstrate the modernity of the new Japan, government workers deliberately showed off Western fashion to foreigners as a symbol of Japan’s civilizing process. In 1873, the Meiji emperor and the empress themselves appeared in official portraits dressed in Western clothing. In one of such photographs, the emperor appeared in a military coat with epaulettes, trousers, and a Western haircut, while the empress appears a low-neck line evening gown with a pair of long white gloves. The army and the police forces began adopting Western uniform as well. In an 1877 engraving that appeared in the *Illustrated London News* (fig 1), Japanese policemen armed with clubs were wearing long

[3] Clara A.N. Whitney, *Clara’s Diary: An American Girl in Meiji Japan,* ed. M. William Steele and Tamiko Ichimata (New York: Kodansha International Ltd, 1979), 9, 302, 340.

coats, leather, belts and shakos – equipment and dress not so different from that of a nineteenth-century Western policeman. However, their clubs were in the shape of Japanese swords and were carried in such style.[4]

Among the citizens, "a man with a short haircut, gold watch and chain, carrying a black bat umbrella, and especially if seen in one of the new restaurants serving beef, would truly be a man of civilization and enlightenment."[5] In fact, Western fashion was so intertwined with broader social changes that a Japanese man returning from San Francisco in 1863 was advised not to carry his umbrella in order to avoid assassination by the opponents of Westernization[6] Since opening of Japan in 1858, Japanese traditionalists and nationalists had perceived the ongoing reforms as a sell-out to the West, and sometimes took out their frustration on the external manifestation of Westernization. Narsume Sokeki, the first Japanese lecturer in English at Tokyo Imperial university in 1903 noticed a decline in English proficiency at this time, but it was a different story during Sokeki's own days as a student. He recalls men who "would show off by dangling gold watches, wearing Western dress, growing beards, and interjecting English phrases when speaking ordinary Japanese." In 1887, Foreign Minister Inoue Kaoru gave balls and garden parties to foreign diplomats in the Rokumeikan, "the center for Western manners and customs."[7] Despite the Japanese showing off some Western fashion as a symbol of civilization, the real influence of Western fashion was much more limited. Most Western elements adopted by the Japanese were only convenient fragments of Western fashion, such as watches and

[4] Harold Bolitho, *Meiji Japan,* (New York: Cambridge University Press, 1977), 29, 41.
[5] Whitney, *Clara's Diary,* 12.
[6] Bolitho, *Meiji Japan,* 41.
[7] Sukehiro Hirakawa, *Japan's Love-Hate Relationship with the West,* (Kent: Global Oriental LTD, 2005), 117, 120, 127.

umbrellas. Even in the case of fully-uniformed policemen, who had little choice about their clothing, their clubs still took the shape of a Japanese sword.

It is a known fact that diplomats, government officials, scholars, and others who interact regularly with foreigners did wear full suits of Western clothing. However, even elites did not accept Western fashion as much as we might have imagined them to. They only wore Western suits ceremonially in most occasions, and had little personal fancies in Western suits. In the personal life of the Japanese elites, or sometimes even in their public life, they wore Western fashion selectively. When the elites fully clothed themselves in Western suits, they often wore them so improperly that it gave glaring suggestions to their personal unacquaintance with Western fashion. These improprieties often go unnoticed to modern eyes, because nineteenth century Western fashion is archaic to us, and might lead us to the mistaken conclusion that Meiji Japanese elites were masters of Western fashion. Clara Whitney provides valuable insights into the inexperience of Japanese elites with Western fashion.

In her diary, Clara Whitney notes the occasions where Japanese elites wore Western clothing and pokes fun at them when she finds their effort laughable. Clara's diary can confirm that Japanese elites mostly employed Western fashion ceremonially. For example, Arisuke, the nephew of the Japanese prime minister, wore Western clothes to Clara's fifteenth birthday retreat. At the opening ceremony of the Imperial Academy of Music, to which Clara's family was invited, Clara noticed "the hall was crowded with gentlemen in European dress which gave them a very learned appearance and which made me quite shy." Even in ceremonial occasions, the Japanese did not wear Western fashion exclusively, especially when the ceremony was not a planned exhibitions of Japan's civilizing achievement targeting important foreign audiences. Clara was invited by Iwaka Tomomi, one of the chief advisors of the Meiji emperor, to witness a

balloon ascension put on by the Japanese navy. Here, all of the officials in Iwaka's party were dressed in Japanese hakama.[8]

When Clara saw Japanese elites wearing Western fashion improperly, she was not hesitant to make commentary in her diary. At the 1875 Japanese National Day parade, Clara notes government officials in broadcloth pants and swallowed-tailed coats and beaver fur hats looking "comical enough. . . the space between the vest and pants was often too great and as they seldom wear suspenders their snowy shirts often protruded. Some had no collars or cuffs, which deficiency is more remarkable with ballroom costumes."[9] A similar sight reappeared at the closing ceremony of the National Exhibition in 1877. "The petty Japanese officials looked so funny in their 'court dress.' It consisted of a swallow-tailed coat, having in front a great space between the nether garments, from want of suspenders, which is usually supplied by an immense Japanese girdle of white or blue crepe, some ten feet long, wound round and round the body." The stovepipe hats also seem too large and heavy to the uncomfortable wearer. Clara's diary also tells us the reason for such ill-fitting clothes: the suits and hats did not belong to the courtiers, but were rented to them at a cost, "and it [was] sometimes unfortunately the case that a little man [got] a large suit or a tall man a small suit."[10] The rental suits indicate that Western fashion was mostly utilitarian and not a personal fashion choice even among government officials. Not only were the Japanese officials inexperienced in the wearing of Western suits, they also had a special dislike for Western suspenders. Fukuzawa Yukichi, the reformer famous for introducing the idea of "Leaving Asia," would have agreed with Clara's observations. In an 1867 publication titled "Western clothing, food, and homes," Fukuzawa himself complains about suspenders for being

[8] Whitney, *Clara's Diary,* 30, 213, 137.
[9] [9] Whitney, *Clara's Diary,* 62.
[10] Whitney, *Clara's Diary* ,153.

"clumsy and troublesome."[11] More evidence for selective adaptations of Western fashion by Japanese elites could be seen in photographs as well. A 1908 photo of managers in front of a mineshaft in Waga-gun, Iwasaki-mura (fig 2) shows several of them wearing Japanese sandals with their Western suits.[12]

The private lives of Japanese elites suggest even more about their unacquaintance with Western fashion. Mr. Tsuda, a Christian convert and scholar who accompanied the first Japanese embassy to the U.S. in 1860, appeared at a picnic in 1878 "flushed and perspiring," dressed in Western clothes. Unfortunately, Clara was there to observe and wrote down a detailed description of his attempt at civilization: "His ankles several inches out of his trousers, his diaphragm several inches below his waistcoat, showing to advantage an amount of linen quite astonishing. His collar, not being fastened properly, had slipped around to the side, and his cravat thus being tied under his left ear gave him quite a kittenish appearance" In Clara's opinion, the Japanese looked roguish and silly in their ill-attempts at Western fashion, but more graceful in traditional Japanese garments. While dining at Mr. Mori's new mansion in that same year, Fukuzawa Yukichi wore a Japanese hakama, which makes him "far more dignified and at ease. . . than did those loose-jointed, heated gentlemen in ill-fitting European dress."[13]

Among the common Japanese citizens, acceptance of Western fashion was more selective than among the elites. There is currently little doubt to this statement. However, it is worthy to note just how little Western fashion was incorporated into the everyday life of Meiji Japan. The common Japanese man often possessed only three elements of Western fashion: haircut, hat, and

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[11] Yukichi Fukuzawa, "Seiyô ishokujû (Western clothing, food, and homes, 1867) by Fukuzawa Yukichi," University of Delaware, Accessed April 26, 2021.
[12] "東宮行啓紀念写真帖," National Diet Library Digital Collections, 2011, https://dl.ndl.go.jp/info:ndljp/pid/780856/90?contentNo=90&itemId=info%3Andljp%2Fpid%2F780856&lang=en.
[13] Whitney, *Clara's Diary,* 240, 270.

umbrella. These three elements have on thing in common: they are relatively easy to acquire. More importantly, Meiji-era Japanese men incorporated these selective items of Western fashion into their Japanese attire instead of the other way around.

Western haircuts were almost universal in the Meiji period. It is the easiest trend to catch – a trip to the barber would suffice. Western haircut was so prevalent in Meiji Japan that Fukuzawa Yukichi mentions it in his book *An Outline of Civilization.* "Can we say that the current Western styles seen more and more in daily Japanese life are a proof of civilization? Can we call those men with Western haircuts whom we meet on the street civilized persons?" Fukuzawa is not specifically discussing fashion here, but is rather using Western haircut as an example of the "exterior spirit of civilization" as opposed to the "interior spirit."[14] Nevertheless, we can see through his writings that Western haircut was the most popular element of Western fashion. It is also worth noting that not all Western haircuts were done out of the citizens' personal desire. In the 1870s, the Japanese government forced all citizens to adopt some type of Western haircut by prohibiting the topknot. As a result, traditional Japanese barbers had to either give Western haircut or be put out of business.[15]

Although men's Western haircut was universal in Meiji Japan, people still adapted to it with different levels of enthusiasm. This can be seen through different conditions people kept their hair in. Those that took pride in their new token of civilization might oil their hair and keep it neatly parted, while others left it mussed. Some, perhaps having no personal desire to adopt Western hairstyle, simply kept the base of old topknots. Contemporary photos taken by Globetrotters, a foreign photographer in Meiji Japan, show the diverse conditions of Western

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[14] Yukichi Fukuzawa, *An Outline of a Theory of Civilization,* Trans. David A. Dilworth and G Cameron Hurst III, (New York: Columbia University Press, 2008), 21.
[15] Bolitho, *Meiji, Japan,* 28.

hairstyles among Japanese. In a photograph titled "Boys Playing a Game," (fig 3) six boys sport a variety of "Western hairstyles." Some boys have their hair neatly parted in the middle. Other boys simply cut their hair short in accordance with the new law and left it to its own accord.[16] In another photo titled "Farmers Threshing Rice," (fig 4) a farmer's shaven hair thickens in the middle – an obvious remnant of a former topknot.[17] In "Farmer Pounding Rice," (fig 5) the subject's short hair has become so out of shape that it could only be called Western as far as length concerned.[18] Clara Whitney had an encounter with a common Japanese man on her fifteenth birthday. The stranger came up to her in Western haircut and Japanese clothes, bowed and greeted her family in English, and presented Clara with a bouquet of flowers while saying "This, I give to you, lady." Clara was quite flattered by this presentation and wrote in her diary, "such is the beau ideal of my fifteenth birthday! Was he not handsome?"[19] The man who greeted Clara in broken English probably cared more about his Western haircut than the rice farmer who simply cut off the topknot in accordance with the law.

In addition to haircuts, Western hats were also popular in Meiji Japan. Just as a haircut, a hat sits on the head and leaves the rest of the Japanese attire undisturbed, making it another ideal choice for selective adaptation. Similar to Western haircuts, Western hats were usually thrust awkwardly upon an entirely Japanese outfit. In a photo titled "Funeral Procession," (fig 6) an astonishing number and variety of Western hats appears: toppers, bowlers, slouch hats, and straw hats. At the same time, there was only one man who has a Western suit to go with his hat.[20] In

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[16] "Boys Playing a Game," Globetrotters' Japan: People, MIT Visualizing Culture, 2008, https://visualizingcultures.mit.edu/gt_japan_people/ga1_visnav14.html.
[17] "Farmer Threshing Rice," Globetrotters' Japan: People, MIT Visualizing Culture, 2008, https://visualizingcultures.mit.edu/gt_japan_people/ga1_visnav03.html.
[18] "Farmer Pounding Rice," Globetrotters' Japan: People, MIT Visualizing Culture, 2008, https://visualizingcultures.mit.edu/gt_japan_people/ga1_visnav03.html.
[19] Whitney, *Clara's Diary,* 34.
[20] "Funeral Procession," Globetrotters' Japan: People, MIT Visualizing Culture, 2008, https://visualizingcultures.mit.edu/gt_japan_people/ga1_visnav11.html.

another street scene taken in 1906 Kobe (fig 7), three men in Japanese clothes gather around the booth of a rope merchant, two of them in slouch hats and one in a flat cap.[21] The trend of out-of-place Western hats accompanying Japanese clothes certainly did not escape the scolding pen of fifteenth-year-old Clara Whitney. A Japanese preacher, whom Clara declares "the handsomest I have seen among all the black eyes in Japan," had his charm immediately distinguished when he put on an "unsightly foreign straw hat."[22]

Thus far, the discussion on the selective adaptation of Western fashion mostly concerns men. This is because Western fashion was even less accepted among women of Meiji Japan. Nowhere in Globetrotters photographs could a Japanese woman be seen with a trace of Western fashion. Even at public ceremonies, where elite Japanese men and women appear in front of foreigners, it was common for women to wear Japanese attire. At the 1879 welcoming ceremony for the former US president, Ulysses S. Grant, only five Japanese ladies wore Western dress. The majority being "handsomely dressed. . . in the elaborate court costume."[23] Japanese women sometimes appeared in Western clothing while taking still portraits. In one of such portraits (fig 8), two Japanese women were posed side by side. One in Japanese clothes, and the other in an ill-fitted Western bustle dress. The woman in the Western dress also wears a tattered-looking straw hat – a very irregular appearance in Western portraits at the time, in which people tend to appear in their best clothes.[24] It is very likely that the woman pictured did not own these articles of clothing, and was simply playing dress-up in the photo studio.

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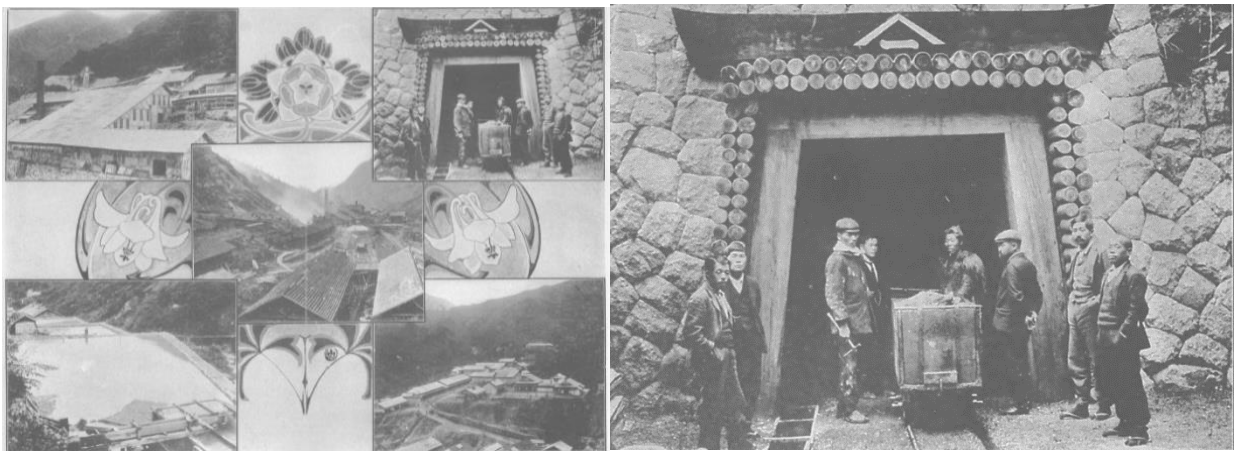
[21] "New Year Celebrations 5," Old Photos of Japan, MeijiShowa, 2007, https://www.oldphotosjapan.com/photos/678/new-year-celebrations-5.
[22] Whitney, *Clara's Diary,* 46.
[23] Whitney, *Clara's Diary,* 256.
[24] Meiji Japanese Carte de Visite photo, in private collection of Harry Zhang.

Fukuzawa Yukichi describes Japan's encounter with the West in the nineteenth century as "a blazing brand [having] suddenly been thrust into ice-cold water" that resulted in Japan's dissatisfaction with its own civilization and enthusiasm for Western civilization.[25] Western fashion was one of the many changes that entered Japan under such dissatisfaction and enthusiasm. Hence, it is commonly believed that Meiji-era Japanese became very fond of Western fashion. The reality is that both the elites and the commoners adopted Western fashion very selectively. Although Meiji Japan was the most Westernized country in Asia at the time, it still retained many elements of Japanese identity. The clashing of foreign and domestic cultures also led to efforts to define foreign and Japanese objects, and contributed indirectly to the consolidation of a modern Japanese identity.

[25] Fukuzawa, *An Outline,* 2.

Appendix

1. 1877 Japanese police in Western uniforms (Harold Bolitho, *Meiji Japan*).



2. Detail, “東宮行啓紀念写真帖.” Mine managers in 1908 (National Diet Library Digital Collections).

3. “Boys Playing a Game” (Globetrotters’ Japan: People, MIT Visualizing Culture).

4. “Farmers Threshing Rice” (Globetrotters’ Japan: People, MIT Visualizing Culture).

5. “Farmer Pounding Rice” (Globetrotters’ Japan: People, MIT Visualizing Culture).

6. Detail, “Funeral Procession” (Globetrotters’ Japan: People, MIT Visualizing Culture).

7. “New Year Celebrations,” Kobe, 1906 (Old Photos of Japan, MeijiShowa).

8. Carte de Visite of two Japanese women, ca. 1870 (Harry Zhang’s Collection).

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"Farmer Pounding Rice," Globetrotters' Japan: People, MIT Visualizing Culture, 2008. https://visualizingcultures.mit.edu/gt_japan_people/ga1_visnav03.html.

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"Funeral Procession," Globetrotters' Japan: People, MIT Visualizing Culture, 2008. https://visualizingcultures.mit.edu/gt_japan_people/ga1_visnav11.html.

Meiji Japanese Carte de Visite Photo. In private collection of Harry Zhang.

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"A Freedom Rider Before Freedom Rides:" Jackie Robinson Beyond Baseball – *Amy E. Cantrell, Gettysburg College*

Jack "Jackie" Robinson is widely heralded as the pioneer of integration in professional sports. His ten-year career with the Brooklyn Dodgers between 1947 and 1957 marked a paradigm shift towards increased inclusivity not only in America's favorite pastime, but also throughout the nation's social, political, and economic framework. Competing at a time of heightened racial prejudice and discrimination, Robinson faced hostility on all fronts, yet his perseverance, drive, and resilience transformed the sporting world for a national audience. Beyond his baseball career, Robinson played a vital role in shaping the narrative of the Civil Rights Movement, a fact often overlooked in recounts of his life. By utilizing his newfound platform in a campaign for integration and equality, Jackie Robinson became a paramount figure for African American civil rights progression. Unfortunately, the tendency to focus solely on the story of his baseball career has undermined these contributions. Adopting a wider scope, the full weight of his commitment to civil rights, both on and off the baseball diamond, showcases a man who dedicated the entirety of his life towards combatting the racial disparities which have defined American institutions and society. As Martin Luther King Jr. so aptly described him in 1962, Robinson was a "sit-inner before the sit-ins, a freedom rider before freedom rides."[1]

Prior to his baseball career, Robinson had already made strides to challenge dispositions of bigotry. In 1939, Robinson began his collegiate career at University of California, Los Angeles, enrolling at a time when "the student population was less than 1% African American and there

[1] Martin Luther King, "Hall of Fame," *New York Amsterdam News,* August 4, 1962.

was not a single black faculty member."[2] To this day, he remains the only athlete to letter in four sports in the college's history – baseball, football, basketball, and track.[3] Despite Jackie Robinson's collegiate stardom, propelled by his competitive spirit, after a brief two years he left to join the army. He enlisted in April of 1942, at 25 years of age, and was assigned to a segregated unit in Fort Riley, Kansas where over the next two years he would rise to the rank of second lieutenant. However, in the summer of 1944, Robinson would receive a court-martial after refusing to move to back of a military bus in Camp Hood, Texas. The ordeal occurred as Robinson was travelling back to base following a social gathering at a segregated officers' club. Robinson's refusal directly challenged a racialized standard of the Jim Crow south, one predicated on an aggressive resistance to social integration efforts following the end of the Civil War in 1865. Although the military camp, as other federal properties, did not legally enforce such discriminatory regulations, these social constructs persisted in accordance with the norms many white soldiers operated within. Throughout the ensuing investigation, prejudices flared as several of the white witnesses commented on their disapproval of Robinson's actions and even his high-ranking position in the army. On July 17th, he was charged with six violations of the Articles of War, one of which included drunkenness despite the fact that Robinson did not drink.[4] Robinson would later commend his lawyer's closing remarks and assessment that the trial reflected "not a case involving any violation of the Articles of War, or even of military tradition, but simply a situation in which a few individuals sought to vent their bigotry on a Negro they considered 'uppity' because he had the audacity to exercise rights that belonged to him as an American and a Soldier." Deliberations

[2] "Jackie Robinson, 1919-1972: A Century of Impact," Jackie Robinson (University of California, Los Angeles, January 24, 2019), https://newsletter.alumni.ucla.edu/connect/2019/feb/jackie/default.htm.
[3] Ibid.
[4] Martin Stezano, "Jackie Robinson's Battles for Equality on and Off the Baseball Field," History (A&E Television Networks, April 13, 2018), https://www.history.com/news/jackie-robinson-color-barrier-baseball.

of an all-white jury would eventually acquit Robinson of all charges. Because of this, he would request retirement from the Army and receive an honorary discharge several months later.[5] The next year would mark Robinson's first meeting with the Dodgers' General Manager Branch Rickey and the beginning of his future as a national icon.

During this monumental meeting, Branch Rickey is famously reported to have stressed his need for "a man with the guts enough not to fight back."[6] Rickey's request for Robinson to "turn the other cheek" underlined the struggle Robinson would go on to face, one fraught with resistance from his competition, fans and even his own teammates. Rising above this struggle, he would proceed to win the first-ever baseball Rookie of the Year award in 1947 and act as a key player in six World Series throughout his time in baseball, including the triumphant 1955 series against the New York Yankees.[7] The remainder of his career would be marked by versatility in play and strong athletic prowess. However, this ten-year span, though undoubtedly historic, fails to enshrine the entirety of his life's dedication towards furthering civil equality, even prior to the rise of the popular movement during the 1960s.

Championed by Branch Rickey as being fiercely resilient to bigotry, Robinson has historically often been depicted, inadvertently or not, as a conciliatory figure. Resilient to the struggles that came from being the first African American player to break the long withstanding color-line in professional baseball. However, prior to, during, and after his baseball career, Robinson operated along lines of fierce and persistent confrontation to racial prejudices and segregation. Following his retirement from Major League Baseball, Robinson used his position as

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[5] Adam Kama, "The Court Martial of Jackie Robinson," *The Army Lawyer*, no. 1 (2020): pp. 68-82, https://doi.org/http://ezpro.cc.gettysburg.edu:2048/login?url=https://www.proquest.com/trade-journals/court-martial-jackie-robinson/docview/2396316754/se-2?accountid=2694.
[6] Norman O Unger, "Jackie Robinson Dies at 53," *Chicago Daily Defender*, October 25, 1972, p. 32.
[7] Jessie Kratz, "Jackie Robinson's 100th," A Blog of the U.S. National Archives (National Archives and Records Administration, February 27, 2019), https://prologue.blogs.archives.gov/2019/02/27/jackie-robinsons-100th/.

a celebrated national icon as well as his newly acquired role as Vice-President of New York's Chock-Full O-Nuts restaurant chain to push an agenda of civil liberty and equality.

Often collaborating with major accredited organizations such as the National Association for the Advancement of Colored People (NAACP), Robinson assisted in organizing boycotts, delivered speeches, and collaborated on initiatives to further equal opportunity for African Americans. On one such occasion, Robinson would be photographed picketing alongside protestors in Cleveland, Ohio, during a protest of segregated lunch counters. The event was organized by the NAACP and included strong student involvement.[8] The boycott of the discriminatory practices in restaurants and shops reflected grassroots approaches towards countering segregation and prejudices, a tactic Robinson often advocated for. In 1956, Robinson's efforts were lauded as the organization awarded him the esteemed Spingarn Medal. Citing his role as a symbol of hope and progress for racial minorities, specifically for the youth populations, the NAACP noted that he "has been keenly aware of his responsibilities as a citizen of a democracy."[9]

[8] Eric Moskowitz, "On Jackie Robinson Day, 100 Photos of the Icon on the Field and with Family," The New York Times (The New York Times, January 31, 2019), https://www.nytimes.com/2019/01/31/sports/jackie-robinson-photos-100th-birthday.html.

[9] "Library of Congress," *Library of Congress* (United States Legislative Information, December 8, 1956), https://www.loc.gov/collections/jackie-robinson-baseball/articles-and-essays/baseball-the-color-line-and-jackie-robinson/citation-for-jackie-robinson/.

Jackie Robinson alongside picketers in Cleveland, Ohio, on April 23rd, 1960. Sponsored by the NAACP, the picket was organized in protest of discrimination at lunch counters and was a part of a larger, nationwide boycott.

Photo Source: Associated Press

September of 1957 marked a crucial year in path towards accomplishing the Civil Rights Movement's principal goal of integrating and equalizing the American public school system, one met with combative resistance in the Jim Crow south. Earlier that decade, in 1954, the United States Supreme Court ruled in *Brown vs. Topeka Board of Education* that segregation in schools was unconstitutional, thus launching the tumultuous process of integration. Tensions reached a pinnacle when Arkansas Governor Orval Faubus instigated the Little Rock Crisis after calling the state's national guard forces to block school entry of nine African American students at Central

High School.[10] Although President Eisenhower did respond, sending the 101st Airborne Division to uphold the court's decision, Robinson quickly voiced his frustration with what he deemed a weak response. Specifically, Robinson criticized Eisenhower's statement that African Americans should have "patience," arguing that the government needed to adopt a stronger, more aggressive stance to ensure "the freedoms we [African Americans] are entitled to under the Constitution." He went on to declare that "we want to enjoy now the rights that we feel we are entitled to as Americans. This we cannot do unless we pursue aggressively goals which all other Americans achieved over 150 years ago."[11]

Throughout the 1960s, Robinson also employed his regular column in the newspaper, *The New Amsterdam News*, to advance arguments not only for integration in sports, but also issues relating to a wider narrative of African American civil rights. Often, "Robinson came to take almost militant stands, challenging oppression by calling for boycotts… years before such strategies were adopted by a younger generation."[12] His articles affirmed support and solidarity along a wide array of athletic, political, and social issues ranging from Muhammad Ali's religious-based refusal to pledge military service to commentary regarding presidential elections. Although a devout supporter of the Republican party, Robinson would eventually become a stark critic of Richard Nixon.

Robinson had long advocated for a more racially diverse GOP, arguing throughout much of the 1950s that it would be beneficial for racial minorities to avoid becoming confined to one singular political party. Although it was a shock when Robinson initially committed to Nixon's

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[10] Gerald D Jaynes, "Little Rock Nine," Encyclopædia Britannica (Encyclopædia Britannica, inc., November 8, 2021), https://www.britannica.com/topic/Little-Rock-Nine.
[11] Jackie Robinson to President Eisenhower, May 13, 1958, in *Civil Rights: The Little Rock School Integration Crisis*, https://catalog.archives.gov/id/186627?q=jackie%20robinson#.VgWe6FhEAd8.link.
[12] Raymond McCaffrey, "From Baseball Icon to Crusading Columnist: How Jackie Robinson Used His Column in the African-American Press to Continue His Fight for Civil Rights in Sports," *Journalism History* 46, no. 3 (2020): pp. 185-207, https://doi.org/10.1080/00947679.2020.1757345.

campaign, he cited Nixon's progressive attitudes towards race-related issues as a determining factor in his decision. Additionally, Robinson expressed his disdain of the opposing candidate, Senator John F. Kennedy's "open courtship of Southern governors."[13] Kennedy, who recognized the value of Robinson as a galvanizer of African American voters, would send a letter to him in July of 1960, four months prior to the elections. In the letter, Kennedy hoped to reiterate his commitment to the civil rights issues Robinson so valued whilst also addressing his expressed concerns over Kennedy's relationship with Southern politicians. Kennedy specifically noted that although he had engaged in dialogue with Governors from every state, a stipulation of his role in politics, "that does not imply my agreement with them or their agreement with me on particular issues." Going on to reassert his allegiance in ending all discrimination ranging from housing to the administration of justice, Kennedy commended peaceful protestors as examples of a uniquely American tradition of standing up for one's rights. He also emphasized his appreciation for Robinson's devotion to "fulfilling the American promise of equal opportunity for all," something guaranteed in both the Declaration of Independence and the United States Constitution. Ending the letter by reaffirming what he hoped would finally be the shift in Robinson's perspective needed to sway voters, Kennedy declared his unwavering commitment to an issue that would define not only the upcoming elections but also American political discord throughout the remainder of the century.[14]

Soon thereafter, Robinson would become an outspoken critic of the Nixon-Lodge campaign despite his initial support. His reasoning for the switch stemmed primarily from Nixon's

[13] Michael G Long, "Jackie Robinson Fought for a Racially Inclusive GOP," Chicago Tribune (Chicago Tribune, May 31, 2019), https://www.chicagotribune.com/opinion/commentary/ct-perspec-jackie-robinson-100-politics-mlk-nixon-0131-20190130-story.html.
[14] John F. Kennedy to Jackie Robinson, July 1, 1960.

omission of Harlem during his campaign as well as his lackluster response to Reverend King's imprisonment, Nixon offering "no comment." Following Kennedy's electoral victory, Robinson was also quoted saying that he was surprised with President Kennedy's attention to civil rights issues, noting that he was "doing a really good job in almost everything including the field where I thought he might not—civil rights."[15] Despite this shift, years later, in 1966, he would be hired as the Special Assistant for Community Affairs for Governor Nelson Rockefeller of New York, solidifying his continued commitment to the Republican Party, although it should be noted that Rockefeller was perceived as more liberal and progressive than other party members of the era. In reference to his political ambitions, Robinson would announce his primary goal as disseminating Rockefeller's record and attention to minority groups, something he hoped would improve his popularity amongst the African American minority. This assignment would further allow him to continue advocating for his championed idea of a racially inclusive Republican party.[16]

Even delving into international debates, Robinson offered commentary on the proposed boycott of the 1968 Summer Olympics in Mexico City, Mexico. Although the boycott was ultimately cancelled, those Olympic games marked a watershed moment in international history and continue to stand as a consequential symbol of black power movements. In reference to the most vocal athletes, track stars Tommie Smith and John Carlos, Robinson stated, "I do support the individuals who decided to make the sacrifice by giving up the chance to win an Olympics medal. I respect their courage. We need to understand the reason and frustration behind these protests."[17] His emphasis on the reasoning behind the boycott reflected popular opinion of many African American athletes and activists at the time and was emblematic of growing frustration with their

[15] "Nixon Is Criticized by Jackie Robinson," *The New York Times*, March 10, 1961, p. 15.
[16] "Jackie Robinson Is Appointed Aide to Rockefeller," *The New York Times*, February 8, 1966, p. 31.
[17] Arnold Rampersad, *Jackie Robinson: A Biography* (Ballantine Books, 1998), 422.

long-held struggle for equality both on and off playing fields. Both Dr. King and Robinson often criticized how America championed African American athletic greats yet welcomed them home to the same racial prejudices and hostility once competition ceased.[18] Beyond this vocalized support, Robinson also signed onto an initial official statement facilitated by the American Committee on Africa alongside professional basketball player K.C. Jones and other African American athletes, both professional and collegiate. The statement, denoting a more globally centered reasoning behind the boycott, condemned the International Olympics Committee's restoration of South Africa's membership in the games. During a period of highly contested white minority rule, the signatories emphasized that should "the IOC accept South African tokenism, it will appear that the international sportsmen condone South Africa's apartheid policy."[19] This was a particularly monumental act given its direct confrontation of enduring and deeply seated racial norms at an international level.

[18] Dave Zirin, "The Explosive 1968 Olympics," *International Socialist Review*, no. 61 (2008), https://doi.org/https://isreview.org/issue/61/explosive-1968-olympics/index.html.
[19] "African Activist Archives," *African Activist Archives* (Michigan State University Libraries Special Collections, February 8, 1968), https://africanactivist.msu.edu/document_metadata.php?objectid=210-808-10983.

Jackie Robinson and Martin Luther King Jr. discussing the integration of the University of Mississippi prior to a press conference in New York. September 19th, 1962.

Photograph Source: Bettmann Archive, Getty Images

Jackie Robinson's relationship with celebrated leader Reverend Martin Luther King Jr. was also symbolic of his commanding position within a wider frame of civil rights beyond athletics. The two received honorary Doctor of Law degrees from Howard University in 1957, Robinson becoming Dr. John Roosevelt Robinson to the academic world. He was the first professional athlete to have been honored in such a way by the esteemed university.[20] Later, during the 1962 annual "Freedom Dinner," hosted by the Southern Christian Leadership Council in Birmingham, Alabama, Robinson would deliver a speech on King. Praising the activist for his actions, Robinson

[20] "Jackie Robinson Now Dr. John," *The New York Times*, June 8, 1957, p. 9.

stated, “I think every Negro and fair-minded white person ought to throw their arms around him, give him all the backing and support possible and acclaim him for what he is – a great leader of the Twentieth century.”[21] Robinson and his son would later attend King’s infamous “I Have a Dream” speech in August of 1963 and continue to cross paths with King, their friendship and mutual respect evolving as the movement accelerated. Although they did disagree on certain issues, most notably their opposing stances on the Vietnam War – which Dr. King was vehemently opposed to and Robinson perceived as a patriotic necessity, the two often worked in cohesion to mobilize and inspire a nation. Prior to Dr. King’s untimely death in 1968, he would be quoted saying “Jackie Robinson made my success possible. Without him, I would never have been able to do what I did.”[22]

Following King’s arrest and subsequent jailing in 1963, the catalyst for his infamous “Letter from Birmingham Jail,” Robinson and his wife, Rachel, would host a jazz concert to raise funds for King’s organization, the Southern Christian Leadership Conference (SCLC). The “Afternoon of Jazz,” held at Robinson’s home in Stamford, Connecticut, directly responded to calls for bail money by Reverend King’s executive assistant, Walker Tee Walker. The Birmingham campaign had left hundreds imprisoned and abused, including children. Utilizing his connections and influence, Robinson organized a lineup of musicians ranging from Dizzy Gillespie to Marian Logan, all of whom agreed to perform pro bono. The event would go on to raise over $14,000. Two months later, spurred by the success of the first, a second such event would bring in an additional $30,000 for the SCLC and the NAACP, King then free and in attendance. The

[21] David Prince, “MLK, Jackie Robinson, and US,” Prince on Preaching (David Prince, January 16, 2017), https://www.davidprince.com/2017/01/16/mlk-jackie-robinson-us/.
[22] Vincent Davis, “The Memory and Legacy of Jackie Robinson Lives on, in Perpetuity,” New York Amsterdam News (Amsterdam News, April 18, 2019), https://amsterdamnews.com/news/2019/04/18/memory-and-legacy-jackie-robinson-lives-perpetuity/.

Robinsons would continue to host these "Afternoons of Jazz" several times in the following years, primarily in response to major socio-political events. In 1964, they would collect approximately $30,000, this time directed towards the construction of a community center in honor of the young activists James Chaney, Andrew Goodman, and Michael Schwerner, who were brutally murdered in Philadelphia that summer. The murders, which resonated throughout American minority communities, were connected to the activists' involvement in the Freedom Summer, a campaign aimed at fostering greater African American voter turnout in the south. Several years later, in 1971, the devastating death of their son, Jackie Jr., would prompt the family to host yet again, the profits benefiting a drug rehabilitation center in his honor. At the time of his death, he was working as assistant regional director for Daytop, Inc., a drug rehabilitation center based in Connecticut. Jackie Jr. had a tumultuous history with drugs, having become addicted after returning from military service in Vietnam, one that inspired the Robinsons' continual involvement in drug awareness and rehabilitation programs.[23] Beyond this activism, the "Afternoons of Jazz" events continue to this day, now facilitated by Rachel Robinson. Currently all proceeds are administered by the Jackie Robinson Foundation, distributed in scholarships to minority students in needs.[24]

[23] "Jack Robinson Jr. Dies in Car Crash," *The New York Times*, June 18, 1971, p. 22.
[24] Michael G Long, "Music to His Ears: How Jackie Robinson's Love of Jazz Helped Civil Rights Movement," The Undefeated (ESP Enterprises, April 15, 2020), https://theundefeated.com/features/how-jackie-robinsons-love-of-jazz-helped-civil-rights-movement/.

An "Afternoon of Jazz" hosted at the Robinson's home in Stamford, Connecticut on September 8th, 1963. The event was organized to raise much-needed funds for Martin Luther King Jr.'s organization, The Southern Christian Leadership Conference (SCLC). Photograph Credit: Associated Press

Robinson was also able to use his prestige to foster communications with the government at a more personal level. Throughout his life, he sent a series of letters and telegrams to America's White House, addressing significant events and encouraging more aggressive action from various presidencies in furthering social justice initiatives. In 1957, he telegrammed President Dwight D. Eisenhower urging for a stronger and more active Civil Rights Act, voicing the opinion of the "many true Americans who insist on equal rights for all."[25] In 1965, responding to the violent opposition which met the peaceful marchers in Selma, Alabama, Robinson sent a telegram to President Lyndon B. Johnson. Jarred by the assault on the protestors – those including women,

[25] Jackie Robinson to E. Frederick Morrow, telegram, August 13, 1957, *Jackie Robinson: Civil Rights Advocate*, The U.S. National Archives and Records Administration.

children, and clergy members – many of whom were killed or left with severe injuries, Robinson yet again vocalized the shock and frustration of an African American collective. His statement articulated the importance that "you [President Johnson] take immediate action in Alabama. One more day of savage treatment by legalized hatchet men could lead to open warfare by aroused negroes. America cannot afford this."[26] The warning seemingly foreshadowed the rise of more combative organizations, such as the Black Panther Party, the following year.

Years later, only six months prior to his death, Robinson would pen a letter to the Deputy Special Assistant to the President, Roland Elliott. The letter would signal a growing shift in popular opinion during the time, one indicative of growing African American frustration with passive governmental responses, a trend which prompted a transfer away from King's nonviolent methodology. Robinson warned, "Black America has asked so little, but if you can't see the anger that comes from rejection, you are treading a dangerous course. We older blacks, unfortunately, were willing to wait. Today's young blacks are ready to explode! We had better take some definitive action or I am afraid the consequences could be nation shattering."[27] This pessimism was further aggravated by major setbacks to the nonviolent progressive movement for civil rights. The assassinations of important political and social figures such as Martin Luther King Jr., Malcolm X, Medgar Evers, President Kennedy, and his brother, Bobby Kennedy, weighed heavily on any headway made. Personal struggles, including his growing health issues and the loss of his son and mother, only augmented Robinson's growing frustrations with government inaction.

Robinson would succumb to a heart attack on October 24th, 1972, only nine days after his attendance of that year's World Series Game Two in Cincinnati, Ohio. There, Robinson threw out

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[26] Jackie Robinson to President Lyndon B. Johnson, telegram, March 9, 1965, *Jackie Robinson: Civil Rights Advocate*, The U.S. National Archives and Records Administration.
[27] Jackie Robinson to Roland L. Elliot, telegram, April 20, 1972, *Jackie Robinson: Civil Rights Advocate*, The U.S. National Archives and Records Administration.

the first pitch and gave a speech commemorating the twenty-fifth anniversary of his induction into professional baseball. Much like with the government, Robinson's relationship with the MLB had unfortunately soured, primarily as a result of the organization's unwillingness to hire racial minorities to managerial positions. During his speech, Robinson would reiterate his hope for a more inclusive MLB, noting "I am extremely proud and pleased to be here this afternoon, but I must admit that I am going to be tremendously more pleased and more proud when I look at that third-based coaching line one day and see a Black face managing in baseball."[28] Sadly, his death would prevent this dream from being realized for him. Three years later, however, Frank Robinson would become the first African American baseball manager for the Cleveland Indians and all of baseball.[29]

Robinson's obituary, featured on the front page of *The New York Times* the day after his death, would declare him "America's most significant athlete" in regard to "sociological impact." Highlighting his role as a pioneer of integration in professional sports as well as his later role as an "influential member of the Republican party," the article recalled Robinson's commitment to his beliefs and willingness to challenge what opposed them. Referencing his stout commitment to this ideology, Robinson said, "I was told that it would cost me some awards… but if I had to keep quiet to get an award. It wasn't worth it. Awards are great, but if I got one for being a nice kid, what good is it?"[30]

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[28] Rich Puerzer, "Jackie's Last Stand: Jackie Robinson's Last Public Appearance and His Appeal for the Integration of Major League Baseball Management," Society for American Baseball Research (Society for American Baseball Research, April 15, 2021), https://sabr.org/research/article/jackies-last-stand-jackie-robinsons-last-public-appearance-and-his-appeal-for-the-integration-of-major-league-baseball-management/.

[29] Jeremy Hayes, "On This Day: 42 Years Ago, No. 42 Jackie Robinson Called for Change in Baseball," The Suffolk Journal (Suffolk University, October 15, 2014), https://thesuffolkjournal.com/15706/sports/on-this-day-42-years-ago-no-42-jackie-robinson-called-for-change-in-baseball/.

[30] Dave Anderson, "Jackie Robinson, First Black in Major Leagues, Dies," *The New York Times*, October 25, 1972, p. 1.

Over 2,500 people would attend his funeral, where Reverend Jesse Jackson would deliver a hero's eulogy. He remembered that "when Jackie took the field, something within us reminded us of our birthright to be free. And somebody without reminded us that it could be attained… for a fleeting moment, American became one nation under God. This man turned the stumbling block into a steppingstone."[31] Buried in Cypress Hills Cemetery in Brooklyn, the very place where Robinson forever altered the course of history, his tombstone reads "1919-1982." Jackson would declare that "on that dash is where we live. And for everyone there is a dash of possibility, to choose the high road or the low road, to make things better or worse. On that dash, he snapped the barbed wire of prejudice."[32]

Regrettably, much contemporary work on Robinson fails to account for the vastness of his contributions to the civil rights movement beyond his baseball career and rather confines him to the sole image as a benign and peaceful athlete. The three cinematic accounts of the Jackie Robinson story have thus served as reflections of the broader American public's responses to racial dilemmas, ones which often distort the true narrative. First released in 1950, *The Jackie Robinson Story* delved into his childhood through the beginning years of his Dodger career. Forty years later, in 1990, *The Court-Martial of Jackie Robinson* would also convey a story along this timeline, though beginning with his college career rather than his childhood. Lastly, the most contemporary piece, the 2013 biopic *42*, examined the brief span of his minor league experience with the Montreal Royals through his first Major League season.

The former, *The Jackie Robinson Story*, stressed the then championed ideal that "fairness will prevail," the narrative voice asserting that the triumph of Robinson's baseball career was only

[31] *Eulogy for Jackie Robinson, Baseball: A Film by Ken Burns* (The Baseball Film Project, 1994), https://www.youtube.com/watch?v=fs1_X6iRb7Y.
[32] Dave Anderson, "But on That Dash Is Where We Live," *The New York Times*, October 28, 1972, p. 1.

made possible by a "country that is truly free… a country where every child has the opportunity to become president or play baseball for the Brooklyn Dodgers." [33] Given the rise of Cold War tensions which fueled a need for nationalism, the film strategically omitted the prevalence of systemic racism in America. This omission aligned with many narratives pushed in 1950s mainstream media yet disregarded Robinson's stark critiques of American social and political structures, ones which disproportionately harmed African Americans and other minority groups.

Therefore, the subsequent 1990 made-for-television adaptation offered a wider and more visceral examination of racial issues during the beginning of Robinson's life. Featuring clips and imagines from the Jim Crow era, such as the infamous photograph of the lynching which inspired the song, "Strange Fruit" by Billie Holiday, this movie strayed from the passive themes of the first. However, it once more neglected Robinson's experiences and efforts beyond the beginnings of his career. Although it discussed the lesser-known events of his court-martial, the film failed to reach a wider audience and thus much of the relevant information was left unacknowledged. Even so, this was the first piece which attempted to shift Robinson's legacy away from his athletic career. The film's coda included the lines, "In 1947 Jack Roosevelt Robinson became the first black man to play major league baseball, and in 1962 he was inducted into the Baseball Hall of Fame. He devoted the rest of his life to the civil rights movement and the quality of all men."[34] Additionally, the emphasis on a more grassroots approach to baseball integration allowed for the commendation of strong African American figures who played vital roles in the process, including the efforts of those such as long-time Pittsburgh Courier journalist Wendell Smith.[35] This more progressive approach developed into a primary reason for critique of the most recent account, *42.*

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[33] *The Jackie Robinson Story* (Eagle-Lion Films, 1950).
[34] *The Court-Martial of Jackie Robinson (Turner Pictures, 1990).*
[35] Elliot Abramson, "42: The Jackie Robinson Story," *Nine* 22, no. 1 (2013): pp. 176-180, https://doi.org/https://www.proquest.com/docview/1503107415?parentSessionId=hV%2BxfT5nI%2B8pXC6T9tglp

Arguably most indicative of modern perceptions of Jackie Robinson, *42* offered a more emotional recount of his first season with the Dodgers. Though powerful, it too failed to fully encapsulate the depth of his contributions to the civil rights movement and, in a sense, reversed the ideas forwarded by *The Court-Martial of Jackie Robinson*. Depicting Branch Rickey as the moral heroine mainly responsible for integration, the film disregards others' efforts, especially those by African American journalists and activists who also argued for integration beyond the economically based reasons of Rickey. The movie was also criticized for its portrayal of Robinson as more accommodating and relatively docile, its narrow scope limiting awareness of Robinson as a fierce opposer of bigotry and racism. Because of the focus on Robinson solely as a ballplayer, the audience was impeded from understanding the extent of his accomplishments beyond sports.[36] This in turn has shaped the way that today's public views and remembers the man who dedicated his life towards furthering the fight for racial equality and progress.

Frustrated by the historically narrow focus of Hollywood, and America as a whole, on his career in baseball, Robinson was prompted to dedicate a vast majority of his autobiography, *I Never Had It Made*, to his life beyond sports. Deemed "too political" by the initial publisher, Random House, the book would ultimately be first published in 1972, only two years prior to his death.[37] Yet despite this attempt to shift the scope of conversation, modern portrayals of his life, as seen in *42,* continue to offer a limited view of his life and efforts. Notably, all three mentioned accounts fail to address Robinson's socio-political endeavors following his baseball career.

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[36] Lisa Doris Alexander, "The Jackie Robinson Story vs. The Court- Martial of Jackie Robinson vs. 42: Hollywood's Representations of Jackie Robinson's Legacy," *Nine* 24, no. 1/2 (2016): pp. 89-102, https://doi.org/https://www.proquest.com/docview/1973344805?parentSessionId=ZS4gFjIJvZqBFxd68gfoMgUEFuGmohVUQQ0PI8QxWgo%3D&parentSessionId=irqQJ2I8xU5tDbMw9X%2FGw%2FqTMazQqoGUzgxMOsnneqs%3D&accountid=2694.

[37] Arnold Rampersad, in *Jackie Robinson: A Biography* (Random House Publishing Group, 2011), p. 435.

Professor of African American Studies at Wayne State University, Lisa Alexander, would emphasize these failures as the fault of "filmmakers [who] make the mistake of thinking Robinson's legacy ends there and that does a huge disservice to the audience and to Robinson himself. Unfortunately, the things we should not forget about Robinson's story have yet to be adequately portrayed in popular film."[38]

Undoubtedly, Robinson's status as the first player to break the color barrier in professional sports should remain celebrated. However, his continued commitment to racial justice should become a staple in discourse. As historian William C. Kashatus noted in 1997, "Had he done nothing else with his life after 1947, Jackie Robinson could have easily rested on his laurels as an American legend. But he didn't. Instead, he continued to help define the civil rights movement."[39] His life was plagued by the struggles that came with being an African American in a nation struggling to cope with a violent colonial past and the rising dichotomy between integration and long-held racial hierarchies. Yet because of this, Robinson aptly embodied the complexities and intricacies of the Civil Rights movement. His approaches reflected a man who redefined sports and a nation with both passion and controversy. Receiving criticism from all fronts throughout his life, Robinson remained devoted to his beliefs and hoped for an integrated and equal America. This unyielding commitment and self-determination paved the way for a man who would reshape the American social and political structure for the foreseeable future.

Robinson would write in his autobiography, "many people resented my impatience and honesty, but I never cared about acceptance as much as I cared about respect." He would also write

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[38] Alexander, "The Jackie Robinson Story vs. The Court- Martial of Jackie Robinson vs. 42: Hollywood's Representations of Jackie Robinson's Legacy," pp. 89-102.

[39] William C Kashatus, "Martin Luther King Inspired by Jackie Robinson," William C. Kashatus (William C. Kashatus, January 18, 1997), http://www.historylive.net/op-eds-bill-kashatus/martin-luther-king-inspired-by-jackie-robinson/.

of his motivations: “I don’t like to be in debt. And I owe… until hatred is recognized as a disease, a scourge, an epidemic, and treated as such.”[40] His death marked the end of an era for an icon who had done much to promote inclusivity and equality in athletics and beyond. However, his legacy would live on through his charity operations and his lasting impact on the minds and mentalities of American society, throughout which one singular truth persists: Jackie Robinson’s contributions to America were by no means limited to his time on the baseball diamond.

[40] Jackie Robinson and Alfred Duckett, *I Never Had It Made* (Hopewell, New Jersey: Ecco Press, 1995), 422.

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Caption: "Hosting an Expansive Garden Party with His Wife, Rachel, to Raise Funds for the N.A.A.C.P., the Southern Christian Leadership Conference and the Congress of Racial Equality. The Party, at the Robinson Home in Stamford, Conn., Was Attended by Martin Luther King Jr., Benny Goodman, and NAACP Executive Secretary Roy Wilkins.". The New York Times. Associated Press, January 31, 2019. https://www.nytimes.com/slideshow/2019/01/31/sports/100-photos-jackie-robinson/s/30Robinson-ast40.html.

Original Caption: "Former Baseball Star Jackie Robinson Grabbed a Sign and Joined a Picket Line in Cleveland, Ohio, to Protest Discrimination against Blacks at Southern Lunch Counters, 1960. The Picketing Was Organized by the N.A.A.C.P.". Associated Press Images. Associated Press, June 12, 2013. http://www.apimages.com/metadata/Index/Watchf-AP-A-OH-USA-APHS448024-Jackie-Robinson/79dcf222c28f4cfaa9bc70c4b52e5b9b/27/1.

Climate Change: The Ultimate Cereal Killer: The Impact of Temperature and Precipitation on Agricultural Yields – *Hayley Huber, Robert Salita, and Ruth Abraham, Washington and Lee University*

I. Introduction

To meet the increasing needs of a rapidly growing international population, global agricultural yields have been on steady increase since the 1970s. However, Earth is slowly approaching its estimated carrying capacity of 9-10 billion people (Wolchover 2011). As global population growth inevitably slows down, we must be cognizant of how agricultural output will respond and how that response will affect the populations of both developed and developing countries. Because the global population's existence depends on available food supply, understanding the future of agriculture is imperative to our existence. Thus, to comprehend the urgency of the issues we will inevitably face over the next century, we must understand the complex relationship between agriculture and climate that was created in the Anthropocene.

As global demands for agricultural products increase with an increasing population, more energy is expended to provide enough yields to support the population. Meanwhile, as temperature and precipitation are affected by climate change, growing crops on a per unit basis becomes evermore challenging as well. Our research aims to explore how climate change is affecting agricultural yields so that we may learn what kinds of adaptation strategies are needed and gain insight into the possibilities of the future.

Although many studies have been conducted to see the effects of climate change on agricultural production within specific nations, none so far have taken a more comparative and

global approach. Our study allows us to compare specific crop productions across countries and allows us to compare differences in crop sensitivity against other crops.

This research paper explores the impacts of climate change on multinational agricultural production of certain crops. Specifically, we look at the effects of temperature and precipitation on multinational production of barley, rice, and soybeans using a country-specific time trend model. We hypothesize that as mean temperature increases up to a certain point (degrees Celsius), rice yields will increase before hitting a maximum and then decrease. Likewise, as precipitation increases to a certain point (millimeters per year), rice yields (tons) will increase until a certain point before decreasing. In a similar fashion, soybean yields (tons) will decrease both with increasing temperature and increasing precipitation. Finally, we predict that barley yields (tons) will decrease more dramatically than the other crops due to increasing temperature and will decrease with increasing precipitation.

II. Literature Review

To better understand the current and historical approaches to economic research related to climate and agriculture, we explored several prominent economic and scientific papers. In our research, we seek to explore the impacts of climate change on multinational agricultural production of certain crops. We found that there exist more than 220 economic papers related to climate and agriculture, yet we only find that 4% of these papers prior to 2011 examine geographic distribution of crops (White, et al. 2011). This literature review will cover models, methods, data, and general findings established by previous research.

A. Models / Methods / Data

One method that researchers utilized to measure the impact of climate change on agriculture is via change in farmland value. Mendelsohn, Nordhaus, and Shaw used the Ricardian approach to estimate the economic impacts of climate change based on a cross-sectional analysis of farmland values (prices of farmland). Specifically, they regressed farmland values on a set of climate and control variables and found that "higher temperatures in all seasons, [except for fall,] ... reduce average farm values while more precipitation outside of autumn increases farm values." (Mendelson et al. 1994). Additionally, their research estimated a lower impact on US agriculture than the traditional production function approach. The strength of their approach is its ability to measure the long run impact from climate change given likely climate adaptations by farmers. However, John Antle notes that the Ricardian approach fails to measure true agricultural production and cannot be used to analyze structural or policy innovations that would change the effects of climate change. This shortcoming limits the practical uses and implications of their research. Further, Antle argues that many economic studies on the effects of climate change depend on agriculture production function and, as such, tend to underestimate technological and economic innovation and adaptation, which Mendelsohn, Nordhaus, and Shaw seem to have successfully avoided (Antle 1995).

Another method, as described by Antle, uses General Circulation Models (GCMs) to estimate the effects of CO_2 accumulation on climate. The GCMs are based on grid blocks of 2,500 square kilometers, which is too large to accurately capture spatial vulnerability, and is therefore considered unreliable for variables other than temperature. This, Antle argues, warrants low confidence in estimates derived from these.

Furthermore, White et al. uses "ecophysiological models to forecast potential impacts of climate change on future agricultural productivity and to examine options for adaptation by local stakeholders and policy makers" (White et al. 2011). They also found that assuming "a low baseline CO_2 level may exaggerate projected impacts of increased CO_2" which can dramatically impact policy implications and adaptation strategies and the urgency to execute them. Interestingly, about 40% of the papers studied by White et al. used the CERES (Crop Environment Resource Synthesis) and/or EPIC (Erosion Productivity Impact Calculator) models. However, many of these papers do not adequately justify their use of particular models nor their selection of particular geographic regions (White et al. 2011). On the other hand, Phillips, Lee, and Dodson (1996) endorse the EPIC model as a sound estimating tool for yield citing "the simulated mean yields were always within 7% of the mean measured yields and were not significantly different ($P > 0.05$) from any of them." The models used in all of the papers that we read have significant contributions to the field and provide a good framework, but they also have drawbacks that we need to account for when developing our model.

B. Research Findings

In 10% of papers, the findings are related solely to theory put forward by the paper (White, et al. 2011). The theory-only papers focus on fleshing out models, some of which we discussed above, and discussing potential independent variables and functional forms. For example, Antle writes that "understanding the impacts of climate exchange on agriculture … will require a better understanding of the long-term path of innovation, land use, and the dynamic behavior of managed ecosystems." (Antle 1995). Antle and others seek to spell out the methods and models used by others so that future research has a strong theoretical foundation to build upon.

The impacts of climate change on agricultural yields of soybeans, barley, and rice have also been extensively detailed with 84% of papers discussing impact to some degree (White, et al. 2011). Global warming threatens agricultural yields in their existing locations through desertification and land degradation. Global temperature increases, too, have noticeably changed societies' food systems (Yamanoshita 2019). Phillips, Lee, and Dodson (1996) predict, "3% decreases in both corn and soybean yields in response to a 2°C temperature increase at baseline precipitation levels." These staple crops suffer from the compounding effects of rising temperature and less precipitation to further drive down expected overall yields. For luxury crops, such as wine and coffee, it is predicted that, "by 2050, the area of California suitable for wine growing could be down to nearly half of what it is today (2013)," and "by 2080, [a] study's model predicts a best-case scenario of a 65-percent reduction in the number of suitable locations for the plant, with the worst case projection a nearly 100-percent reduction," which somewhat contradicts Lobell and Gourdji's finding that net crop yields will not decrease as discussed later (Mayer 2013). In the short term, existing locations that are renowned for producing specific crop types will suffer. Even well-known adaptation strategies like irrigation techniques can strain limited water resources in areas suffering from the effects of climate change.

On the other hand, adaptation has been covered by very few papers as only 20% of papers discuss adaptation at all and less than 5% focus solely on adaptation. (White et al. 2011) Kurukulasuria and Mendelsohn 2008 emphasize that, "crop choices are more sensitive to temperature than precipitation." In response to rising temperatures, maize-millet, maize-groundnut, and fruits- vegetables, and cowpea suffer where sorghum and all other crops increase the probability. Knowing this, African farmers deal with the continued consequences of climate change through crop switching buffering the magnitude of losses incurred in response to

continually changing temperature and precipitation patterns. Adaptation strategies are typically established in reaction to climate change instead of as preventative measures.

Lobell and Gourdji found that “even in the most pessimistic scenario, it is highly unlikely that climate change would result in a net decline in global agricultural yields,” contradictory to what seems apparent in the IPCC 2021 reports and Mayer 2013 (Lobell and Gourdji 2012). We want to highlight that this analysis is from a decade ago, which makes us question the validity and relevance of their results because we now have much more complete data and possibly more accurate climate change projections. However, Lobell and Gourdji do add much useful information to our analysis of climate change and agriculture. First, they spell out the five primary pathways in which temperature affects crop yields. They also point out that with higher precipitation comes greater flooding frequency and intensity which will inevitably lead to crop damage. Further, changes in the wet season will disrupt traditional farming practices which may have social and economic consequences (Lobell and Gourdji 2012). Aside from crop damage resulting from heat and rain, “... rising [temperature], along with higher atmospheric CO_2, may favor the growth and survival of many pests and diseases specific to agriculture” exacerbating the negative effects of climate change on crop yields.

C. Final thoughts on prior research

Through this literature review, we found impactful data and research done that will help us frame our paper. The models and data used were very informative in describing how we can go about building our own model. However, we also found limitations and gaps in the research that we aim to improve upon with our research paper. Prior to our evaluation of past papers, we struggled to find crops and countries that would be most prudent to study. However, White et al. revealed which crops and countries were understudied. Rice, soybean, and barley are three of the

five crops that take up the largest harvesting area, but are much less studied than maize and wheat. For instance, rice takes up more land than maize but is studied in 50% fewer research papers than maize. This is due to the fact that its top producers, China and India, release little research on this in the English-language, limiting the scope of its use.

How will soybean, rice, and barley outputs change as a result of changes in temperature and precipitation? These crops are three of the five crops that take up the largest harvesting area, making our findings important to the climate change adaptation conversation. Some previous research indicates that there will be zero net change to agricultural production due to climate change while others suggest that climate change will have negative effects on agriculture, forcing adaptation (Lobell and Gourdji 2012, Mayer 2013).

Rice, soybean, and barley grow in radically different temperatures and humidities which allows us to see how climate change impacts yields in different climate zones. We can apply insights from the models and findings of previous papers to these understudied crops. Rice tends to grow best in hot, humid regions that see an average temperature range between 21-37 degrees Celsius. The highest temperature that rice can tolerate is about 40 degrees Celsius (Farmer Portal). As the mean temperature increases to above 40 degrees, producing rice becomes much more difficult, despite sufficient precipitation. Soybeans optimally grow where mean temperatures range from 16-21 degrees Celsius and where the soil is well drained, suggesting that increasing precipitation will negatively affect yields (Albert 2020). Barley tends to grow best in cooler, drier climates. Barley is quite resistant to frost and so is preferentially grown in cooler regions. We would predict that as cooler climatic regions become warmer, countries in such regions will shift from barley production to a warmer-climate crop, thus reducing barley yields.

Additionally, we now see that the global comparison will be a helpful addition to the climate-agriculture conversation. Adaptation, whether it is crop switching within a given region, shifting agricultural production into higher latitudes, or even, adjusting the growing time to match with changing seasons, is an extremely important driver of current research yet very few papers discuss it. As such, our paper will focus on adaptation in our Discussion section. In our paper, we aim to add to the conversation by focusing on multinational agricultural impact and adaptation as a result of climate change.

III. Data Description

For our topic, we have two sources of data: World Bank Climate Change Knowledge Portal and Our World in Data Agricultural Production data. The Climate Change Knowledge Portal (CCKP) provides us with country-level temperature and precipitation time-series data. Meanwhile, Our World in Data provides us with country-level agricultural production time-series data by crop. The CCKP presents the World Bank Group's operational team's raw climate and model-based projection data combined with 15 global circulation models and comprehensive physically-based models of climate change made available by the Intergovernmental Panel on Climate Change (IPCC) 4th Assessment Reports. While the time-series spans as far back as 1901 and makes projections up until 2099, the projections may fail to include unprecedented advances in technology or development causing predictions to be under- or overstated. This comprehensive data set is presented to policymakers and other global professionals and is produced by reputable experts in the field. However, for our analysis, we will not be using projected data; we are only using recorded climate data up to 2018. The country category provided allows users to compare climate datasets at the national level. The spatial and temporal

resolutions that we intend to employ are annual national average temperatures in degrees Celsius and annual national precipitation levels in millimeters. The CCKP will provide us with sound climate data in order to track climate change over time.

Our World in Data receives its data from the United Nations Food and Agricultural Organization (FAO). “The main data source is official statistics from FAO member countries, collected either through annual production questionnaires (APQ) distributed to countries, from national publications or from official country websites.” (FAO). The main drawback to this type of data is that the variable sources can impact the reliability of data and how we compare data for different countries. If some data is obtained from official sources while other data is obtained in a dramatically different way, comparing the two sets of data could lead to biased results. The variable time spans nearly six decades covering the years 1961 to 2018 and the dataset has information on most countries as well as select aggregated regions. There are a total of 6,775 data points (distinct year, country/region pairs) in the barley data set, 8,549 data points in the rice data set, and 6,041 data points in the soybean data set. The units of production for all three data sets are measured in tons. From this data set, we will be analyzing yearly production of our three crops.

We will join these data sets in order to have data points for every year-country pair that contain information on both climate data and production data. We will be using 10 countries that produce all three crops in addition to another 10 unique countries that produce at least one of the three crops. Additionally, since we only have production data starting at 1961, we will not be using climate data from before this year either. This results in 58 years and 38 countries worth of data (two countries overlap in two of the individual crop data sets). Our final data set contains 2,320 data points with mean temperature, average precipitation, and total production as the

variables in each of these data points. This is split up into the four distinct data sets: one per crop, and one with all three crops which will then be used to run our models.

IV. Methodology

Our research will examine the relationship between climate change and multinational agricultural production of certain crops. In particular, we will analyze the effects of rising temperatures and precipitation on soybean, rice, and barley yields across the global landscape. Both agricultural yield and agricultural production, here, will be defined as total output in tons.

To test our hypothesis, we will regress climate data from the Climate Change Knowledge Portal onto agricultural data collected from the World Bank. Our independent variables in our regression analysis are temperature and precipitation measured in degrees Celsius and millimeters per year, respectively. Our dependent variables are rice, soybean, and barley outputs. We predict nonlinear relationships between our independent and dependent variables and so employ a nonlinear regression model. We will employ four different regressions to model the effects of climate change on specific crop outputs, one for each crop and the fourth for our composite analysis. The general model appears as follows:

$$\ln(Y_{it}) = \beta_0 + \beta_1 T_{it}^2 + \beta_2 T_{it} + \beta_3 P_{it}^2 + \beta_4 P_{it} + FE + x_{it} + \varepsilon_{it}$$

where $\ln(Y_{it})$ is the percent change in crop (rice, soybean, or barely) output in a given year in a given country, T is temperature in degrees Celsius, P is precipitation in millimeters, FE is fixed effects, and epsilon is the error term. In our analysis, we employ different combinations of fixed effects and country-specific time trends in an effort to determine the model that best fits our data. Note that technological changes that affect all countries would ordinarily be accounted for by time fixed effects, but we can't be certain that technological innovations will or already do so.

Our strategy helps to eliminate threats to causal inference due to technological changes. Other threats to causal inference in our analysis will be addressed in the Discussion section.

Using this panel data model, we assume (1) no perfect multicollinearity, (2) variables are independently and (3) identically distributed (IID), and large outliers are unlikely. Temperature and precipitation are likely correlated but are not perfectly so, thus satisfying the first assumption. We believe that the error terms between countries are not correlated, satisfying the second assumption, but recognize that this may not be the case. If the latter is true, then we can correct for it using clustered standard errors in our analysis. Finally, our time series data should allow us to correct for possible outliers, thus satisfying our final assumption. Outliers are discussed further in the Discussion section.

V. Results

We ran a series of regressions including different combinations of fixed effects (FE) and country-specific time trends (CSTT) for each crop. Specifically, we used regressions with no FE, with time FE only, with country FE only, with both time and country FE, with CSTT, and with both CSTT and country FE. Tables 1 - 4 show all of the models that we used.

Most of our coefficients in each of the models are not statistically significant. We found that temperature coefficients have a higher magnitude than precipitation across the board. In fact, many of the precipitation coefficients were at or just above 0 in absolute value. Additionally, coefficient signs tended to change based on which model we were using.

The no-FE model had the lowest R-squared value for each of the three crops and the composite (model that includes all three crops). The time-only and the country-only FE models had comparable R-squared values, generally in the lower range (0.1-0.25). However, the time-

only and country-only FE models for rice had R-squared values above 0.8, far higher than the results for soybean and barley. For each crop and the composite, the R-squared value for the combined time and country FE model was greater than either of the FE models alone. The combined CSTT and county FE model for each of the crops and the composite had R-squared values higher than the combined time and country FE, but the difference between these values tended to be less than .03 except for soybean which had a ~.07 difference. This large difference is the likely driver behind the .05 R-squared difference between models for the composite. The CSTT model (excluding other FE) had the highest R-squared values across the board, each of the values at or above .96. The country-specific time trend model for rice yielded an astonishing R-squared value of 1.000. The results of each model can be found in the Appendix, Tables 1-4.

Excluding constants, rice had the highest amount of statistically significant results, most of which were at the 5% level or lower. Comparing results across models, we found that the CSTT-only regressions for each crop consistently had the highest R-squared values, leading us to believe it is the best fit model for our data. Table 5 shows the country-specific time trend model for each of the crops and the composite. As shown, very few results are statistically significant, except for temperature on rice, which is significant at the 1% level. The signs on the temperature coefficients are negative for all crops except for barely. The signs on precipitation coefficients, despite the values equaling near 0, are all negative except for rice. Finally, the square terms for each of the crops are all positive, except for barley which has negative signs on both square terms.

VI. Discussion

By using CSTT, we measure the yearly deviation in output from the general time trend in each country. Negative coefficients can be interpreted as causing negative variation in output

from the trend and positive coefficients as causing positive output variations from the trend. Temperature coefficients have a higher magnitude than precipitation across the board; many of the precipitation and precipitation-squared coefficients are near or at zero, contrary to our prediction. This indicates that agricultural yields are more sensitive to changes in temperature than precipitation. In other words, changes in temperature cause larger deviations from the trend than does precipitation. Technological advances, like irrigation --which allows farmers to control water exposure to crops--, might explain why we achieve this result.

Thailand, a top rice exporter, was able to confirm supplying irrigation water was a rather effective adaptation strategy to help its rice production when compared to changing planting date and reduction in fertility stress through proper nutrient management. (Boonwichai 2021) Another explanation for precipitation having a negligible effect also stems from the fact that although annual precipitation increases in magnitude, its effects may not have manifested themselves during the cropping period for soybean, rice, or barley leaving no observable differences in yield. (Dahal 2018) Bannayan et. al. (2010) strongly notes that timing of precipitation dictates a crop's success crop's yield in a particular yield. Thus, changes in precipitation would have little to no effect on agricultural yields, as our model shows, if the seasonality of precipitation was affected in a certain way.

The signs on the resulting coefficients generally follow our predictions. As shown in Table 5, increasing temperature leads to negative variation from the trend for all crops. Total rice, soybean, and barley yield variations are negatively affected by increasing temperature. The temperature-squared term is zero, making the temperature and yield variation relationship linear. The coefficient is statistically significant at the 1% level, and combined with the high R-squared, this is an extremely strong relationship. A potential limitation to our results is the small sample-

size. With ten countries in each category, we can only make conclusions for multinational trends; a correction strategy that a future paper could take would be to include more countries' agricultural yields into our final CSTT model.

Similarly, the temperature-squared coefficient for soybean is zero, so the relationship between temperature and soybean yield is also a simple negative linear relationship. As temperatures increase, variation in soybean yield from the trend will continue decreasing, eventually causing net soybean yield to decrease as well.

Barley, however, has a positive coefficient for temperature and a negative coefficient for temperature-squared, different from the other crops, suggesting that the variation caused by temperature will eventually stop increasing and start decreasing, as visualized by an inverted parabola. Our exact position on this curve is unclear; for each country, we do not know if variation in yields are increasing at a decreasing rate or decreasing altogether. However, we can still say that the overall effect of temperature on barley is negative in the long run.

Opposite to barley, the temperature coefficient for rice is positive and the temperature-squared coefficient is negative. Variations in rice yield caused by temperature would be modeled as an upward-facing parabola. This means that variations in rice yield may be decreasing currently, but will start increasing in the long-run. As with barley, we do not know our precise location on the curve. One explanation for this trend might be that colder-climate countries will eventually begin to produce rice as they warm due to climate change. This explanation would result in greater production of rice despite rising temperatures. However, our data does not account for other possible future climate scenarios. For instance, we do not have the temperature range to account for even higher increases in temperature that may cause potential new producers of rice to lose this newfound ability to do so. Although our model makes it seem that climate

change has a positive impact on rice production, more analysis is needed to see long-term effects of a global increase in temperature on rice yields.

It's important to note that the rice coefficients are much higher and more statistically significant than the others. For example, a one degree increase in temperature leads to a more than 200% negative deviation from the trend; i.e. rice yields decrease by a large relative amount (Figure 5). We suspect this could be due to the fact that most rice is produced in east Asian countries, which may be subject to poor record keeping over our time interval.

Unlike temperature, the coefficients for precipitation and precipitation-squared are all virtually zero. Thus, the signs on these coefficients have no practical interpretation. This leaves us with, most simply, a model for variations in crop yield as a function of temperature. Note that the coefficients for precipitation and precipitation squared for each of the crops in each of our other models are all practically 0 (Tables 1-4). This supports our inference that technological advances like irrigation have mitigated the effects of precipitation on agricultural production.

An important question regarding our analysis is whether or not there is a relationship between temperature and precipitation. If these variables are collinear, then our results might not hold as the model would be severely affected by collinearity. Intuitively, we know that rising temperature isn't *always* associated with rising precipitation. For example, as temperature increases in Sub-Saharan Africa, we wouldn't expect precipitation to increase because it's a desert! Similarly, we wouldn't expect a decrease in precipitation in the Amazon with increasing temperature. Figure 3 shows the relationship between temperature and precipitation for our chosen countries. As shown, there are horizontal clusters of points that indicate temperature can increase without increasing precipitation. Likewise, there are vertical clusters that suggest that precipitation can increase with increasing temperature. The distributions of temperature and

precipitation by country support this analysis (Figures 1-2). The analytical consequence is that we can be confident that the precipitation coefficients are zero for a reason other than collinearity.

Another potential threat to our analysis is the existence of production outliers; there are some countries that produce much higher yields than countries we compare them to, particularly for soybean and rice (Figure 4). These outliers aren't necessarily anomalous; we chose the top producers for each crop and so expect a fair range between the highest top producers and the lowest top producers. However, these outliers may still have affected our results.

VII. Conclusion

We are able to confirm that agriculture is an especially climate-sensitive human activity. Revisiting our earlier claims from the literature review section, we can confirm the work of Kurukulasuria and Mendelsohn (2008) that crops are more sensitive to temperature than the precipitation climate variable. Oresults suggest that agricultural yields are negatively affected by climate change and left unmitigated, net global agricultural yields will likely fall, contrasting Lobell and Gourdji. Specifically, agricultural yields of top crops like soybeans, rice, and barley are threatened by rising temperatures. This fact necessitates adaptation and other mitigation strategies because under almost all emissions scenarios identified by the IPCC (Intergovernmental Panel on Climate Change), temperature rates will continue to rise.

Historically, farmers typically respond to climate change by adjusting farming practices or adopting a new crop altogether. (Korres 2016) With temperatures increasing at a rate of .18°C per decade, global agricultural outputs are exceedingly threatened (Lindsey and Dahlman 2021) The top five soybean-producing countries have witnessed reduced soybean yields after 0.5 °C rise in temperature. While adaptation strategies such as planting earlier in the season and

changing variety delay temperature's effect and ultimately, help to maintain the upkeep of soybean yields in response to small rises, their effectiveness will be thwarted beyond a rise of 2 °C. (Rose et. al. 2016) A Korres (2016) study established that with inevitable temperature rise, the best way to sustain rice-yields in the short term is cultivar selection–breeding rice strains to be more heat-resistance or heat-tolerant–and reorganizing planting dates to harvest before extreme heat hits. This suggests that R&D in crop genetic engineering might be a useful strategy in dampening the negative effects of temperature on yields.

Similarly, increasing crop diversity and physically protecting seeds during the most pivotal part of their growing will enhance resiliency in the face of climate change. In order to sustain barley yields, seed-sowing windows must be adjusted accordingly. (Kalra et. al 2008) All the climate change impact studies warn of the doom brought upon by the work of rising temperatures and encourage subsequent research and development in adaptation strategies.

As mentioned earlier, precipitation's seemingly negligible effect on agricultural yields, likely due to technological advances in irrigation. Overall, adapting to climate change in an effort to safeguard the global food supply is in the world's best interest. Further country-specific research should be conducted to explain and shed light on specific impacts by climate-region. This would determine the effect of climate change on individual crops and identify where crop-switching would need to be enacted. However, with rising food needs, food security can be stabilized only when the effects of climate change on agriculture are mitigated. Unadulterated anthropogenic climate change will increase temperatures, decrease yields, and intensify humanitarian crises such as world hunger. This requires the development and implementation of adaptation strategies that are best fit for each region and the intended crop. If this is able to be

implemented, then, the effects of temperature can be lessened and agriculture can become a less climate-sensitive activity.

Appendix

Table 1.

Climate Change on Soybean Output

VARIABLES	No FE ln(Soybean)	Time FE ln(Soybean)	Country FE ln(Soybean)	Time & Country FE ln(Soybean)	Country Specific Time Trend ln(Soybean)	Country Specific Time Trend & Country FE ln(Soybean)
Precipitation	0.001	0.001	-0.001	-0.002	-0.001	0.000
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
Temperature	-0.013	-0.012	-0.072	-0.099	-0.101	-0.027
	(0.013)	(0.010)	(0.080)	(0.093)	(0.079)	(0.107)
Precip. Sq.	-0.000	-0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Temp. Sq.	0.001**	0.001***	0.001	0.002	0.000	0.002
	(0.001)	(0.000)	(0.003)	(0.004)	(0.004)	(0.004)
Constant	5.161***	5.160***	5.887***	6.599***		4.623***
	(0.408)	(0.475)	(1.169)	(1.620)		(1.390)
Observations	580	580	580	580	580	580
R-squared	0.032	0.111	0.188	0.260	0.960	0.334

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.

Climate Change on Barley Output

VARIABLES	No FE ln(Barley)	Time FE ln(Barley)	Country FE ln(Barley)	Country & Time FE ln(Barley)	Country Specific Time Trend ln(Barley)	Country Specific Time Trend & Country FE ln(Barley)
Precipitation	-0.001	-0.001*	-0.000	-0.001	0.001	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Temperature	-0.208***	-0.199***	0.080	0.028	0.161	-0.143
	(0.051)	(0.049)	(0.106)	(0.123)	(0.111)	(0.145)
Precip. Sq.	0.000	0.000	-0.000	0.000	-0.000	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Temp. Sq.	0.007***	0.007***	-0.008*	-0.001	-0.013**	0.014*
	(0.002)	(0.002)	(0.005)	(0.006)	(0.005)	(0.008)
Constant	6.908***	6.896***	6.080***	5.753***		4.641***
	(0.358)	(0.316)	(0.792)	(0.929)		(0.841)
Observations	580	580	580	580	580	580
R-squared	0.035	0.144	0.221	0.321	0.975	0.345

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.

Climate Change on Rice Output

VARIABLES	No FE ln(Rice)	Time FE ln(Rice)	Country FE ln(Rice)	Time & Country FE ln(Rice)	Country Specific Time Trend ln(Rice)	Country Specific Time Trend & Country FE ln(Rice)
Precipitation	0.001***	0.000	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Temperature	0.470***	-1.171***	-1.171***	-1.563***	-2.278***	0.101
	(0.081)	(0.111)	(0.111)	(0.169)	(0.169)	(0.086)
Precip. Sq.	-0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Temp. Sq.	-0.014***	0.044***	0.044***	0.036***	0.053***	-0.003
	(0.002)	(0.003)	(0.003)	(0.004)	(0.003)	(0.002)
Constant	11.281***	18.116***	18.116***	32.455***		15.612***
	(0.804)	(0.972)	(0.972)	(2.166)		(0.718)
Observations	580	580	580	580	580	580
R-squared	0.339	0.826	0.826	0.924	1.000	0.967

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.

Climate Change on Total Rice, Soybean, Barley Output

VARIABLES	No FE ln(Total RSB)	Time FE ln(Total RSB)	Country FE ln(Total RSB)	Time & Country FE ln(Total RSB)	Country Specific Time Trend ln(Total RSB)	Country Specific Time Trend & Country FE ln(Total RSB)
Precipitation	-0.002***	-0.002***	-0.001	0.001	0.000	0.001
	(0.000)	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)
Temperature	-0.018	-0.018*	-0.264***	-0.089	-0.267***	0.118
	(0.012)	(0.009)	(0.058)	(0.083)	(0.058)	(0.100)
Precip. Sq.	0.000***	0.000***	0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Temp. Sq.	0.000	0.000	0.002	0.008***	0.000	-0.002
	(0.001)	(0.000)	(0.003)	(0.003)	(0.003)	(0.004)
Constant	6.198***	6.176***	8.803***	3.615**		3.852***
	(0.181)	(0.144)	(1.343)	(1.713)		(1.428)
Observations	580	580	580	580	580	580
R-squared	0.048	0.158	0.120	0.222	0.972	0.297

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.

Climate Change on Agriculture Using Country-Specific Time Trends

VARIABLES	Country Specific Time Trend ln(Rice)	Country Specific Time Trend ln(Soybean)	Country Specific Time Trend ln(Barley)	Country Specific Time Trend ln(Total RSB)
Precipitation	-0.000	-0.001	0.001	0.000
	(0.000)	(0.002)	(0.001)	(0.001)
Temperature	-2.278***	-0.101	0.161	-0.267***
	(0.169)	(0.079)	(0.111)	(0.058)
Precip. Sq.	0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Temp. Sq.	0.053***	0.000	-0.013**	0.000
	(0.003)	(0.004)	(0.005)	(0.003)
Observations	580	580	580	580
R-squared	1.000	0.960	0.975	0.972

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 1.

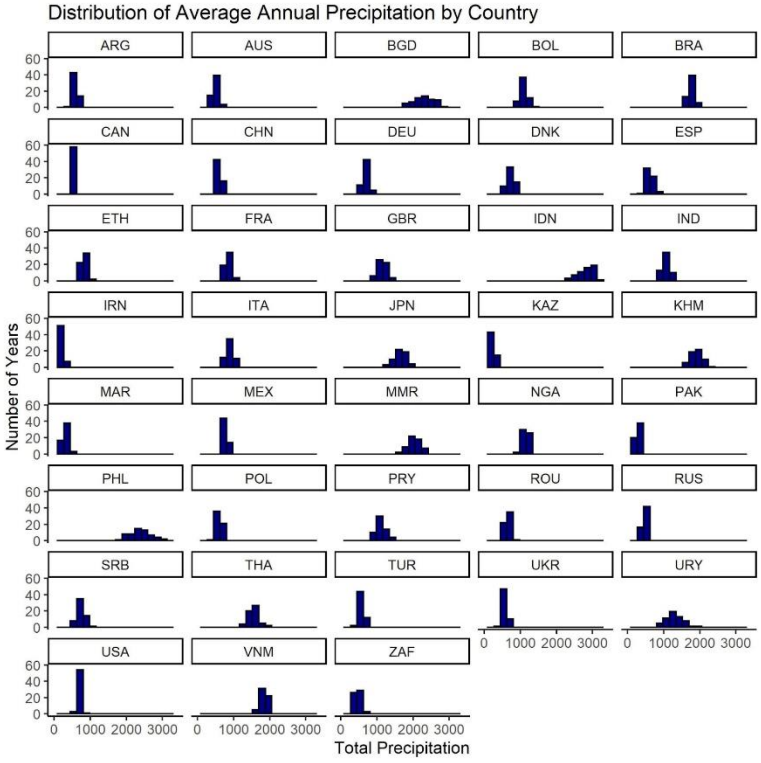


Figure 2.

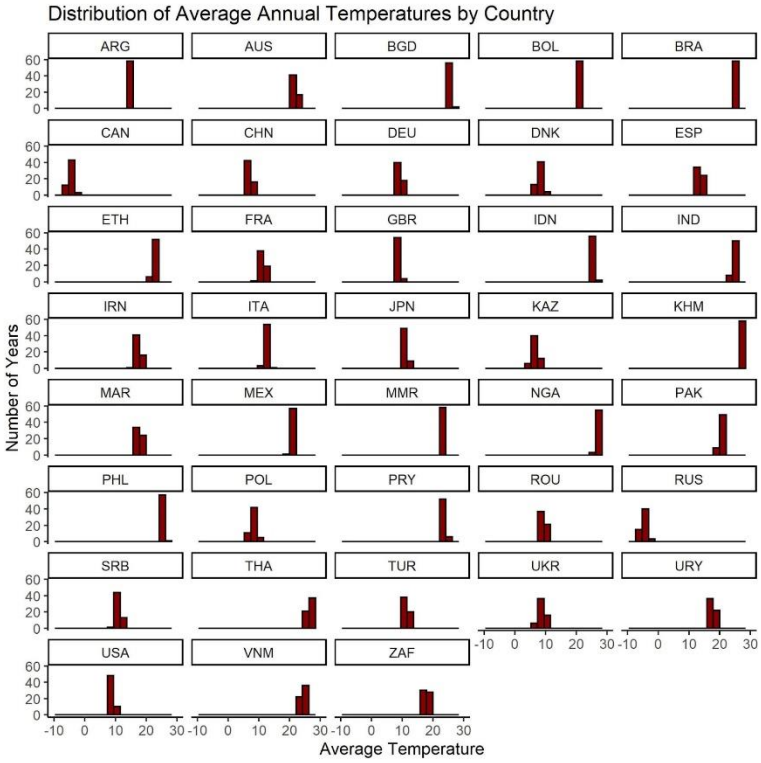


Figure 3.

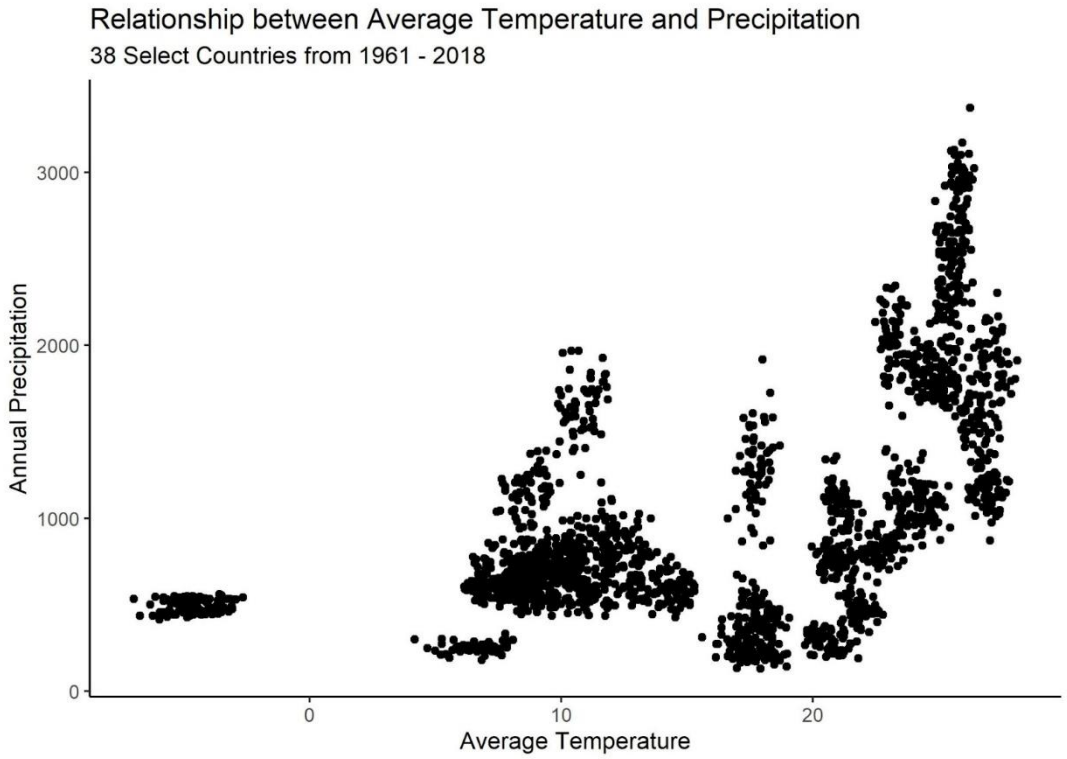
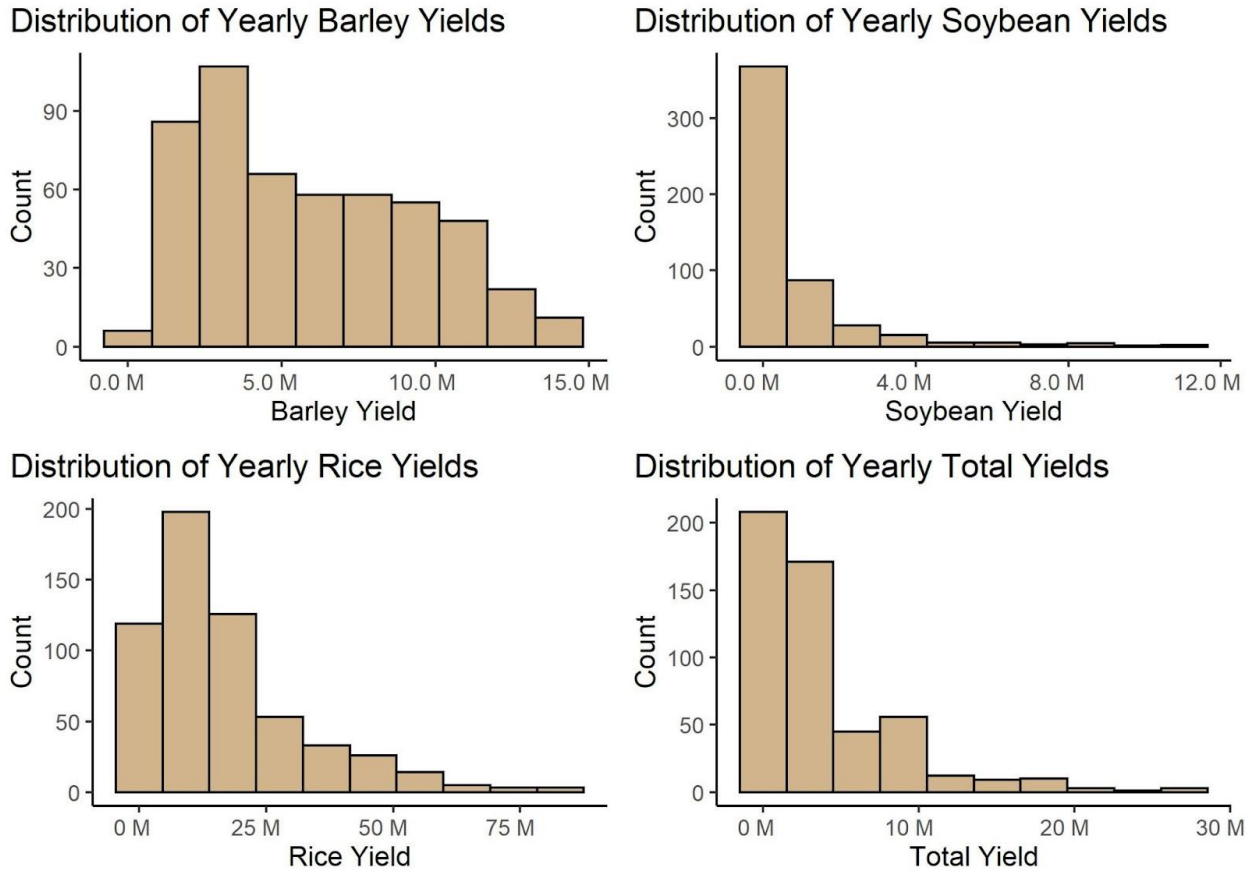

Relationship between Average Temperature and Precipitation
38 Select Countries from 1961 - 2018
Annual Precipitation
3000
2000
1000
0
0
10
20
Average Temperature

Figure 4.


Distribution of Yearly Barley Yields
Count
90
60
30
0
0.0 M
5.0 M
10.0 M
15.0 M
Barley Yield
Distribution of Yearly Soybean Yields
Count
300
200
100
0
0.0 M
4.0 M
8.0 M
12.0 M
Soybean Yield
Distribution of Yearly Rice Yields
Count
200
150
100
50
0
0 M
25 M
50 M
75 M
Rice Yield
Distribution of Yearly Total Yields
Count
200
150
100
50
0
0 M
10 M
20 M
30 M
Total Yield

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The Effect of Trading Volume on Stock Price –

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Introduction

For decades, traders have been intrigued by the question of how trading volume impacts stock prices and returns. Understanding this impact may reveal important details regarding financial market structure and future market event (Bajzik, 2021). Trading volume is the total number of shares of a security traded within a certain timeframe. In this paper, we examine the extent of the causal relationship between trading volume and stock prices. The effect of trading volume on stock price reveals fundamental information significant for our knowledge of how financial markets operate and offers an opportunity to shed light on the efficient market hypothesis. This paper will be of use to investors, traders and public policy makers.

Nearly 56% of Americans are invested in the stock market. (Saad, 2019) As volume and stock price are fundamental characteristics of the financial markets, understanding their relationship bears significant implications for millions of Americans, who have significant sums of money invested in the market or in retirement funds. This relationship also bears significance for traders and investment banks, whose livelihoods and existence depend on their ability to make quality returns in the market. Finally, these results are important for public policy makers to understand. New legislation that raises the capital gains tax rate, for example, would initiate a locked-in effect, where investors hold on to financial assets longer to avoid taxation. (Tatom, 2021) Trading volume would thus decrease. Understanding the resulting impact on stock price, and thus its impact on millions of Americans with savings tied to the equity markets, is imperative.

Prior literature primarily concentrates on addressing the relationship between trading volume and stock returns. Past research is divided on whether there is a positive or negative relationship between these variables, which is corroborated by a literature review conducted by Ruhani et al. (2018). Estimating whether this relationship truly exists, and its magnitude, bears significance for the efficient market hypothesis, which argues that it is impossible to outperform the market as share prices reflect all publicly available information. If a relationship exists, the hypothesis is dispelled, as an opportunity for arbitrage is indicated. We develop a linear framework where stock price is contingent on trade volume and other market factors.

To estimate the relationship between trade volume and stock price, we rely on a regression framework and a dataset of S&P 500-listed companies from 2013 to 2018. Unlike the majority of previous research into related topics, we examine the impact of trading volume on stock price, not stock returns. We contribute to existing literature by utilizing an ordinary least squares model, while other researchers tend to perform a time series analysis or implement a volatility-based GARCH model. Our framework uniquely positions us to control for variation in our model, as we implement control variables that address the impact of the stock's performance the previous day and the magnitude of its daily volatility. Stock and time fixed effects, as well as an instrumental variable, are added to our model, minimizing heterogeneity, while all estimates are made with heteroskedastic-robust standard errors.

We find that an increase in trade volume positively affects stock prices of companies listed in the S&P 500 index. In our headline regression, stock price increases by $5.606e-07 for each additional share traded. When multiplied by the mean trading volume of these stocks, mean stock price increases by $2.42. Through the addition of nonlinearities into our model, we find that stock returns in the index increase by 3.20%. Our findings corroborate certain prior literature

and reveal that an arbitrage opportunity exists for traders and investors to exploit, disputing the efficient market hypothesis.

Conceptual Framework

Most prior literature relating to the topic of the relationship between trading volume and stock prices focuses on stock returns. Both positive and negative relationships have been discovered between these two variables. (Ruhani et al., 2018) We will first define the key variable of trade volume before examining past research that finds both positive and negative relationships. Then, we will address the implications of potential findings on the efficient market hypothesis. Finally, we will develop a basic framework that will serve as the foundation of our empirical analysis of trading volume and stock price later in the paper.

Trading volume is characterized as the total number of shares of a given stock that was traded or exchanged hands on a given day. Volume is a key technical indicator for investors, as it reflects the liquidity and efficiency of order execution in a given market. Higher trade volume can reflect a more active market (Twin, 2022) and the flow of new information into the market (Tetlock, 2007). Chordiaa et. al (2000) emphasize that liquidity can affect asset returns. Their analysis of NYSE and AMEX stocks from 1966 to 1995 ultimately yielded a negative relationship between volume and expected stock returns. Chordiaa speculates that increased volume is sourced from lower trading costs, meaning that investors demand a lower return when purchasing securities included in the sample. Chen (2012) finds a negative relationship between volume and returns during bear markets, but a positive relationship during bull markets. Conversely, a positive relationship between volume and returns is found by Karpoff (1988), Gallant (1992) and Shen and Wang (1998). On a related topic, Bessembinder and Seguin (1992) finds that volume and volatility are positively related, emphasizing the need to address stock

variance in our econometric model. A clear disparity exists in literature related to volume and stock prices, as findings range from negative to positive. This disparity is corroborated by a literature review completed by Ruhani et al. (2018).

In completing a meta-analysis of the relationship between trade volume and stock returns, Bajzik (2021) argues that determining the relationship between these variables would bear significance in confirming or denying the efficient market hypothesis. Downey (2021) defines the efficient market hypothesis as a posit that share prices reflect all available information, and that outperforming the market through generating consistent outsized returns is therefore impossible. According to this theory, stocks trade at their fair market value on all exchanges. Karpoff (1988) regards volume as a representation of the flow of information into the market, which may present opportunities for traders, as Tetlock (2007) believes that a sentiment-based trading strategy could be possible following his analysis of *Wall Street Journal* columns on stock returns. If a relationship between trading volume and stock prices is discovered, it would indicate that markets are not indeed fully efficient and reflective of all information. This would thus generate an opportunity for arbitrage and stand to dismiss the efficient market hypothesis, despite its empirical backing. (Bajzik, 2021)

Prior literature establishes that the movement of volume relates to the price of equities. Shen and Wang (1998) repeat an adage of technical analysis held by many traders that abnormally large volume is a sign of price changes. Gebkaa and Wohar (2013) find a complex relationship between these variables. Shen (2012) observes market folklore suggesting that prices and volume are positively related, as volume is necessary for prices to move. Given these fundamental market viewpoints and past research, we estimate an equation where stock price depends on trading volume and other financial market characteristics. We will add to existing

literature by using a linear model, which contrasts with prior researchers, who primarily utilize time series analysis and GARCH models. This linear model permits us to address heterogeneity by instituting control variables, fixed effects, and an instrument. We will be assuming a linear model consistent with an ordinary least squares (OLS) regression:

1. $stockprice_i = \beta_0 + \beta_1 tradingvolume_1 + X_i\gamma + \varepsilon_{it}$

Where $stockprice_i$ is the measure of daily stock price, $tradingvolume_1$ measures the number of shares bought or sold on the same day and ε_{it} is a random error term. This framework will serve as the basis for the remainder of our analysis.

Data

To estimate the relationship between trading volume and stock price, we rely on a dataset of the Standard & Poor's 500 Index (S&P 500) sourced from the New York Stock Exchange. The S&P 500 Index is a market-capitalization float-weighted index of 500 premier leading publicly traded American companies. Containing a large sample of diverse large cap stocks from varying industries, it is considered the benchmark and gauge of the entire equities market. (Kenton, 2022) The dataset is provided by user Cam Nugent on the online data science platform Kaggle. Nugent acquired the dataset through the Investor's Exchange API (IEX), a program that tracks the stock data of all companies listed on the S&P 500 composite index. This data is available to download on the Kaggle website. Spanning from February 8, 2013 to February 7, 2018, this panel dataset includes detailed information regarding publicly traded corporations over the duration of this period. (Nugent, 2018)

The individual unit of observation in this dataset are the daily stock prices of all companies listed on the S&P 500 index. There are 619,040 observations in this dataset. Other

variables listed in this dataset include the date, the open, high, low and close price of each stock, and finally, the volume. For this sake of this analysis, the daily closing price of each stock will be utilized as the regression dependent variable. Utilizing the closing price will permit us to control for the impact of the stock's performance the previous day in our model. In tracking the daily returns of Pacific Basin countries, Gebkaa and Wohar (2013) indicate that accounting for market movement the previous day is important.

Table 1 shows a summary of relevant variables included in the S&P 500 dataset. Variable stock price, the closing daily stock price of each company during the timeframe, has a mean of $83.044 and a standard deviation of 97.39. The standard deviation of this variable exceeding the mean indicates a distribution that includes extreme values. The difference between the minimum stock price ($1.59) and maximum stock price ($2,049) corroborates this notion, suggesting that a small number of corporations with extremely high stock price cause an upward effect in the estimation of the mean and standard deviation of the dataset. These companies will not be dropped from the dataset, however, as many of them have a significantly high enough market capitalization to warrant inclusion given their weighting in the S&P 500. The standard deviation of the trading volume variable (8693609.5 shares) also exceeds its mean (4,321,823.4 shares). Evidently, stocks with high trading volumes skew the distribution. However, they will not be dropped from the dataset due to their market capitalization warranting their inclusion in the Index. The mean number of trading volume, 4,321,823.4 shares, will be utilized in the interpretation of our results. As there is a significant disparity between the magnitude of the mean stock price ($83.044) and mean volume (4,321,823.4), the regression coefficient for trade volume will be extremely small. Thus, we will multiply the mean number of shares traded by this regression coefficient to attempt estimation the true impact of volume increases on price.

Other variables included in Table 1 include the mean and standard deviation of stock variables open, high and low. Similarly, to stock price and volume, the standard deviation of these figures exceeds their means. This is consistent with intuition suggesting extreme values are present in the dataset. Also included in Table 1 are control variables Highlowdiff and Prevday, which we will elaborate on in the Econometric Identification segment of this paper. Binary variable Prevday has a mean exceeding .5, indicating that stocks closed higher than they opened over 50% of the time on average. This figure indicates that the overall stock market was in a bull run during this timeframe.

Econometric Identification

We estimate the relationship between stock price and trading volume using a linear ordinary least squares (OLS) model, as shown in equation 2. Though Bajzik (2021) does not raise questions regarding the viability of OLS in stock analysis, this contradicts prior literature. The main challenge presented by utilizing the OLS framework is controlling for unobserved heteroskedasticity in the stock market. Shen and Wang (1998) note that conditional heteroskedasticity is common for stock returns, particularly in the short run. Given these concerns, we will implement control variables, fixed stock and time effects and an instrumental variable into our model. This will minimize the impact of heterogeneity originating from the behavior of individual firms and variation sourced from time itself. The basic OLS framework that will be utilized for this analysis is presented as follows:

$$2. \quad stockprice_i = \beta_0 + \beta_1 tradingvolume_1 + \varepsilon_{it}$$

Where $stockprice_i$ is the measure of daily stock price, $tradingvolume_1$ measures the number of shares bought or sold on the same day and ε_{it} is a random error term. We will term

this framework Model 1. As it lacks sophisticated controls, it can only be considered as a preliminary estimate of the true impact of trading volume on stock price. To address conditional heteroskedasticity contained in the error term, we will implement several control variables in Model 2:

3. $$stockprice_i = \beta_0 + \beta_1 tradingvolume_1 + \beta_2 Highlowdiff_1 + \beta_3 Prevday_1 + \beta_4 month_1 + \varepsilon_{it}$$

This framework introduces three primary control variables. $Prevday_1$ is a lagged binary variable reflecting whether the stock closed higher than it opened the previous trading day. It is coded 0,1, with value 0 representing the stock closing lower than its opening price and 1 if it closes higher than its opening price. Control variable $Highlowdiff_1$ is introduced to control for short-run volatility in stocks. It is calculated as the difference between the High and Low price of a stock on a given day. Thus, the effects of a stock's volatility throughout a trading day will be held constant throughout this analysis. Finally, we follow Gallant et al. (1992) in introducing monthly controls. Variable $month_1$ represents a value coded contingent on the month of the year, holding the impact of the month on stock price constant.

As we are working with a panel dataset, we will introduce fixed effects into our model. The fixed effects will hold constant the impact of individual publicly traded companies and the impacts of time. By implementing these fixed effects, we are controlling for the average differences of both observed and unobserved variation across all companies in the dataset. This greatly minimizes the effect of omitted variable bias in our analysis. We are instituting both fixed effects for the individual stocks and daily time fixed effects. The time fixed effects will eliminate any observed and unobserved heteroskedasticity across all individual days included in this dataset. Thus, Model 3 can be outlined with the following equation:

$$4.\quad stockprice_i = \beta_0 + \beta_1 tradingvolume_1 + X_i\gamma + \alpha_i + \lambda_t + \varepsilon_{it}$$

Where X_i is a set of control variables Highlowdiff, Prevday and month, α_i is represents stock fixed effects and λ_t contains daily time fixed effects. Though we have now controlled for a significant quantity of omitted variable bias, we can maximize the robustness of our final model by introducing an instrumental variable. This variable must be exogenous, only impacting stock price through trade volume. Shen and Wang (1998) included weekday dummy variables in their analysis of trading volume and price limits on the Taiwan Stock Exchange. We will build off this previous research by introducing instrumental variable day of week. The day of the week will not impact the prices of individual stocks except through the quantity of stocks traded on that individual day. A Tuesday trading day will not influence stock price except through the number of shares exchanged on a Tuesday. Our final, headline 2 Stage Least Squares regression can be modeled with the following equations:

$$5.\quad stockprice_i = \beta_0 + \beta_1 \widehat{tradingvolume_1} + X_i\gamma + \alpha_i + \lambda_t + \varepsilon_{it}$$

$$6.\quad \widehat{tradingvolume_1} = \Pi_0 + \Pi_1 Z_{dow} + X_i\theta + \alpha_i + \lambda_t + \upsilon_{it}$$

Where $\widehat{tradingvolume_1}$ is an instrumented variable representing trading volume and Z_{dow} is instrument variable day of week, which does not impact stock price except through trade volume. Equation 5 outlines Model 4, the primary regression utilized in this analysis. When combined with our existing stock and time fixed effects, our model appears to be robust and controls for a large quantity of heterogeneity in the data.

A further way to approach this question is through the percentage change of a stock in response to an increase in volume. The percentage change of a financial asset is defined as its return (Hayes, 2021). Considering much of related literature on this topic focuses on the impact of trade volume on stock returns, introducing a nonlinearity will function as a robustness check

and a point of comparison with prior research. Furthermore, we add to prior research conducted by Gebkaa and Wohar (2013), who find a complex, nonlinear relationship between volume and stock returns. An updated model (Model 5), modified to include nonlinearities, reveals the percentage change in stock price due to a single trade increase in volume:

$$7.\quad lnstockprice_i = \beta_0 + \beta_1 \widehat{tradingvolume}_1 + X_i\gamma + \alpha_i + \lambda_t + \varepsilon_{it}$$

Where $lnstockprice_i$ represents the percentage change in stock price given an increase of shares traded.

This OLS framework represents a strong basis for estimating the impact of volume on stock price. However, it is imperfect. Other sources of bias remain and were unable to be controlled for due to limitations in the available dataset. Information regarding the specific industry of all companies listed in the S&P 500 was not available. Thus, industry-specific effects are unable to be controlled for in this analysis. Theoretically, financial stocks may be subjected to higher volume than agricultural stocks, which could lead to a disproportionate impact on stock prices. This may lead to an overestimation or underestimation of the true effect of trading volume on stock price. Macroeconomic conditions during the period reflected by the data are generally consistent, limiting the application of this analysis beyond the conditions of an expanding U.S. economy.

Results

We begin with a preliminary, first-stage ordinary least squares regression including only independent variable trade volume and dependent variable stock price. This regression, Model 1, is included in Column 1 of Table 2. No further control variables, stock or time fixed effects or instrumental variables are implemented in this model. We find a negative relationship between

trade volume and stock price (-1.600e-06), statistically significant at the one percent level (standard error of 2.590e-08). This suggests that, on average, a single trade will decrease stock prices by a small quantity. Multiplying the regression coefficient by 4,321,823.4, the mean trading volume of S&P 500 stocks in Table 1, an average stock price decrease of -$6.91 is found. However, this model lacks adequate control variables, as indicated by a small adjusted R^2 of .02039084.

To build a more sophisticated model, we introduce several control variables. Included in Model 2, depicted in Column 2 of Table 2, are control variables highlowdiff and Prevday. Monthly control variables are also implemented. In this second model, we find another negative relationship between trade volume and stock price (-9.698e-07), statistically significant once more at the one percent level (standard error of 1.720e-08). Multiplying the regression coefficient by the mean trading volume reveals a decrease in stock price of -$4.19. This result suggests that our preliminary Model 1 overestimated the magnitude of stock price decrease.

The coefficients for control variables Highlowdiff (34.921249) and Prevday (2.7617624) are both positive and statistically significant at the one percent level (with standard errors of (.35171411 and .15351793, respectively). Based on these results, we can infer that larger volatility and an equity's performance the previous day are both positive sources of a stock price increase. We further conduct an F-Test of Highlowdiff in Model 2, finding a result of 9858,25, indicating that it is a significant control variable. Coefficients for the monthly variables are all positive and statistically significant at the one percent level. We find an adjusted R^2 of .62175199, indicating that this model is a more effective fit for the data.

In Model 3, presented in Column 3 of Table 2, and given our panel dataset, we implement both stock and time fixed effects. We include these fixed effects to control for any

daily variation in specific equities over time. The average effects of each stock (stock effect) and each trading date (time effect) are held constant, eliminating any observed or unobserved conditional heteroskedasticity in individual companies. After completing the fixed effects regression, we once again find a negative relationship between trading volume and stock price (-5.090e-07), statistically significant at the one percent level (standard error of 1.075e-07). We find a decrease of stock price by -$2.20 after multiplying the volume regression coefficient by the mean trading volume. This represents a substantial change in the magnitude of the stock price decline. Model 3 suggests a difference of $1.89 in the decline of stock price relative to Model 2, and a $2.82 difference in the decline of stock price relative to Model 1. Without fixed effects, the magnitude of stock price decline is overestimated.

Examining the other control variables yields notable results. The coefficients for Highlowdiff (7.5999057) and Prevday (1.1828226) are both positive, but of smaller magnitudes relative to Model 2. They remain statistically significant at the one percent level. The robust standard error of Highlowdiff increases from Model 2, suggesting greater variance of volatility values, while the standard error of Prevday decreases. Coefficients for month variables remain positive and statistically significant at the one percent level, with the exception of the month of October (-2.531538), which has a negative coefficient, and November (.08794807), which has no statistical significance. This result indicates that the month of November contributes neither positively nor negatively to a change in stock price. The Adjusted R^2 of the model declines significantly relative to Model 2, however, decreasing to .10410542. The model is a less effective fit for the data at hand.

As a final step to develop a maximally robust result, we introduce an instrumental variable for day of the week. Each weekday (Monday, Tuesday, Wednesday, etc.) is coded with

a specific value. Day of the week is an exogenous instrument within our regression framework because the effect of each weekday will not impact individual stock prices except through the quantity of trades on that given day. For example, the trading day of a Monday will not impact specific stock prices except through the number of shares traded because it is Monday. To evaluate the strength of this instrument, we complete a regression with day of week as a control variable. We find the instrumental variable, *dow*, to have an F-statistic of 13.75. As the value of the F-statistic is greater than ten, it is a sufficiently strong instrumental variable for the sake of our analysis. We will proceed with Day of Week as an instrumental variable.

Our final headline 2 Stage Least Squares regression includes regressor trade volume, control variables highlowdiff and Prevday, monthly controls, stock and time fixed effects, and the day of week instrumental variable. Our result in Model 4 differs drastically from our previous Models. Included in Column 4 of Table 2, we find a positive relationship between trade volume and stock price (5.606e-07), significant at the ten percent level (standard error of 3.273e-07). When multiplied by the mean trading volume included in Table 1, this represents an increase of stock price by $2.42. This is a positive change in stock price relative to Model 3 by $4.62. This result significantly alters our interpretation. With the day of week instrument *dow* included in our model, an increase of trading volume by an additional trade increases stock price by $.0000005606. It is important to note the loss of statistical significance with this result, suggesting that this positive value is harder to differentiate from a zero change in stock price due to an increase in trading volume.

Model 4 yields further results of interest in control variables. Variables highlowdiff (7.187223) and Prevday (1.2723824) maintain positive regression coefficients, which are statistically significant at the one percent level (standard errors of .12977547 and .08369697,

respectively). Neither the coefficients nor standard errors are substantially different from Model 3, suggesting that the inclusion of the instrumental variable *dow* does not alter the impact of the market's volatility or previous day's performance in comparison to the fixed-effects only regression. Coefficients for monthly variables are all positive and statistically significant at the one percent level with exceptions of the months of August and November. August has a negative regression coefficient (-.42586915) that is not statistically significant at any level. The impact of the month of August on stock price is not substantially different from zero. The coefficient of November remains positive (.61060662) and adds two levels of significance, now significant at the five percent level.

We extend our findings and further test for robustness by introducing nonlinearities to our model. Introducing the log of Stock Price represents the most appropriate nonlinearity. As stated previously, much of prior literature focuses on stock returns. By logging stock price, we can determine the percentage change in stock price contingent on volume. This effectively represents the change in stock returns, which are defined as the percent change in price of a financial asset or investment (Hayes, 2021). Model 5, presented in Table 3, includes a 2 Stage Least Squares regression with logged Stock Price, while maintaining all previous controls from Model 4, including highlowdiff, Prevday, monthly controls, stock and daily fixed effects, and the day of week instrumental variable. We find a positive percentage increase in stock price (7.400e-09) for an additional trade, statistically significant at the one percent level (standard error of 2.600e-09). When multiplied by the mean trading volume value in Table 1, the percentage change in stock price equates to 3.20%. This indicates a substantial, positive influence of trading volume on stock returns. Coefficients for control variables highlowdiff (.03776876) and Prevday (.01172677) are positive and statistically significant at the one percent level (standard errors of

(.00102136 and .00065871, respectively). All monthly control variables have positive regression coefficients and are statistically significant at the one percent level barring November. Akin to Model 3, November has a positive coefficient (.00264719) with no statistical significance (standard error of .00199356). The month of November appears to have no major discernable impact on stock returns. Ultimately, the results of Model 5 pertaining to the impact of trade volume on stock returns corroborate our previous findings in Model 4 regarding the impact of trade volume on stock price.

All told, we find evidence that trade volume causes a small but notable increase in stock price. These findings extend to the impact of trade volume on stock returns, which is also positive and statistically significant at the one percent level. These findings are consistent with previous literature, including Chen (2012) who finds a positive relationship between volume and stock returns during bull markets; Karpoff (1988) who suggests that costs incurred by short-sellers minimizes the influence of bears during periods of high trading volume; and Bessembinder and Seguin (1992) who discover a positive relationship between volume and volatility in futures trading.

Although our results are in line with prior research, several important caveats apply to our model. First, our dataset lacks any information regarding a relevant control variable: the industry of each stock included in our analysis. Thus, while we can control for company-specific impacts through fixed effects, we cannot account and control for the impacts of certain industries of varying volumes and its impact on stock prices. Informational technologies, financials and real estate stocks are weighted differently within the S&P 500. (Reiff, 2022) Our inability to control for industry-specific effects may have caused us to either overestimate or underestimate the true impact of trade volume on stock price. This is a source of major omitted variable bias.

Secondly, we did not control for any macroeconomic factors that can influence the stock market. Arago and Nieto (2004) found that macroeconomic factors prevail over specific company factors in determining market returns. Our model does not account for these factors outside of through the Prevday control variable, which is a reflection of the general past performance of the stock market. As the period from 2013 to 2018 can be characterized as a bull market, this control variable does capture the effects of certain positive macroeconomic indicators that may influence stock price.

Finally, we assume that changes in our instrumental variable, day of week, has no impact on stock price except through changes in trading volume. Though the F-statistic for the instrumental variable exceeds ten, indicating it is strong, it is still not a perfect instrument. Companies issue earnings reports on certain trading days, which can have a substantial impact on their stock. Shadka (2007) finds a strong negative relationship between expected stock returns and expected firm earnings. Earnings reports may increase trading volume, which permits our model to capture some of this effect. Gillette et al. (1999) finds that trade volume is inversely related to traders' expectations of the standard deviation of dividends forecasts, which lends some credence to our instrument as stock price is only impacted through volume.

Acknowledging these caveats, our results are consistent with prior literature regarding stock returns during bull markets and are robust to minimize the impact of undesired biases. We find that trading volume has a small and somewhat significant impact on both stock price and stock returns.

Conclusion

We find a small, slightly statistically significant increase in stock price when trade volume increases for stocks listed in the S&P 500 index. These results occur after our preliminary results indicated a negative relationship between volume and stock price. We find this positive relationship after controlling for stock performance and volatility, as we implemented fixed effects and a robust instrumental variable to address unobserved heterogeneity in the market. Our findings are consistent with prior literature reviewing the relationship between volume and stock returns during bull markets, which the U.S. stock market between 2013 and 2018 can be characterized as.

As higher volume increases stock price, this presents a potential opportunity for traders to profit during bull markets. Our results are consistent with research by Stickel and Verrecchi (1994), who are unable to deny the existence of arbitrage opportunities in their analysis of volume and stock price. Arbitragers can emerge to take advantage of the disparity in price between the increase volume and the fair market value of a company. The existence of arbitragers disputes the notion that the financial markets are fully efficient. (Downey, 2021) Gebkaa and Wohar (2013) do acknowledge that it may be difficult for traders to take advantage of this relationship. Nonetheless, the actions of these traders will reduce the disparity in price but will increase trade volume on these stocks. Evaluating the difference in the magnitude of price change between the correction of the market inefficiency and the subsequent increase in volume is an area warranting further research.

Overall, increases in trading volume of publicly traded companies listed in the S&P 500 stock index have a positive, though not fully significant, relationship with the corresponding stock price. When accounting for the mean trading volume of a stock, stock price tends to

increase by $2.42 and stock returns increase by 3.20%. Though counteracting our initial research, our analysis is robust in controlling for heterogeneity. This apparent positive connection between trading volume and stock price improves our knowledge of financial market structure. Furthermore, it reveals an opportunity for a volume-based arbitrage trading strategy, disputing a central tenant of the efficient market hypothesis. Finally, it represents an important consideration for public policy makers, as legislation that could impact trade volume has clear bearings on stock prices.

Appendix

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Price	619040	83.044	97.39	1.59	2049
Volume	619040	4321823.4	8693609.5	0	6.182e+08
Open	619029	83.023	97.379	1.62	2044
High	619032	83.778	98.208	1.69	2067.99
Low	619032	82.256	96.507	1.5	2035.11
Highlowdiff	619032	1.522	2.173	-.255	138.26
Prevday	618535	.523	.499	0	1

Table 2: Primary Regressions

Stock Price	(1) First Stage	(2) Controls	(3) Fixed Effects	(4) DoW Instrument
Volume	-1.60e-06***	-9.698e-07***	-5.090e-07***	5.606e-07*
	(2.590e-08)	(1.720e-08)	(1.075e-07)	(3.273e-07)
Highlowdiff		34.921249***	7.5999057***	7.187223***
		(.35171411)	(1.0122101)	(.12977547)
Prevday		2.7617624***	1.1828226***	1.2723824***
		(.15351793)	(.13263911)	(.08369697)
February		3.2878162***	6.3817586***	6.5160311***
		(.41319261)	(.50306153)	(.20400271)
March		7.9680845***	4.2436125***	3.9047188***
		(.39551458)	(.46659219)	(.21998833)
April		5.2664731***	5.2690293***	4.9360958***
		(.39575619)	(.60144191)	(.22057438)
May		9.8509729***	3.1303168***	2.5182104***
		(.39705316)	(.52658681)	(.27031429)
June		10.165068***	2.0490714***	1.5963077***
		(.40568221)	(.48008362)	(.23859348)
July		11.056931***	1.5333182***	.86882919***

		(.40227109)	(.43815368)	(.28147722)
August		9.7191898***	1.3586382***	-.42586915
		(.42969345)	(.35207087)	(.34440017)
September		8.8981954***	1.8359448***	1.2799356***
		(.4014514)	(.34055509)	(.25936144)
October		3.6344436***	-2.531538***	2.1391052***
		(.39148265)	(.23992614)	(.22647024)
November		6.3895765***	.08794807	.61060662**
		(.41258804)	(.21944036)	(.25330551)
December		8.3437717***	.95264986***	1.6565103***
		(.3933017)	(.22517868)	(.28991415)
Constant	89.957527***	26.024646***	75.319132***	70.822962***
	(.17432272)	(.70342683)	(1.6853926)	(1.3845842)
Observations	619040	618529	618529	618529
Adj R^2	.02039084	.62175199	.10410542	.z
F-stat	3828.6506	1444.7762	37.428605	.z
Stock FE	No	No	Yes	Yes
Daily FE	No	No	Yes	Yes
Dow IV	No	No	No	Yes

Notes: Regression coefficients are significant at the one (***), five (**) and ten (*) percent level. Robust standard errors are displayed in parentheses. Month variables are categorical and are included in the 2nd, 3rd and 4th regressions. The sample consists of stock open, close, high, low, volume and date. High-Low Difference is calculated difference between the stock's open and close price on a given trading day. Previous Day's Performance is a binary variable representing whether the stock closed higher than it opened on the preceding trading day.

Table 3: Nonlinearities Regression

LnStockPrice	(5) price
Volume	7.400e-09***
	(2.600e-09)
Highlowdiff	.03776876***
	(.00102136)
Prevday	.01172677***
	(.00065871)
February	.07301438***
	(.00160554)
March	.05128507***
	(.00173135)
April	.05740496***
	(.00173596)
May	.03495897***
	(.00212743)
June	.02485806***
	(.00187778)
July	.01736178***
	(.00221528)
August	-.0152789***
	(.0027105)
September	.02396729***
	(.00204122)
October	.02790584***
	(.00178236)
November	.00264719
	(.00199356)
December	.01509749***
	(.00228168)
Constant	4.0643591***
	(.01089694)
Observations	618529
Adj R^2	.z
F-stat	.z
Stock FE	Yes
Daily FE	Yes
Dow IV	Yes

Notes: Regression coefficients are significant at the one (***), five (**) and ten (*) percent level. Robust standard errors are displayed in parentheses. Month variables are categorical. The sample consists of stock open, close, high, low, volume and date. High-Low Difference is calculated difference between the stock's open and close price on a given trading day. Previous Day's Performance is a binary variable representing whether the stock closed higher than it opened on the preceding trading day. LnStockPrice is the logged value of Stock Price. The coefficient for volume represents the percent change in stock price given an additional trade of a company's stock.

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Poverty Rate Inequality: Analyzing the Causes of the Larger Difference in the Poverty Rates between Black and White Americans in Philadelphia and New York City – *Patrick Carney, Villanova University*

Introduction

Amongst the "poorest large cities in the United States," Philadelphia's poverty rate of 26 percent was the third highest in the country and has consistently been higher than the national average, which is around 11.4 percent. [1] Included in the impoverishment of the city are black Americans, whose poverty rate of around 30% is the second-highest in Philadelphia among racial groups.[2] Comparatively, white Americans in the same area have a poverty rate of only 13%, which is the lowest rate among all racial groups in the city. These two numbers are drastically different, especially when compared to New York City, where the poverty rates among black Americans have hovered around 20% and among white Americans have stayed around 12%.[3] Why is there a larger difference in the poverty rates between black and white Americans in Philadelphia when compared to New York City? To find out why, this paper analyzes different variables that cause poverty. Specifically, it seeks to identify the factors that are not as drastic or do not exist in New York City that, comparatively, cause black Americans to face higher rates of poverty than whites in Philadelphia.

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[1] Diez Roux AV, Moore KA, Melly SJ, Wang X, Joshi R. 2017. "Neighborhood Health and Poverty in Philadelphia. Urban Collaborative Data Brief Number 2." Philadelphia, PA:Dornsife School of Public Health, Drexel University. ; Bureau, US Census. "Income and Poverty in the United States: 2020." Census.gov, October 18, 2021.

[2] Eichel, Larry. "Philadelphia 2021: The State of the City." The Pew Charitable Trusts, April 2021.

[3] Eichel, "Philadelphia 2021: The State of the City." ; New York City Government; NYCgov Poverty Rates, by Race/Ethnicity
Total NYC Population, 2005 - 2019

Existing literature explains this difference in poverty rates between black and white Americans through three different schools of thought, those being the redlining policy school of thought, the economic school of thought, and the education school of thought. Through analysis of data from Philadelphia and New York City, the education and economic schools of thought best explained the higher rate of poverty among black Americans in Philadelphia when compared to New York City. Although the policy school of thought helped explain differences in poverty rates between white and black Americans, there was not enough concrete data to support the hypothesis that there were significant differences in redlining policies between Philadelphia and New York that would help cause the difference between the two cities.

The structure of the paper will proceed as follows. The subsequent section will analyze the existing literature on differences in poverty rates between white and black Americans. Then, the logic behind the selection of New York City and Philadelphia as cases will be discussed. This will be followed by a discussion of how I have chosen to operationalize the key terms to answer the question at hand, as well as a discussion of the method of analysis used, and the sources of the data found. After this, relevant data will be presented with an analysis of this data and the findings that the data leads to. To close, the findings and the implications of this paper for the future will be discussed.

Existing Literature

In order to answer the question, existing research on poverty and the difference in poverty rates between races have to be analyzed. To perform this analysis, the different relevant research can be organized into different "schools of thought" or "approaches." For this specific topic, the explanations can be organized into the following three trains of thought: the redlining

school of thought, the economic school of thought, and the education school of thought. The redlining policy school of thought seeks to explain the reason for higher poverty rates—which contribute to the difference between white and black poverty rates—as policies on the federal, state, or local levels lead to higher poverty rates in black communities than in white communities. The economic school of thought contends that unemployment and low social spending correlate with and are major contributors to the difference in these poverty rates. Specifically, this approach argues that unemployment, lower spending on social programs that help individuals living in poverty, low-paying jobs, and the social impacts of unemployment cause individuals to live in poverty. Finally, the education school of thought seeks to explain the difference between the two groups' poverty rates through the lens of education, focusing on low spending on education and the impacts this has on students living in poverty.

Redlining Policy

Literature falling into this school of thought argues that different redlining policies help lead to higher poverty rates amongst black individuals. The policy itself encompasses laws passed on local, state, and federal levels in the United States. The significant policy that has led to the difference in poverty rates was instituted by the Home Owners Loan Corporation and is known as redlining.[4] The Home Owners Loan Corporation (HOLC) was founded in 1933 as part of President Franklin Roosevelt's New Deal, and it aimed to help expand access to housing for white American housing via loans.[5] This federal corporation literally drew red lines around areas that contained a higher population of black Americans, aiming to segregate black Americans

[4] Gross, Terry. "A 'Forgotten History' of How the U.S. Government Segregated America." *NPR*. May 3, 2017.
[5] Gross, Terry. "A 'Forgotten History' of How the U.S. Government Segregated America."

from white Americans, and effectively barring them from investing in a home. By doing so, the HOLC helped to take away a key factor in establishing wealth in the United States: homeownership. Research suggests that, at as of 1990, areas that were redlined have home values that are on average about 5% lower than areas that were not redlined, with their value continuing to decrease since.[6] The majority of the areas that were redlined in both Philadelphia and New York were occupied by black Americans and were redlined because these individuals lived there. Literature on this has shown that this redlining has led to higher poverty levels among individuals in these areas.[7] Since the majority of individuals who live in these areas are black, the conclusion is that redlining leads to higher poverty amongst these black individuals.

Economic Approach

The next school of thought deals with the impact unemployment, low-paying jobs, low social funding, and unemployment have on poverty rates, while also addressing the difference in poverty rates among races. For example, an analysis of the causes of poverty, as well as the difference between black and white poverty rates, suggests that employment explains almost 20% of the discrepancy in poverty between black and white Americans.[8] Additionally, being unemployed, which black Americans face at a rate consistently twice that of white Americans, has shown to contribute to mental and physical impediments to the condition one is in and the ability to find and maintain a job, which together lead to further poverty. [9] Other evidence leads

[6] Appel, Ian and Jordan Nickerson. "Pockets of Poverty: The Long-Term Effects of Redlining." SSRN Electronic Journal, October 15, 2016, 1–53.
[7] Appel, Ian. "Pockets of Poverty: The Long-Term Effects of Redlining."
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[9] Paul, Mark, William Darity, Darrick Hamilton, and Khaing Zaw. "A Path to Ending Poverty by Way of Ending Unemployment: A Federal Job Guarantee." RSF: The Russell Sage Foundation Journal of the Social Sciences 4, no. 3 (2018): 46. Goldsmith, Arthur, Jonathan Veum, and William Darity Jr. 1997. "Unemployment, Joblessness,

to the conclusion that higher poverty rates amongst black individuals coincide with lack of employment, and that their financial situation will not improve without access to quality employment.[10] Research also shows that social spending programs, such as welfare, food stamps, government healthcare, and government-supported housing, all help alleviate poverty.[11] Therefore, higher spending on programs such as these would ultimately help black individuals at a higher rate than white individuals, since the poverty rate of black individuals is higher than that of white individuals.

The literature falling under this school of thought may be the strongest in support of the difference between white and black Americans' poverty rates. Conclusive evidence suggests that relatively higher rates of unemployment play a major role in causing black Americans to live in poverty. For example, the fact that white Americans are employed at a much higher rate is strong evidence to indicate that unemployment causes poverty, especially given that other research in this approach strongly suggests a lack of employment directly correlates with poverty.[12]

Therefore, these data from the economic approach have a strong argument to imply an almost definite causal relationship between unemployment and poverty. However, although unlikely, the possibility must be noted that these two variables could both be caused by a third variable. Literature under the redlining school of thought shows how redlining has contributed to retail discrimination within black areas due to redlining. This retail discrimination entails

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Psychological Well-Being and Full Employment: Theory and Evidence." Journal of Socio-Economics 26(2): 133–58. quoted in Paul, Mark, et al; "A Path to Ending Poverty by Way of Ending Unemployment: A Federal Job Guarantee." *RSF: The Russell Sage Foundation Journal of the Social Sciences* 4, no. 3 (2018): 46

[10] Teitz, Michael B., and Karen Chapple. "The Causes of Inner-City Poverty: Eight Hypotheses in Search of Reality." *SSRN Electronic Journal*, Emerging Issues in Urban Development (1998), Vol. 3, no. No. 3 (1999): 33–70.

[11] Rothenberg Pack, Janet "Poverty and Urban Public Expenditures," Urban Studies, Vol. 35, no. 11 (1998): 1995-2019,; M. Joassart-Marcelli, Pascale, Juliet A. Musso, and Jennifer R. Wolch, "Fiscal Consequences of Concentrated Poverty in a Metropolitan Region," Annals of the Association of American Geographers, Vol. 95, no. 2 (2005): 336-56,

[12] Baker, Regina S., David Brady, Zachary Parolin, and Deadric T. Williams. "The Enduring Significance of Ethno-Racial Inequalities in Poverty in the U.S., 1993–2017."

companies divesting from redlined communities, which in turn would lead to the lack of high paying, or even any, employment opportunities.[13] This antecedent factor suggests that the redlining has helped cause the economic environment leading to higher unemployment amongst, and worse paying jobs for, black individuals that have subsequently helped lead to higher levels of poverty when compared to white Americans amongst black Americans.

Educational Approach

Lastly, some works fall under the educational school of thought. This school suggests that lower educational quality, based on outcomes and funding, leads to the difference in poverty rates among races. For example, the lack of education spending policies by the state and federal government that might address the disparity in educational outcomes in math and reading has helped to contribute to the poverty gap between black and white Americans.[14] These educational differences show lower-quality education, such as lower retention rates among black elementary and high school students, which also may help explain the higher poverty rate in these communities.[15] Also, there is data to suggest that these differences in the quality of education—as measured through outcomes for reading, writing, math, retention in high school, and continuation to higher education—between black and white Americans contribute to about 37% of the difference in the poverty rates of these two groups.[16] Studies across the globe and the

[13] Knowles, Anne Kelly, and Amy Hillier. "Redlining in Philadelphia." Essay. In Past Time, Past Place: GIS for History, 79–92. Redlands, CA: ESRI Press, 2004.
[14] Paschall, Katherine W., Elizabeth T. Gershoff, and Megan Kuhfeld. "A Two Decade Examination of Historical Race/Ethnicity Disparities in Academic Achievement by Poverty Status." *Journal of Youth and Adolescence* 47, no. 6 (2018): 1164–77
[15] Paschall, et al; "A Two Decade Examination of Historical Race/Ethnicity Disparities in Academic Achievement by Poverty Status." *Journal of Youth and Adolescence* 47, no. 6 (2018):1175.
[16] Gradín, Carlos. "Poverty among Minorities in the United States: Explaining the Racial Poverty Gap for Blacks and Latinos." *Applied Economics* 44, no. 29 (2012): 3793–3804.

United States have shown that higher educational quality leads to lower poverty and economic development.[17] Therefore, the low quality of education in poor black communities can be seen to lead to further impoverishment in the same communities.

The strength of the argument in this train of thought lies in the high correlation between poor education and the difference in the poverty levels between white and black Americans. This correlation is high enough to suggest that poor education may be a large causal factor behind this difference. However, similar to the weakness in the literature regarding the perpetual poverty train of thought, there still is reason to question the causal relationship between poor education and poverty. Could this contrast in poverty rates be because the high poverty rates lead to poor quality education? Or because another factor, such as employment issues among poor black Americans, is the cause for both of these factors. These reasons must be considered in order to properly assess this school of thought.

Case Selection

I am planning on analyzing the major causes of differences in poverty within the United States. I analyze the different variables that cause poverty. In turn, I analyze the factors identified as causing poverty that either does not exist or are not as drastic in New York City as they are in Philadelphia. In all, I am hoping to attribute these factors as the cause of the difference in the cities' poverty rates, as well as identify what causes the difference in the poverty rates between races. The time frame in which poverty rates between the two groups are measured extends from

[17]Tariq Khan, Muhammad. "Role of Education in Poverty Reduction" *International Journal of Information, Business and Management,* 7, No. 3 (2015): 124-134

2005 to 2019, spanning 15 years. This time frame is selected for several reasons. The fact that the poverty rate in each city has not fluctuated on an extreme level, which is established as 10% due to the fact that this is between 33% to 50% of each of the two cities poverty rates over any period of time from 1950 onwards is one, and the other being that this 15-year period provides recent data that is easy to access.

The variation exists between the two cities in multiple areas. First, in terms of their geographic location, Philadelphia is in Pennsylvania and subject to the state and local laws and the same as New York City for the state of New York. Further, the state legislature in Pennsylvania has mostly been run by Republicans over the time period, whereas the opposite is true in New York. Finally, the poverty rate amongst black individuals is different in these two cities, averaging about 10% higher in Philadelphia over the period.

These two cities are appropriate for answering the research question due to some of their similarities. For example, both cities have mostly had Democratic mayors since 1985, with New York City having around 10 years of Republican mayoral leadership in that period compared to Philadelphia having none.[18] Further, in terms of population, New York City is the largest city, followed by Philadelphia second, on the Eastern coast of the United States.[19] Additionally, they are both situated in a similar geographic location, located only 95 miles apart from each other, therefore experiencing quite similar weather. Also, the two cities are similar economically, having converted from mainly industrial hubs to now more serving as hubs of service workers. Each city lost the majority of its industrial workers from 1950 onwards and subsequently can be

[18] "City Archives: Department of Records." City of Philadelphia. City of Philadelphia, April 1, 2022. Mayors of the City of New York. New York City Government.

[19] Bureau, US Census. "City and Town Population Totals: 2010-2019." Census.gov. US Census Bureau, October 8, 2021. https://www.census.gov/data/tables/time-series/demo/popest/2010s-total-cities-and-towns.html.

considered deindustrialized.[20] These two cities also share cultural similarities, given that they are both in the United States and quite proximal to each other. The difference in poverty rates between black Americans and white Americans in these two locations is why New York City was chosen; there exists a large difference in poverty rates between races in both cities, but a larger difference within Philadelphia. What is of interest in this area is the fact that across the time period of 2005-2019, the poverty rate amongst black individuals in New York City has declined marginally while the poverty rate of this group in Philadelphia has stayed approximately the same. This, when coupled with the social, geographic, political, and economic similarities of the two cities make it logical to compare these rates and see why there is a larger difference in the poverty rates between black and white Americans in Philadelphia compared with New York City.

Defining Key Concepts

In order to answer the question at hand, terms used to operationalize poverty, such as poverty and poverty rates, must be defined. Further, educational spending per student and social spending must be defined as they will be used in this paper. The Census Bureau determines poverty status by using an official poverty measure (OPM) that compares pre-tax cash income against a threshold that is set at three times the cost of a minimum food diet and adjusted for family size and inflation.[21] As for poverty rates, the annual poverty rate describes the percent of people who were classified as such in the aforementioned definition of poverty in a calendar

[20] Licht, Walter. "Workshop of the World." Encyclopedia of Greater Philadelphia, February 1, 2022. Hopper, Kim, et. al "Urban Anthropology and Studies of Cultural Systems and World Economic Development" *The Institute, Inc.* Vol. 14, No. 1/3, Declining Fortunes: Anthropological Perspectives on Deindustrialization (SPRING-SUMMER-FALL): 197

[21] US Census Bureau. 2019. "How the Census Bureau Measures Poverty." Census.gov. August 27, 2019.

year.[22] These are the definitions used for poverty as well as poverty rates when speaking about New York City and Philadelphia. As for educational spending per student, this term is used to describe the dollar amount spent on average in a city on a single student in a given year. As for social spending programs, the following adjusted definition[23] is used for social spending programs: "Social expenditure is the provision by government institutions of benefits to, and financial contributions targeted at, households and individuals to provide support during circumstances that adversely affect their welfare, provided that the provision of the benefits and financial contributions constitutes neither a direct payment for a particular good or service nor an individual contract or transfer."[24] Examples of these types of expenditures would include but are not limited to, child welfare, food stamps, homeless services, and housing assistance. These definitions are used when describing the social and education per capita spending of Philadelphia and New York City.

Hypotheses

Multiple hypotheses are tested to determine whether the factors described in the literature review to cause the difference in poverty rates between white and black Americans in Philadelphia and New York City can be attributed as factors causing the higher poverty of black Americans in Philadelphia than in New York City. The first hypothesis to be tested stems from the education school of thought; this hypothesis contends that lower funding per student for

[22] US Census Bureau. 2019. "How the Census Bureau Measures Poverty."

[23]This definition has been adjusted from the original definition from the Office of Economic Cooperation and Development to remove the word "private" from the definition and the replacement of the word "public" with government. This was done in order to specify government spending on the described programs, as these are the relevant programs at hand in this paper

[24]Adema, Willem, and Pauline Fron. "The OECD SOCX Manual." OECD. *Office of Economic Cooperation and Development*, 2019.

education in Philadelphia than in New York City has led to higher black poverty rates. This hypothesis is tested based on data on education spending per student in each city. The next hypothesis based on the redlining policy school of thought attempts to see if higher levels of discriminatory redlining policies in Philadelphia than in New York have led to higher black poverty rates in Philadelphia. Data on the methods of redlining in each respective city are collected in order to test the hypothesis. Finally, the last hypothesis seeks to prove that lower social spending per capita and fewer job opportunities in Philadelphia lead to higher black poverty rates than in New York. Information on employment opportunities and employment overall by race in each city, as well as respective social spending program funding, is interpreted to analyze this hypothesis.

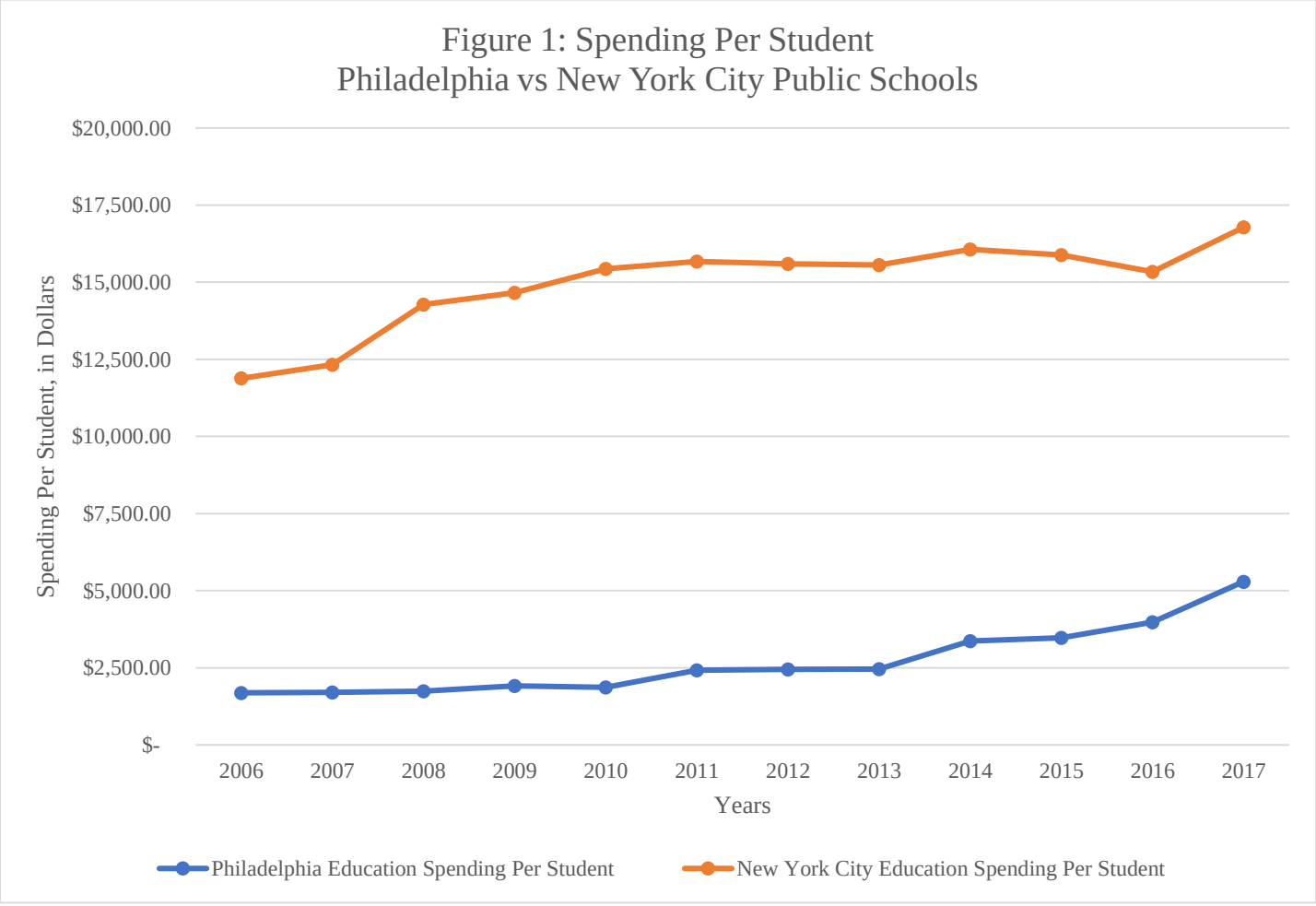
Data and Method of Analysis

Preview of Data and Method of Analysis

The following section will discuss the data discovered and the respective relationships that these data have to the larger difference in the poverty rates between black and white Americans seen in Philadelphia when compared to New York City. First, in order to test the education spending per student hypothesis, an interpretation of the spending in New York City and Philadelphia is done. This spending is then compared between the two cities in order to see if a higher rate of spending on each student in New York has caused a lower poverty rate comparatively to New York, which the data suggests is a possible cause. This data is also related to the poverty rates of each city to see if there is a direct impact on higher spending over time reducing the poverty rate of either respective city. Next, the limitations on access to redlining data that would allow a comparison of New York and Philadelphia, as well as limited data on

employment opportunities and levels of employer discrimination in the two cities made testing the redlining hypothesis and part of the economic hypothesis impossible are presented. Finally, data on the expenditures by each city on social spending are compiled in order to test the social spending per capita hypothesis. The social spending per capita in each city shows that lower per capita spending in Philadelphia compared to New York could be a cause of the higher black poverty rates in Philadelphia. Then, the social spending per capita will be juxtaposed with the cities' poverty rates to see the trend overtime in each city with the context of the social spending.

Testing the Education Spending Per Student Hypothesis



The education spending hypothesis suggests that the difference in black poverty rates between Philadelphia and New York is due to lower education spending per student in Philadelphia than in New York City. When analyzing this spending on education in each city, an extreme difference emerges. [25] Data collected on this spending from both Philadelphia and New York City's yearly budgets from 2006 to 2017, as is presented in Figure 1, demonstrates a difference in spending that helps confirm this hypothesis. From 2006 to 2017, Philadelphia averaged $2,697.92 spent per student and New York City averaged $14,957.59 spent per student; during this period, New York City spent $12,259.67 on average more per student than Philadelphia did. The two cities' education spending per student was not close during this period, with the $10,192.91 difference in 2006 being the closest in funding that the two cities were over this period.

Black individuals in New York City from 2006 to 2019 had, on average, 7.7% lower poverty rates than black individuals in Philadelphia. Given the much lower spending per student in Philadelphia when compared to New York City, this information also falls in line with the education spending hypothesis. With New York City spending five times more, on average, than Philadelphia does on its education spending, it is not surprising that the average difference in black poverty rates between these two cities was 9.4%. All of the data from these two cities suggests that the lower education spending per student in Philadelphia has some causal relationship with why the poverty rates of black individuals who live there are higher than those who live in New York City.

[25] Data from: "Public School Enrollment Reports 2006-2017." Department of Education. State of Pennsylvania Department of Education. Accessed April 1, 2022. ; "School Enrollment 2006-2017." NYC Open Data. City of New York. ; "The City Budget 2006-2017." Budget. City of New York.; "Financial Reports: City Treasurer's Office." City of Philadelphia. City of Philadelphia.

When comparing the data on education spending per student to the poverty levels in each city, increased spending on education in both cities over the time period has been directly related to reduced poverty rates amongst black individuals. In Philadelphia in 2006, the poverty rate for black individuals was at 31.6% and the spending per student was $1690.58; by 2017, the same poverty rate was down to 26.7% and the spending per student was up to $5,294.83. This represents an increase in spending of $3,604.24 and a 4.9% decrease in the poverty rate. In New York City in 2006, the poverty rate for black individuals was 21.4% and the spending per student was $11,883.50. By 2017, alongside a spending per student increase of $3,074.09, the poverty rate of black individuals in New York City fell 1.1%. These decreases in poverty rates are in line with the existing literature that purports that lower spending on education helps contribute to higher poverty rates.

Limitations on the Economic Hypothesis

The first data collected to analyze differences in white and black poverty rates consisted of existing research surrounding this disparity across American cities. From this, the focus of the study was narrowed down to data from the cases selected. In doing so, limitations arose in terms of data on redlining policy differences between New York City and Philadelphia. An insufficient number of sources was found that provided information on whether there was a difference in how redlining was carried out in these cities. One source's explanation of how Philadelphia was redlined suggests a difference in how each city's redlining maps were drawn that more adversely affected black individuals in Philadelphia than in New York City, which would suggest that this could be a cause for the difference in poverty rates among black and white individuals in these

two cities.[26] However, without further data from other sources to corroborate this logic, a strong conclusion cannot be drawn from this source alone. In order to see if redlining policies were a cause of the difference between the two cities' black and white poverty rates, more data would be necessary on the exact methodologies of redlining and statistics of those who were redlined in these communities. If this data then suggested a similar difference as the source above, then this hypothesis would be strengthened and could be further tested.

As for the impact of fewer job opportunities on the difference in these poverty rates, there was not enough data to be found to indicate differences in job opportunities for black Americans between the two cities. Data suggests that in both Philadelphia and New York, black individuals have suffered from discriminatory hiring practices, but data was not found to suggest a higher level of discriminatory practices in one city over the other.[27] In order to see whether or not there is a substantial difference in terms of job opportunities between these two cities, more data on the demographics of individuals employed in high-paying jobs, as well as more information on discriminatory hiring practices in recent years in these two cities would be needed. If such data suggested that New York had less discriminatory hiring practices and more job opportunities for black Americans than in Philadelphia, then the hypothesis that fewer job opportunities in Philadelphia lead to a higher black poverty rate than in New York City could be supported.

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[26] Knowles, Anne Kelly, and Amy Hillier. "Redlining in Philadelphia." Essay. In Past Time, Past Place: GIS for History, 79–92. Redlands, CA: ESRI Press, 2004.;

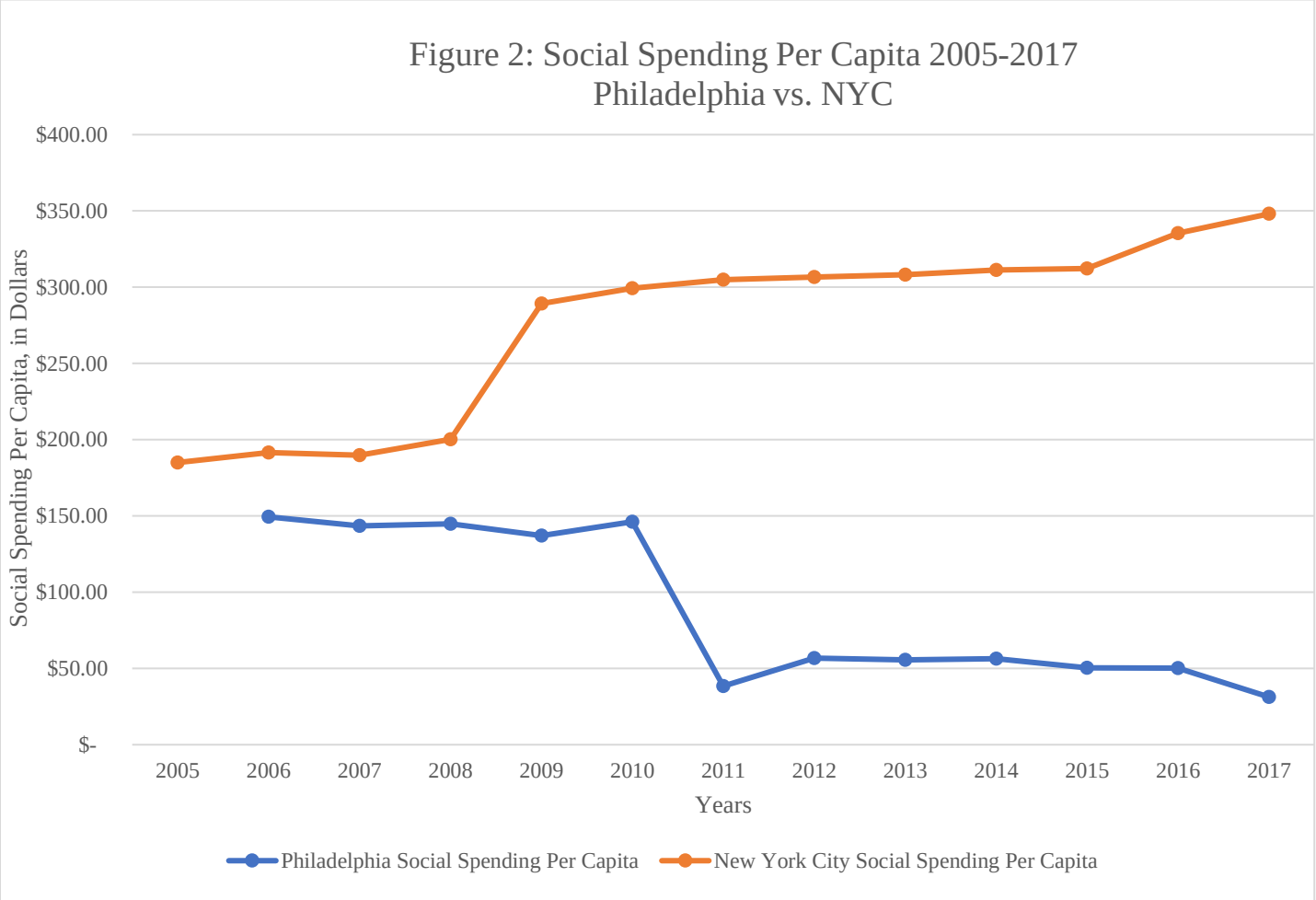
[27] Baker, Regina S., David Brady, Zachary Parolin, and Deadric T. Williams. "The Enduring Significance of Ethno-Racial Inequalities in Poverty in the U.S., 1993–2017."

Data and Analysis for Economic and Educational hypotheses

In order to find data on social spending in Philadelphia and New York City, each city's respective city government spending from 2006 to 2017 was collected. This data was then adjusted to represent the social spending per individual in each respective city. Since a majority of funding for social spending comes from the state government, information from each respective state government was compiled to see if there were details relating to the distribution of funding to either Philadelphia or New York City; there were not. The exact same was done for educational data, with information on per capita spending on students collected from 2006 to 2017 from each city's budget information. The educational outcomes of the two cities were also analyzed based on available data. This data was collected from mostly primary sources and then used to test the hypotheses regarding social spending, education spending, and education outcomes that were laid out earlier in this paper.

Presentation and Discussion of Analysis and Findings

Testing the Social Spending Per Capita Hypothesis

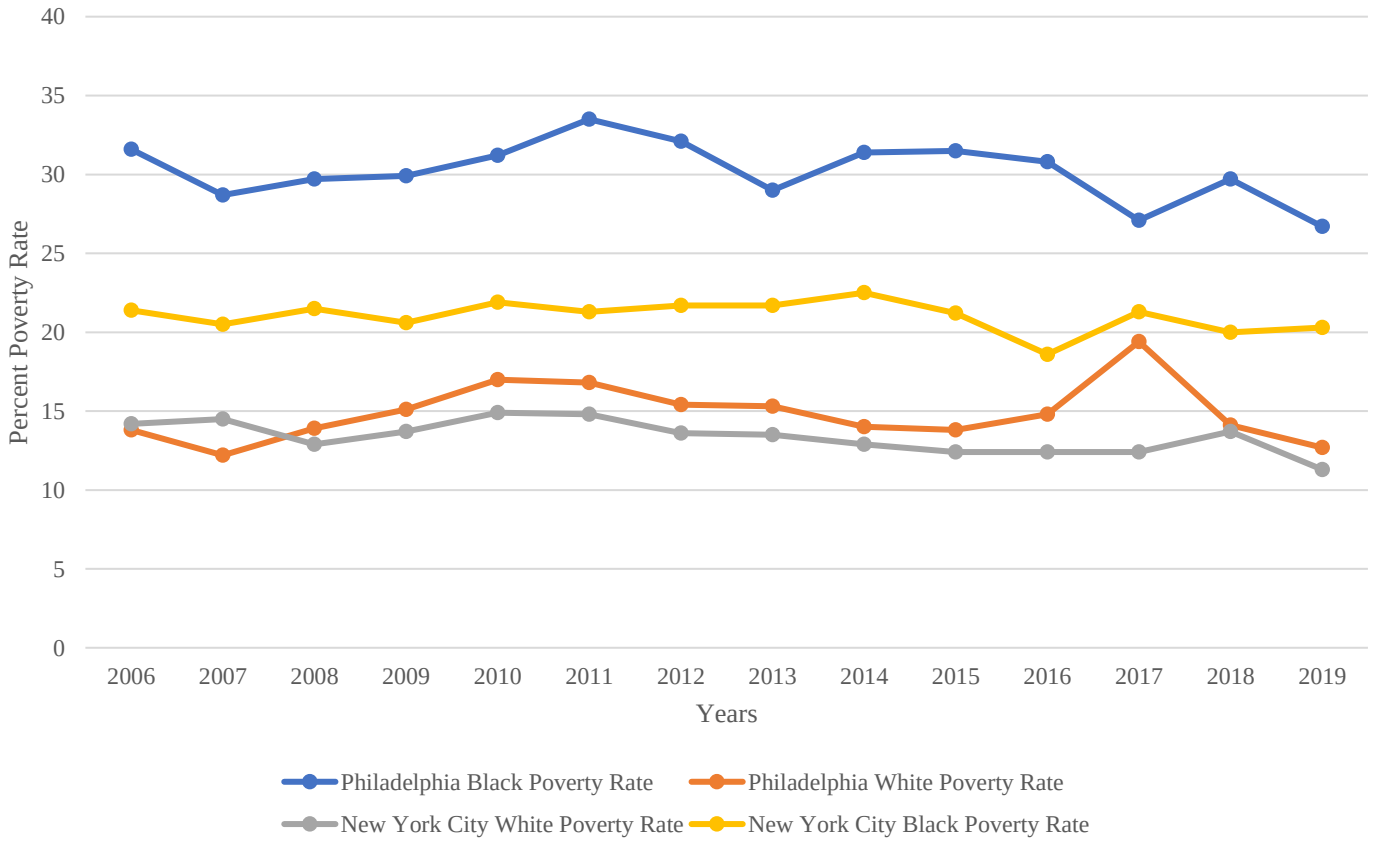


The average difference between Philadelphia and New York City's black poverty rates from 2007 to 2019[28] falls at around 10%, as Figure 3 (below) suggests. The social spending hypothesis offers that there must be a significant spending per capita difference between these two cities. Data collected from both Philadelphia and New York City's yearly budgets, as shown in Figure 2 suggests that the difference in social spending per capita between Philadelphia and

[28] The time range in which social spending was tracked, from 2006 to 2017, in each city differs from the poverty rate range of 2005-2019 due to a lack of detailed social spending data in the years 2005 and 2018 in Philadelphia.

New York was quite drastic; the average difference in per capita spending between the two cities over this time period was $187.2. After the great recession in 2008, the two cities' social spending initiatives took two different paths: New York City continued to increase its social spending per capita, whereas Philadelphia drastically decreased its spending. Notably in 2012, Philadelphia cut its spending on human services, which encompasses programs such as child welfare, to only one-fifth of what it was in 2010. Philadelphia has since continued to cut its social spending per capita, with an almost $100 decrease in spending from 2010 to 2019.[29]

Figure 3: Poverty Rates Amongst Black and White Americans
Philadelphia vs New York City



[29] "City Budget 2006-2017." Budget. City of New York. Accessed April 1, 2022..; "Financial Reports: City Treasurer's Office." City of Philadelphia. City of Philadelphia.

To further see if this data helps support the social spending hypothesis, I analyzed the poverty rates during the years 2010 to 2019 in an attempt to see tangible impacts on the poverty rate of black individuals. The data trend in New York follows as the social spending hypothesis would expect. 2014, 2015, and 2016 were three of the four highest social spending per capita years in New York, with the poverty rate of black Americans over the same time decreasing by 3.9%. In Philadelphia, despite lower social spending per capita from 2010 to 2017, the poverty rate decreased by 3.8%. This data, however, must be contextualized, as the impact of the great recession in 2008 can be seen through the increase in the poverty rate of black Americans each year from 2008 to 2011. In this context, when compared to the poverty rate of black Americans in Philadelphia in 2007, the decrease in the poverty rate was only 1.6%.

Although marginal decreases in the poverty rate of black Americans can be seen from 2006 to 2019 in Philadelphia, as stated earlier, the average difference between the black poverty rates in Philadelphia and New York City stayed at 9.4%, with the closest poverty rate between these two groups coming in 2017 at 5.8%. Further, the average difference between black and white poverty rates over this time was 7.7% in New York city compared to 15.3% in Philadelphia. The average difference between black and white poverty rates over this time in Philadelphia was exactly double the difference in New York City.[30]

The spending data in each city seems to support the social spending per capita hypothesis. The data shows an average of $187 less spent per capita in Philadelphia on social spending programs when compared to New York City. Further, the average difference in the poverty rates of black and white Americans in each city was substantial, at 7.7%. These data,

[30]New York City Government; NYCgov Poverty Rates, by Race/Ethnicity
Total NYC Population, 2005 - 2019; U.S. Census Bureau, American Community Survey, one-year estimates, 2005-19, Table S1703 (Selected Characteristics of People at Specified Levels of Poverty in the Past 12 Months),

when contextualized with the impact that higher social spending has on lowering poverty, help to support the hypothesis that higher social spending per capita in New York City helps explain some of the extensive difference in poverty rates between white and black Americans in these two cities.

Conclusion

The findings of the research in this paper help to suggest possible causal relationships between lower social spending per capita and educational spending per student in Philadelphia than in New York City and higher black poverty in Philadelphia than in New York City. With existing research suggesting that lower social spending causes higher poverty rates, data in Philadelphia showing lower social spending per capita and higher poverty rates from 2006 to 2017 is not surprising. Additionally, the same is true with the impact of lower education spending per student in Philadelphia. With Philadelphia's average spending in this area from 2006 to 2017 totaling about one-fifth of the spending of New York City in this area, the fact that the black poverty rate has been over 9% on average higher during this time period is also not surprising.

This paper sought to explore what variables caused higher black poverty rates in Philadelphia than in New York City. To the best of my knowledge, this study is the first of its kind in comparing poverty rates in New York City and Philadelphia in order to see what has caused a higher rate of poverty amongst black Americans in Philadelphia. The research, however, was limited due to a lack of comparative data on the specifics of redlining in Philadelphia and New York City, as well as a lack of data on concrete examples of differing levels of employment discrimination in these two cities. Information on these two topics could

supplement the research in this paper to further explore what variables cause the difference in poverty rates between these two cities. With the research and hypotheses in this paper, individuals with political power in Philadelphia who are seeking to improve the difference in black and white poverty rates could potentially argue for increased spending on social programs and education in their city. Further, with the knowledge of the difference in education and social spending between New York City and Philadelphia, Pennsylvania state legislators could use this data to push for more funding for public schools and social spending programs in Philadelphia.

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U.S. Census Bureau, American Community Survey, one-year estimates, 2005-19, Table S1703 *Selected Characteristics of People at Specified Levels of Poverty in the Past 12 Months*,