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Blight in the Rural South:
Proliferation, Remediation, and Ethical Claims

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A Message to the Readers

Dear Readers,

First, I would like to thank you for taking the time out of your busy lives to engage with my capstone research. I hope that you enjoy and gain insight from what exists within these pages. This paper was made possible by the contributions of Professor Joseph Guse, Professor Marcos Perez (both at Washington and Lee), and Mr. John Edwards (the lead economic developer in East Arkansas). Their contributions consistently elevated and inspired my research. For any comments and concerns, please feel free to contact me with the information listed below. Again, I would like to reemphasize my gratitude to you for reading my work.

Sincerely, Thomas Willingham

Abstract

Across rural communities in the Southern United States, the proliferation of dilapidated structures which do not meet code enforcement standards (*i.e.* blight) has developed into a primary concern for many communities. Using data from the United States Census Bureau, MARIS, and the United States Geological Surves, my analysis seeks to illuminate the causal impact of blight on economic and poverty-related outcomes. I employ an instrumental variables approach using proximity to a Mississippi River tributary, controlled by proximity to the Mississippi River itself, as an instrument.

I observe a causal link between blight proliferation and poor economic and poverty-related outcomes. Additionally, I find that individuals of color are more likely to live among and be affected by blight proliferation. Moreover, using literature on the topic, I discover complex ethical implications regarding persistent out-migration.

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1 Introduction

While much of the nation—in more populated or urban areas—struggles with a significant housing shortage [12], other locations—less inhabited and publicized—face their own unique challenges regarding housing and other building structures. After experiencing significant out-migration through the 20th century, many rural communities express substantial concerns regarding blight proliferation [15, 17, 18].

Here, the term 'blight' broadly refers to dilapidated, abandoned, or neglected buildings, structures, or infrastructure within a community. After instances of extreme out-migration—a negative shock to a community's population—many structures may be unoccupied, and public entities may struggle to maintain local infrastructure standards.[1] Typically, these negative migratory shocks have occurred within small rural communities. More specifically, rural counties, towns, and communities within the American South[2] have most potently experienced out-migration [6].

1.1 Definitions of Blight Proliferation

While a broad definition of the term 'blight' is provided above, many more specific definitions exist which may indicate my research and further illuminate additional discussions regarding blight proliferation. Within the contexts of public policy, community development, and economic development—the term 'blight' functions nearly as a metaphor. The Merriam-Webster Dictionary defines blight generally as referring to a deteriorated condition, and the word draws its origins from the fungal affliction, of the same name, which has occasionally decimated crop populations. In fact, as early as 1937, the term 'blight' was utilized within the realm of economic development to discuss underprivileged communities. At that time, the National Municipal League modified 'blight' as:

> "stagnation of development and damage and loss to community prosperity and taxable values" [8]

Here, this understanding of 'blight' conceptualizes the issue through a community's contribution to society. Effectively, 'blight' is used as a modifier for communities which receive more public aid than they 'pay back' in taxes. The implication, here, is that communities which pull more from surrounding society than they contribute exist within a state of disrepair and deterioration [8]. This distinction drawn between those communities which function properly and those which are broken, based solely upon their net tax contributions, may have helped to develop harmful attitudes toward the competency of those who populate underprivileged communities [6].

[1] In effect, after a decrease in an area's population—and conceivably its tax base—a policy making body, such as the local government, may struggle to maintain the area's preexisting infrastructure, which was built to serve a larger population.

[2] *i.e.* the southeast portion of the United States

Additionally, the Hoover administration, in 1930, defined blight, through the concept of 'slums,' as a residential area

> "where the houses and conditions of life are of such a squalid and wretched character and which hence has become a social liability to the community" [8]

In this quote, we observe the beginnings of a conceptualization of blight as the dilapidation and neglect of buildings and infrastructure within a community. By 1940, the National Association of Housing Officials had echoed this sentiment, characterizing blighted areas through the occurrence of dilapidated structures. Importantly, they included health and safety risks as a potential indicator for blight proliferation, and they included 'morals' in their definition, suggesting a potential link between the occurrence of blight and crime. More specifically, the National Association of Housing Officials distinguished blighted communities as:

> "an area in which predominate dwellings that either because of dilapidation, obsolescence, overcrowding, poor arrangement or design, lack of ventilation, light or sanitary facilities, or a combination of these factors, are detrimental to the safety, health, morals, and comfort of the inhabitants thereof" [8]

Efforts to properly define blight increased through the 20th century as urban planning, housing shortages, and community development grew as substantial public concerns [6]. Notably—as discussed by Professor Colin Gordon of the University of Iowa—the proliferation of blight was primarily understood to be an urban issue [8], and, therefore, was defined through urban environments. The health of urban communities was far more apparent to officials, activists and scholars, and these urban communities could more easily receive public aid or participate in important programs. While definitions of blight largely applied to urban communities, they still grew increasingly complex and progressively referred to more specific phenomena.

Today, blight proliferation may be specifically quantified through occurrences of "abandoned buildings, vacant residential structures, vacant commercial structures, mortgage foreclosed properties, tax foreclosed properties, tax delinquent properties, and demolished/uncleaned properties" [13], or it may be qualitatively outlined by instances of "neglect, abandonment, cleanliness, health violations, safety violations, or disproportionate levels of crime" [6].

While these definitions provide precise quantitative measurements or qualitative objects through which we may observe occurrences of blight, given the origins and early meanings of the word 'blight,' it is clear that these modern characterizations only serve as proxies for instances of blight. Blight does not refer explicitly to "vacant residential structures" or occurrences of "health violations." Instead, blight fundamentally indicates a state of disrepair and deterioration within a given community [8, 12]; it is a environment which communicates neglect and abandonment readily; it is an attitude from and toward a community that something in that area has experienced damage at the structural level; moreover—as implied by the word's origins as an affliction which decimates crop populations—blight is a *disease* which spreads and moves among and between populations [8, 12]. All of the artifice which researchers and policy makers have constructed around the concept of blight merely approximates the magnitude to which it may exists within a given community or area.

For my research, I will utilize the quantitative specifications to approximate blight proliferation which are outlined by Professor Praveen Maghelal in his research publication, “The Economics of Blight in Dallas” [13], and I will indicate these quantitative specifications, where appropriate, with the qualitative specifications provided by Dr. Ann Carpenter, Dr. Emily Mitchell, and Dr. Shelly Price [6]. But, as discussed, while using these specifications, I will maintain an awareness of the approximation that these specifications represent. This research will utilize the state of Mississippi as a case study through which it will investigate blight proliferation and its impacts.

Blighted Buildings in Helena Neighborhood

Blighted Building in Downtown Helena

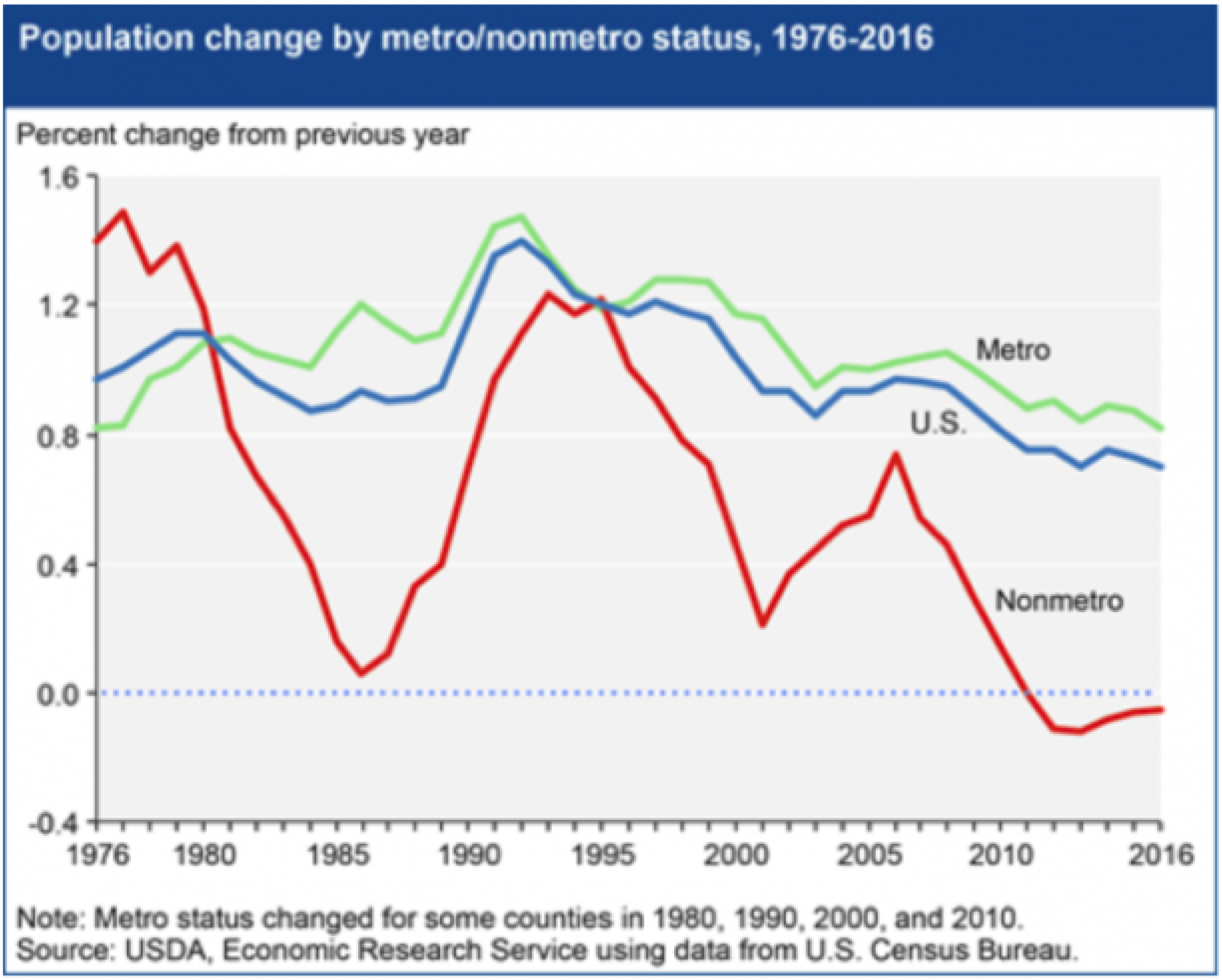
Blighted Building Swallowed by Kudzu in Helena, Arkansas

Pictures Personally Taken while in Helena, Arkansas

1.2 Blight Proliferation in Rural Communities

As mentioned previously, blight proliferation, as a community and economic development concern, has been primarily studied within urban communities. The health of urban communities has, often, received more exposure from public officials and scholars [9]. Additionally, as discussed by Professor Niles M. Hansen, in his book, "Rural Poverty and the Urban Crisis: A Strategy for Regional Development," a pervading notion may exist within American society which conceptualizes many rural communities as "pre-modern," intrinsically broken, and misaligned with today's American civilization [9]. Thus, policy makers, scholars, and interested citizens often dismiss poverty-related issues within rural communities as less pressing, arguing that individuals within these communities may experience increased economic outcomes if they were only to relocate to more urban areas.

Notably, many individuals have followed this argument and have migrated from rural, non-metro areas to urban and suburban communities. Researchers at the Wharton School show negative population growth rates in rural communities and observe substantial out-migration from rural communities by young people [19]. Moreover, they surmise that economic incentives produce much of this out-migration [19].



While these discussions, regarding blight proliferation and migration trends, may investigate a dynamic within and between urban and rural populations, they to not clearly define the terms urban and rural.[3] The United States Census Bureau defines rural through elimination. "Urbanized areas" are understood to be areas with more than 50,000 people, and "urban clusters" are understood to be areas with fewer than 50,000 people and more than 2,500 people.[4] All other areas are, then, characterized as rural. Similarly, the United States Office of Management and Budget defines urban, "core" areas as counties featuring more than 10,000 individuals and "non-core," conceivably rural, areas as counties featuring fewer than 10,000 individuals.[5]

Interestingly, these definition seem to exclude many small towns within rural areas which a visitor may observe as rural. A community of 2,500 individuals in an otherwise rural area may possess little infrastructure and may exist as fundamentally different from larger "urban clusters" of 50,000 individuals. Therefore, in my analysis, I will utilize the definition of 'rural' provided by the U.S. Department of Health and Human services which understands population densities of greater than 1,000 individuals per square mile to be 'urban' and population densities of less than 1,000 individuals per square mile to be 'rural.' Additionally, the U.S. Department of Health and Human Services defines locations featuring less that 7 individuals per square mile to be 'highly rural.' Throughout the remainder of this publication, whenever the term rural is used, it will be used to refer to localities featuring fewer than 1,000 individuals per square mile. Notably, most small towns—outside the perimeters of large cities and their suburbs—qualify as 'rural' under this definition. It is in these small townships within otherwise rural areas that I expect to most often observe blight proliferation.

Although, for decades, many individuals have relocated from their rural hometowns to more urbanized locations, nearly 20% of the population—more than 63 million individuals—still live within rural communities [20]. These individuals face, on average, lower median incomes, less substantial education achievement, and less significant access to important infrastructure items [20]. Additionally, researchers have observed that the nation's most harrowing poverty experiences often occur in rural areas [6, 9].

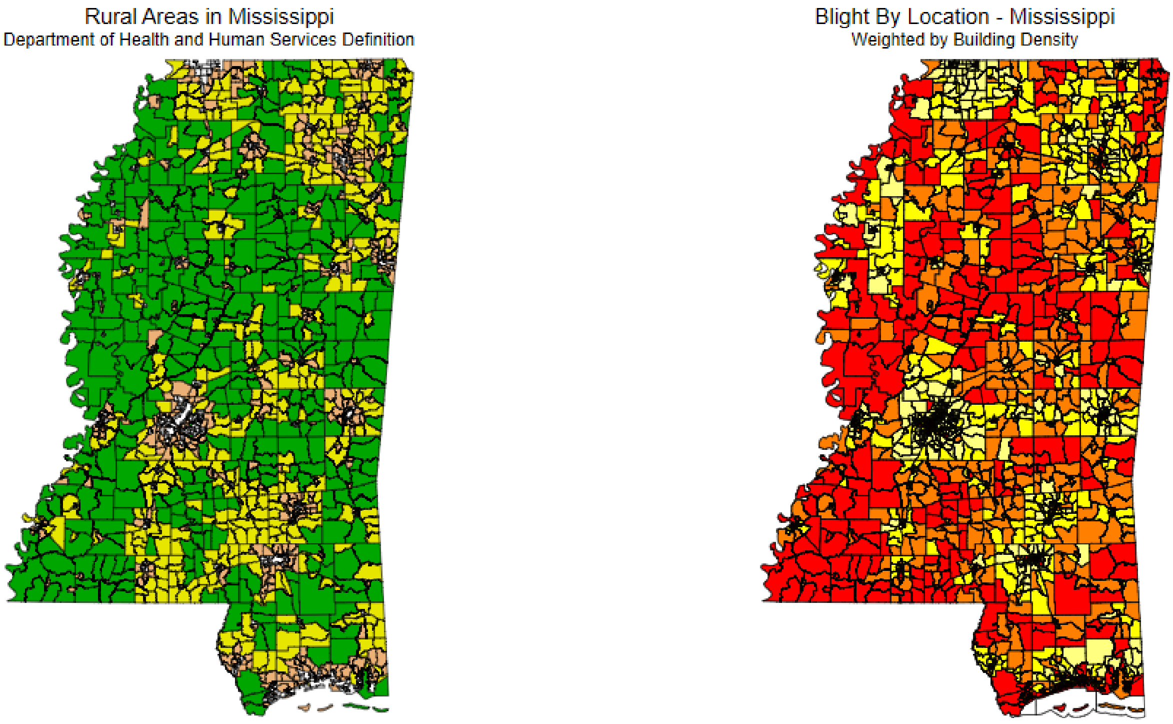
Therefore, for those concerned with improving economic, poverty-related, and agency-related outcomes regarding individuals experiencing substantial hardship and poverty, a dedicated focus on rural areas is required. This paper, consequently, represents a meaningful contribution to literature which seeks to analyze the lives of individuals within underprivileged environments, and it indicates research which may improve the lives of these individuals. By attempting to quantify the impact of blighted structures and infrastructure on rural communities, I am examining a dynamic which may harm individuals experiencing poverty and offer meaningful insight into public policy initiatives directed toward rural communities.

[3]Urban and rural, likely, represents an insufficient dichotomy in which a precise definition may be somewhat inappropriate, but for the purposes of this paper, I will use our societal labeling 'urban' and 'rural' areas to as a construct through which I may analyze the impact of blight proliferation within rural communities.

[4]From the Census Bureau's definition, it is unclear what the word area means, suggesting some flexibility in their labelling process.

[5]While it is outside of the scope of this paper to comment on the intentions implied by the terms "core" and "non-core," those terms do seem to suggest interesting public perceptions regarding rural communities.

Withing this research directive, Mississippi fits as a worthwhile case study. I am able to acquire rich data regarding blight proliferation and economic/poverty-related outcomes in Mississippi, and, using our definition of rural,[6] in Mississippi, nearly $\frac{2}{3}$ of individuals live within rural communities, and over 98% of the land mass is considered rural. Additionally, these rural communities feature the most substantial occurrences of blight proliferation within the state of Mississippi. These figures, by illustrating higher levels of blight proliferation in rural areas, indicate that the emphasis of blight proliferation as a predominately urban issue may be misplaced within Mississippi.



(a) Green and Yellow Represents Rural Localities Using the Above Definition

(b) Red Represents Higher Relative Blight Proliferation

Figure 1: Population and Blight Proliferation Density in Mississippi

As shown above, the most severe blight proliferation tends to occur within the most rural areas of Mississippi, and more urban environments tend to feature less substantial blight issues. While most researchers choose to examine the proliferation of dilapidated buildings in urban areas, it appears that rural communities experience the problem most potently. Therefore, I argue that the quantity of attention applied to blight proliferation in urban areas justifies an investigation into blight proliferation within rural areas.

This paper will seek to demonstrate the extent to which blight proliferation occurs within rural areas and investigate the impacts of this blight proliferation on rural communities. As shown above, Mississippi represents a compelling case study for this research, and I intend for my findings within Mississippi to be conceivably applicable to other locations, further informing discussions regarding blight proliferation.

[6] As stated above, this is drawn from the US Department of Health and Human Services.

1.3 The Significance of Rural Blight Proliferation

Since George L. Kelling and James Q. Wilson wrote their—now infamous—article in *The Atlantic*, titled 'Broken Windows,' policy makers and scholars have considered the consequences of blighted buildings in urban areas [12]. The notion of the 'broken window syndrome,'[7] outlined by Kelling and Wilson, suggests that the severity of urban blight can be captured through the quantity and density of untended properties, abandoned structures, and damaged buildings and that greater quantities of blight proliferation carry a substantial, negative causal impact on individuals' economic and poverty related outcomes within a given community [12]. As discussed previously, under this framework, blight does not refer directly to the buildings themselves, but is a concept that is highly correlated with the condition of local structures [12]. Here, instead, blight represents a general state of disrepair and neglect which may plague a community [13]. Thus, within this paper, dilapidated structures and poorly maintained infrastructure is used as a proxy for blight proliferation.

To many economic developers, blight proliferation represents a substantial concern for rural communities [9]. They argue that blighted structures function as an epidemic for many rural areas and that this epidemic detracts potential investment, further incentivizes out-migration, harms mental and physical health within communities, and generates increased occurrences of unlawful activity [9]. Many states have identified blight proliferation as a primary policy concern, and the Arkansas Economic Development Commission has even instituted a substantial program—the Competitive Communities Initiative—which primarily seeks to ameliorate blight proliferation [3]. The magnitude of this program suggests that the Arkansas Economic Development Commission has conceptualized blight proliferation as its most pressing economic development concern regarding rural communities [3]. Additionally, other localities, including New Orleans—with the New Orleans Blight Reduction Program—and Detroit—with the Motor City Mapping Project—have invested substantial public resources into blight mapping and remediation [7, 15].

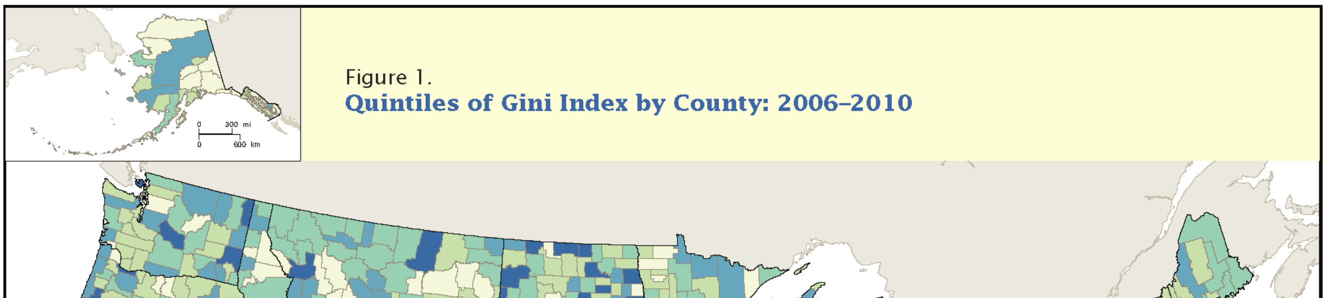
While many may argue that blight proliferation is merely symptomatic of other economic hardships caused by separate dynamics, the emphasis applied to it by policy makers implies that blight proliferation does, in fact, cause poor economic outcomes and additional hardships for nearby individuals. Blight proliferation is certainly caused by a poor economic environment, but it may also be that blight proliferation further causes additional economic tribulations. In this framework, blight acts as a positive feedback loop within poor economic environments, further harming the surrounding area and, thus, increasing blight proliferation [9]. Since public funds have been dedicated to blight proliferation, my research will examine the justifiability of these public policy efforts and offer quantitative estimates regarding the impacts of blight proliferation and the effects which these public policy efforts may carry. In doing so, I will attempt to separate any reverse causality from my estimates so that I only predict the impact of blight proliferation on economic and poverty-related outcomes.

[7]The theory behind the 'broken window syndrome' states that properties which are damaged or poorly maintained may posses a causal relationship with crime and negative economic outcomes.

1.4 Mississippi

As discussed earlier, Mississippi may represent the ideal case study regarding an investigation into rural blight proliferation. Unlike much of the country, the majority of Mississippi's 2.99 million citizens live in rural areas, and 98% of its 48,432 square miles of land is classified as rural [21]. Moreover, the state features more impoverished environments than most in the union. Mississippi ranks in the bottom five among all states in health care access, health care quality, public health outcomes, obesity rate, economic growth, employment, economic mobility, internet access, transportation access, and long-term fiscal stability [21].

Although Mississippi is emblematic of many of the poverty-related challenges faced by rural communities throughout the US, it also possesses several unique features. First, no other state, except potentially Alabama, holds a more complex racial history than Mississippi. Today, racial inequality within the states is more stark than nearly any other state in the union. Next, according to the US Census Bureau, Mississippi features the seventh highest Gini coefficient among all states, suggesting a highly unequal economic environment.[8]



[8]The Gini coefficient of Mississippi is 0.4828.

Finally, much of Mississippi is fundamentally altered by and constructed from the river of the same name [4]. The Mississippi River characterizes much of the western part of the state, and it even spreads it influence, through tributaries, through out the northern and northeastern portion of the state [4]. Much the culture, economy, and even politics of these areas is derived from the river. John M. Barry, in his non-fiction account of the history of the Mississippi River and its floods, titled "The Rising Tide," describes the Mississippi river as an "all consuming presence" and states that every "aspect of delta life is influenced by the dark, churning (Mississippi) river" [4].

The presence of this river, as well as the delta culture it produces, forms much of the state of Mississippi as fundamentally unique relative to the rest of the country in an important way. This uniqueness of Mississippi undermines some of the generality of my results. If Mississippi is too unique relative to the rest of the US, then it is difficult to extrapolate my results to other rural communities. But, while the Mississippi River may impose substantial 'uniqueness' on Mississippi itself, it also allows me to employ an important analytic tool within my research. More specifically, I will use flood dynamics within the rural, often impoverished, and substantially blighted Yazoo-Mississippi Delta[9] as an instrument through which I may separate the causal impact of blight proliferation on poverty-related outcomes from any reverse causality which may exist and obtain a compelling estimate.[10]

Flooding represents a persistent truth within the Yazoo-Mississippi Delta. The Great Flood of 1927—which submerged over 30,000 square miles of Mississippi land, saw the river swell to widths of 80 miles in some areas, and wrought incalculable damage across the southern United States—is a cataclysmic environmental event of near-mythical proportions [4, 16]. While many are aware of this event, persistent flooding has occurred within Mississippi, from the Mississippi River, for decades despite human intervention.

Flooding in Clarksdale, Mississippi (1993)

Flooding in Vicksburg, Mississippi (2011)

[9]The Yazoo-Mississippi Delta represents western and northern Mississippi in this context

[10]By instrument, I mean to say that I will use flood dynamics within an instrumental variable analysis to investigate the impacts of blight proliferation on poverty-related outcomes. This process will be more deeply outlined within my methodology section.

Major Flooding in the State of Mississippi		
Date Occurred	**Areas Affected**	**Description**
May - June, 1983	Southwest, West, and Northern Mississippi	60,52 foot crest recorded. Thousands of square miles submerged
March - April, 1997	Southwest, West, and Norther Mississippi	62.30 foot crest recorded. 30,000 square miles of Mississippi land submerged for nearly two months.
April 2002	Southwest, West, and Northern Mississippi	58.60 foot crest recorded. Thousands of square miles of Mississippi land submerged.
April - May, 2008	Southwest, West, and Northern Mississippi	60.68 foot crest over levy recorded. Major Flooding throughout Mississippi, especially along tributaries. Thousands of square miles flooded. The damage caused to levies by Katrina shortened the duration of flooding but increased its severity.
March - June, 2011	Southwest, West, and Northern Mississippi	63.39 foot crest over levy was recorded in southwest Mississippi. Nearly 40,000 square miles of Mississippi land was submerged for three months, causing President Obama to declare a national emergency.
March - May, 2018	Southwestern Mississippi	River was flooded at Baton Rouge for 67 days, Red River Landing for 74 days, Vicksburg for 51 days, and Clarksdale for 43 days.
All Information from National Weather Service		

The above table, using information from the National Weather Service, outlines major flood events in the state of Mississippi, resulting from the Mississippi River since 1983 [16]. Only flood events which caused at least 1,000 square miles of flooding in Mississippi and featured crests of over 60 feet are included.[11]

The flooding behavior, sheer power, and economic importance of the Mississippi River has caused Americans, since the mid-1800s, to devote substantial resources to controlling the river [4]. The storied rivalry between James Buchanan Eads and Andrew Atkinson Humphreys, specifically, shaped infrastructure policy regarding the river. In many places, Humphreys' elevate power as a top officer for the Army Corp of Engineers allowed his "levies only" policy to function as the primary means through which the temper of the river was controlled. Humphreys argued that, by containing the river somewhat during

[11]This criteria is used by John M. Barry to describe major flooding events [4].

flood stage events, thus increasing the slope and flow-rate of the Mississippi, levies would force the river to carve a deeper and more direct river bed for itself, lessening the severity of future flooding events [4].

Unfortunately, Humphreys' reasoning appears to be flawed—over the 100+ years that substantial levies have existed along the Mississippi, a deeper, more direct river bed has not formed [4, 16, 21]. Instead, the Mississippi levy system has forced much of the flooding which may occur along the banks of the Mississippi toward the many Mississippi River tributaries. These tributaries feature shorter and more narrow levies (where they even exist) and experience many harmful flooding events [4]. Especially in the past 50 years, after significant bolstering of the Mississippi Levy System, the communities and properties along the most southern Mississippi River tributaries (which are located in Louisiana and Mississippi), have confronted devastating and often deadly flooding events [4]. I intend to utilize this variation in the frequency and severity of flooding events between the Mississippi River and its tributaries, within the state of Mississippi, to construct a robust estimate of the causal impact of blight proliferation on poverty-related outcomes.

Therefore, in effect, I will use that which renders Mississippi so unique and potentially compromises the universality of my results to obtain a robust causal estimate. I hope that my results will, both, offer some applicability to other locations and outline a compelling model through which new results may be obtained.

2 Literature Review and Re-analysis

2.1 Literature Background

Despite the gravity of the concerns which blighted buildings may pose to communities, the literature on the topic—including within the fields of economics, sociology, and politics—is relatively shallow. More significant research has been undertaken which studies evictions and housing shortages, but the issue of dilapidated and abandoned housing remains relatively under-analyzed. Additionally, due to the lack of research attention afforded to the study of blight proliferation and remediation, rich data on the subject proves difficult to acquire.

Numerous publications, articles, and books have explored the impact which disrepair my cause on a community. The aforementioned “Broken Windows” article, published in *The Atlantic*, outline, qualitatively, how disrepair may further harm already impoverished communities [12]. This article, along with others, fits nicely within a growing literature regarding evictions, housing vacancies, and gentrification—all issues which are fundamentally related with blight proliferation. Professors John Arrcordino and Gary T. Johnson, in their research publication titled, “Addressing the Vacant and Abandoned Property Problem,” powerfully and carefully investigate these issues and provide an apt epitome of the literature surrounding evictions, housing vacancies, and gentrification [2]. Like many researchers engaging with this topic, they conclude that external and potentially unjust forces often cause housing vacancies and evictions, and they surmise that these evictions and vacancies may instigate further harmful effects on surrounding neighbors [2].

While many researchers have devoted countless hours and funding to the specific study of evictions, vacancies, and gentrification, far fewer have explicitly investigated blight proliferation and its effects. Professor Colin Gordon of the University of Iowa, notably, published over 30 pages on a complete definition and history of blight proliferation and remediation [8]. Meanwhile, researchers in Detroit, employed by the Detroit city government, have painstakingly catalogued and published numerous articles on Detroit’s own blight epidemic [15]. This research, perhaps, represents the most precise and ambitious mapping and analysis of blight proliferation undertaken by an urban community. In most incorporated areas, townships, or cities within the United States, even today, little to no documentation exists on instances of blighted buildings and infrastructure [8]. Further south, researchers in New Orleans have begun to fully document blight proliferation within the New Orleans city limits and provide preliminary analysis of the “economic burden which ‘blighted’ neighborhoods” may impose on the rest of the city [17]. Largely, these research efforts tend to primarily examine relationship between blight proliferation and crime, and they do not typically investigate other economic and poverty-related outcomes with regards to blight proliferation. Additionally, the existing research on the subject, nearly unanimously, exclusively considers impacts in urban areas.

While, as discussed above, some researchers have studied blight from the vantage of crime in urban areas[12], few have engaged with the subject in rural communities. Although data which describes the impacts of blight in rural communities is especially scarce, some evidence (figure 1) states that these communities may represent those most potently af-

[12] Additionally several other researchers have engaged with economics and blight.

fected by the issue of blight. Especially, evidence within the state of Mississippi (figure 1) suggests that rural communities feature the highest occurrence of blight proliferation. Despite the shallow nature of the literature on this subject, two major publications exist which relate closely to the objective of my research and may guide much of my analysis. Both publications—the first, written by Professors Praveen Maghelal, Simon A. Andrew, Sudha Arlikatti, and Hee Soun Jang and titled, "Assessing Blight and its Economic Impacts: a Case Study of Dallas, Texas," and the second, written by Ann Carpenter, Emily Mitchell, and Shelly Price and titled, "Blight Remediation in the Southeast: Local Approaches to Design and Implementation"—are further discussed below.

2.2 The Economics of Blight in Dallas

Among those few researchers who have sought to understand the affects of blight on economic and poverty-related outcomes is Professor Praveen Maghelal and his co-authors [13]. Professors Maghelal Maghelal, Andrew, Arlikatti, and Jang, seeking to further illuminate the dynamics of dilapidated housing, uses the city of Dallas, Texas as a case study. They hope to use these findings, both, as a framework through which other localities may study blight and as a preliminary estimate of the causal impacts carried by the proliferation of blight. Notably, Professors Maghelal, Andrew, Arlikatti, and Jang broadly define blight as follows.

> "Neighborhood blight consists of those conditions that threaten the health and safety of neighborhood residents, depress an area's quality of life, and jeopardize the social and economic viability of an area." [13]

This theoretical definition, while broad, provides the basis for Professor Maghelal and his coauthors' specification of blight. As discussed above, although the concept of blight exists well beyond empirical measures[13], empirical data can still be utilized as a proxy for the concept of blight. To quantify the magnitude to which disrepair is present in an area, Professor Maghelal and his coauthors draw upon code and law enforcement data to acquire these empirical measures. Of course, the selection of which empirical measures should be employed to serve as proxies for blight is critical, and this selection is made even more complex by the availability (or lack thereof) of rich data on the matter [8]. Professor Maghelal and his coauthors, using their theoretical definition and existing literature as a framework, select the following seven physical indicators for blight proliferation from their data set [13].

1. Abandoned Buildings
2. Vacant Residential Structures
3. Vacant Commercial Structures
4. Mortgage Foreclosed Properties
5. Tax Foreclosed Properties
6. Tax Delinquent Properties
7. Demolished and Uncleaned Properties

[13] That is, the concept of blight represents more than just unmaintained buildings. Instead, blight refers to a state of disrepair at all levels of the physical world which individuals inhabit. It is a set of conditions.

Using these indicators and Geographic Information Systems (GIS), Professor Maghelal and his coauthors create "blight variable layers" which they aggregate to identify the degree of blight proliferation within specific neighborhoods in the city of Dallas [13]. They use these aggregates of their physical variables in comparison with socio-economic indicators for blight density to fully develop their blight index, shown below [13].

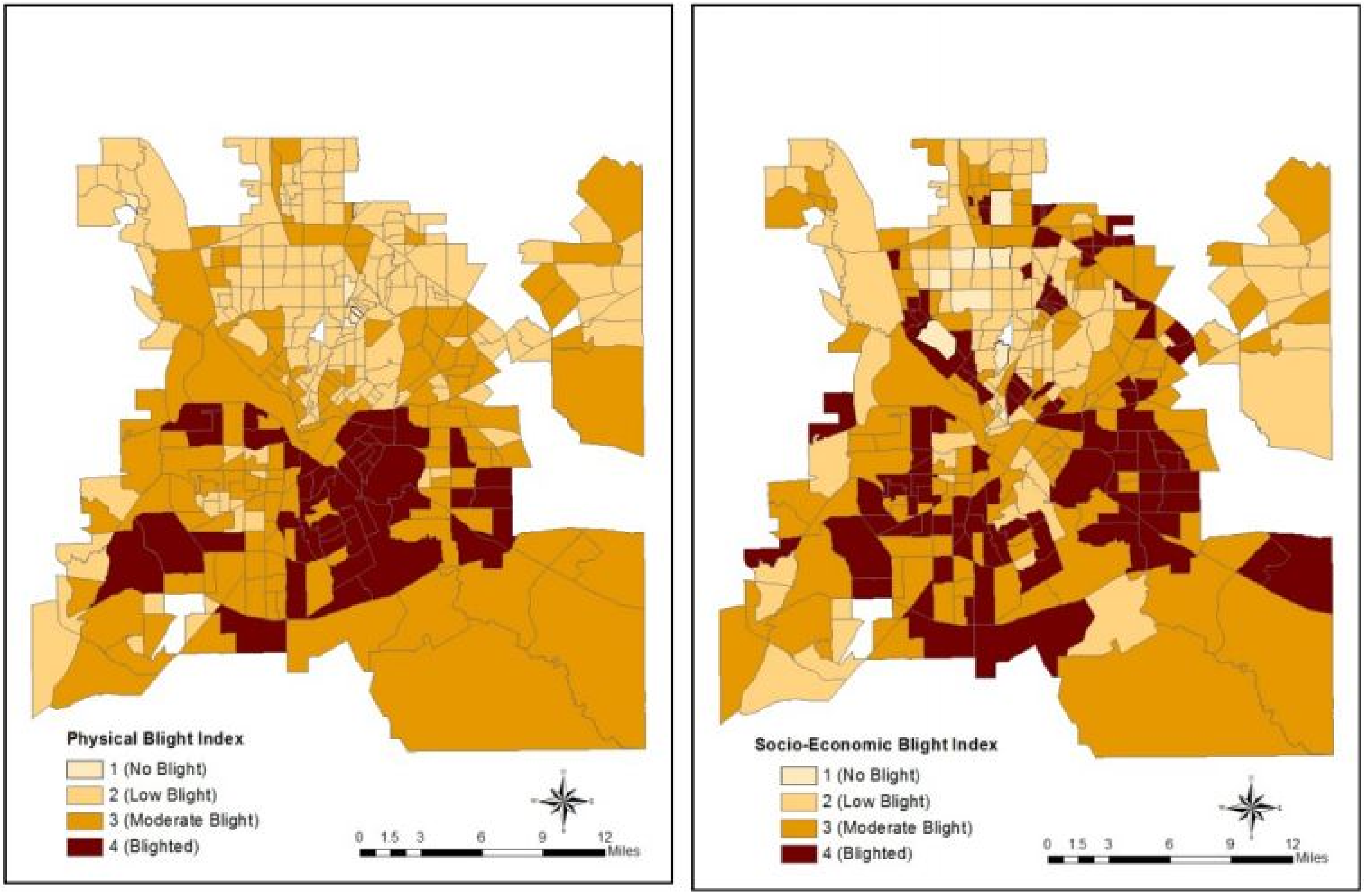


Figure 2: Maghelal's Physical (a) and Socio-Economic (b) Blight Index for Dallas

Ultimately, using these indices, Professor Maghelal and his coauthors demonstrate that blighted neighborhoods cause the city of Dallas to bear significant costs from crime, tax-delinquent properties, and unpaid labor liens [13]. More importantly, they find that these under-maintained properties, which are non-compliant with city codes, create unsafe conditions and negative externalities for the communities in which they are located [13]. These negative externalities included negative pressures on income, investment, public transportation, and community unity, and they disproportionately affect the most underprivileged individuals in those neighborhoods [13]. Finally, Professors Maghelal, Andrew, Arlikatti, and Jang recommend that local governing bodies engage in neighborhood revitalization efforts where special attention is paid to supporting low-income property owners who struggle to maintain their holdings [13].

While Professors Maghelal, Andrew, Arlikatti, and Jang's findings are relevant and cleverly acquired, they may only serve as an outline for my research. Where Professors Maghelal, Andrew, Arlikatti, and Jang chose to study a developed urban environment, I am, instead, analyzing blight in rural communities, where the circumstances in which blight proliferation interacts with the community should be entirely different [6]. Rural communities can not simply function as 'scaled down' versions of larger municipalities, and a town with too few people may not be able to support important features such as law enforcement, code enforcement, and community developers.[14] Nevertheless, much of the methodology employed by Professors Maghelal, Andrew, Arlikatti, and Jang will prove crucial within my paper. My entire construction of geographic density estimates for blight proliferation, demographics, economic outcomes, and poverty-related outcomes within the state of Mississippi is gleaned nearly entirely from the methodology employed by Professors Maghelal, Andrew, Arlikatti, and Jang.

2.3 Local Approaches in the Southeast

Dr. Ann Carpenter and her coauthors, publishing their research through the Federal Reserve Bank of Atlanta, attempt to more deeply understand the subject of blight remediation. They define blight as:

> "Structures, land, or features that are neglected, abandoned, not maintained in a clean, safe, or healthy condition; and/or pose a severe or immediate health, safety, or undue economic hardship, or other imminent hazard to the property owners, occupants or visitors in the vicinity of the site." [6]

Notably, Dr. Carpenter and her coauthors also surmise that "blight is an especially critical community issue in many cities in the Southeast" due to their low population densities, which cause them to struggle to recover from proliferation [6]. Their conclusion that blight proliferation most severely harms southeastern communities adds further credence to my selection of Mississippi as my location of study. Additionally, their statement that lower population densities renders an area or community more vulnerable to blight impacts supports my choice to examine rural communities.

While Dr. Carpenter, Mitchell, and Price primarily frame blight proliferation through the context of urbanized areas and urban clusters within the southeast—since, as part of their research objective, they seek to outline variations in the 'local approaches' to blight remediation appropriate in rural settings and urban settings—their emphasis on 'local approaches' pushes them to also consider blight proliferation and its remediation within the rural settings of the American South [6]. This allows many of the qualitative findings within the research of Dr. Carpenter, Mitchell, and Price to exist as especially informative to my own research objectives.

Dr. Carpenter and her coauthors, first detail a brief history of blight in the US, and they show that—since the great recession—the prevalence of blighted properties has surged,[15]. Disproportionately and nearly exclusively, these properties are located within poor and unstable neighborhoods. Moreover, Dr. Carpenter and her co authors conclude that this blight proliferation primarily results from:

> "Suburbanization, population decline, job loss (particularly in the manufacturing sector), foreclosure, and natural events that render structures or lots unstable." [6]

[14] In short, within rural communities, significant economies of scale concerns may exist.
[15] Typically, these properties have been abandoned or seized by banks [6].

Ultimately though, after outlining the causes of blight proliferation, Dr. Carpenter and her coauthors primarily discuss blight remediation.[16] To do so, they select two case study communities for analysis—New Orleans, Louisiana and Macon, Georgia[17] [6]. Along with having experienced significant blight proliferation issues, both New Orleans and Macon have engaged in substantial blight remediation programs and are considered to be leaders—within the Southeast—in "creating and refining robust strategies for combating blight" [6]. These case studies included macroeconomic data on each city and extensive interviews with residents, policymakers, and local stakeholders [6].

From these case studies, Dr. Carpenter and her coauthors' findings emphasize the importance of substantial data collection by policy-making bodies; the need for an overarching, jurisdiction-wide, continuous blight remediation strategy; the value of transparent and realistic metrics; the need for strong leadership; and strategic partnerships that leverage political will and resources; the need for public participation; and the effectiveness of strategies such as strong code enforcement and land banking over "expropriation or eminent domain" [6]. Furthermore, the researchers stress that all of these remediation goals and strategies should be modified wherever needed for each locality's unique characteristics. This notion of adjustment for locality is especially relevant to my analysis of rural communities. To state an example, rural communities may not feature an effective or any police department, code enforcement office, or organized government organizations. Without this infrastructure in place, rural communities will struggle to enact many of Dr. Carpenter's recommendations as she states. To summarize, my analysis regarding data-collection, proliferation effects, and the necessity of remediation will heavily draw upon Dr. Carpenter, Mitchell, and Price's work, while adjusting their findings wherever necessary.

[16] Remediation refers to the renewed maintenance or destruction of previously blighted properties or infrastructure or the decreasing of crime occurrence.

[17] Both of these cities were selected due to their location, size, and significant blight issues. Macon, importantly, fits closely to type of rural community which I intend to study.

3 Methodology

Within this paper, I utilize data from the state of Mississippi to construct continuous, geographic, kernel density estimates for blight proliferation, demographic metrics, proximity to the Mississippi River and its tributaries, economic outcomes, and poverty-related outcomes within the state of Mississippi. I then input these continuous, geographic, kernel density estimates into an instrumental variables model, using proximity to the tributaries of the Mississippi river, controlled by proximity to the Mississippi River itself, as an instrument for blight proliferation. Through this analysis, I seek to obtain a robust estimate of the causal effect of blight proliferation on economic and poverty-related outcomes.

3.1 Data Collection

While Mississippi was partially selected as my location of study due to the relative quality of its data, a single complete data set which quantifies blight proliferation, demographic metrics, proximity to the Mississippi River and its tributaries, economic outcomes, and poverty-related outcomes across various geographic locations within the state of Mississippi does not exist. Specially, no single state-wide, blight proliferation data set exists regarding Mississippi, and the state-wide data sets quantifying demographics, economics, and poverty-related outcomes across geographic locations in Mississippi and those outline Mississippi hydrology do not exist at the same level of observation.[18]

3.1.1 Blight Proliferation Data

For blight proliferation, I first obtain all freely available, online code enforcement data from county, town, and city governments within the state of Mississippi. The heavy majority of this data is acquired through the Mississippi Automated Resource Information System (MARIS) [14]. This freely available data, occasionally, is aggregated across the entire geographic area of representation, so code enforcement violations are given as a total quantity, by type within a county, town, or city [14].[19] In most cases, though, the obtained code enforcement data is represented through specific addresses which are each associated with a violation type and date. This freely available data, when merged, covers nearly 75% of Mississippi.[20]

As will be discussed, where I only possess aggregated code enforcement data, I propagate these aggregates across all location within the involved municipality or area, weighted by total number of properties, to serve as an approximation of local blight proliferation density. In those locations where I do not possess code enforcement data, I directly contact local governments, requesting the desired data. From this process, I am able to obtain enough data to cover over 90% of Mississippi. Finally, in those few remaining areas

[18]Demographics, economics, and poverty-related are given by the US Census Bureau at the Census block level, and Mississippi hydrology is given by the Mississippi State Government at the point-coordinate level (*i.e.* longitude and latitude).

[19]Code enforcement violation types range from collapsing structures to signs situated too close to a street.

[20]In many areas, data on dozens of Mississippi counties or entire cities is included within the same data set, allowing for relatively easy standardization and combination of data sets.

where I do not possess any code enforcement data, I use housing vacancies as a proxy for blight proliferation. I acquire quantitative representations of housing vacancies—at the census block, census tract, and county level—from the Mississippi Automated Resource Information System [14]. Housing vacancies serve as the primary fundamental cause of blight proliferation in rural areas [6, 8], and there exists a nearly one-to-one correlation between housing vacancies and instances of blight proliferation [8]. Therefore, I conclude that housing vacancies serves as a compelling proxy for blight proliferation in those areas where I do not otherwise possess the more descriptive code enforcement data.

Through this process, I obtain quantitative data on code enforcement violations within every geographic location in Mississippi. Next, according the physical indicators outlined by Professors Maghelal, Andrew, Arlikatti, and Jang, I eliminate any code enforcement violation observation from my data set which does not fit their seven physical indicators [13]. As stated in the literature review, those physical indicators are:

1. Abandoned Buildings
2. Vacant Residential Structures
3. Vacant Commercial Structures
4. Mortgage Foreclosed Properties
5. Tax Foreclosed Properties
6. Tax Delinquent Properties
7. Demolished and Uncleaned Properties

Then, to further move toward my final data set describing the geographic location of instances of blight, I also remove all observations which have already been marked as 're-solved' by the appropriate code enforcement department. For those few code enforcement departments which do not provide dates of resolution, I remove all observations which were codified before 2000. I select January 1, 2000 as my cutoff date because—within those counties and municipalities which record reporting dates (the date on which the code enforcement violation was recorded) and resolution dates (the date on which the code enforcement violation was resolved)—I observe a mean length of resolution (the time between the reporting date and resolution date) of approximately 10 years.

Finally, because my demographic, economic, and poverty-related data is obtained from the 2010 Census, I remove all observations of code enforcement violations which did not exist prior to 2010. After completing this process, I possess a data set of 158,951 code enforcement violations across the state of Mississippi. Since I have elected to follow the method of identification outlined by Professors Maghelal Maghelal, Andrew, Arlikatti, and Jang,[21] I may now interpret these 158,951 code enforcement violations as instances of blight proliferation [13]. Lastly, to ensure the workability of my data set, I utilize *OpenCage Geo*, an online geocoding service, to convert each address associated with each instance of blight proliferation to a geographic coordinate given in latitude and longitude.

[21] By 'method of identification,' here, I am referring to the seven physical indicators for instances of blight from the research of Professors Maghelal, Andrew, Arlikatti, and Jang.

3.1.2 Demographic, Economic, and Poverty-Related Data

Census data which connects demographic, economic, or poverty-related data to specific addresses or geographic coordinates is typically restricted for public use due to privacy concerns. Thus, to quantify demographics, economics, and poverty-related outcomes at each geographic location within Mississippi, I use census block-level data from the US Census Bureau. A census block—the smallest building block on which census tracts and all other geographic census units are constructed—features 2,000 or fewer individuals and is zoned by the US Census Bureau.

I acquire data which provides the mean demographic, economic, or poverty-related metrics within each census block. Notably, I specify income data so that, for each census block, I observe the proportion of households which earn less than $25,000 per year. This low income density representation will be utilized as my primary economic indicator. In total, there are 2,164 census blocks within Mississippi, and I possess data of identical form for each of them. Here, a meaningful hurdle within my analysis arises: due to data constraints, much of my data is represented at various levels which do not neatly sum into one another.

3.1.3 Mississippi Hydrology

Finally, I acquire data, also through the Mississippi Automated Resource Information System, on hydrology within Mississippi. More specifically, I acquire geographic data, within a file type known as a shape file, which provides exact latitude and longitude coordinates for the major rivers within the state of Mississippi. I then restrict my data set to only the Mississippi River and its tributaries, eliminating all major rivers in the state of Mississippi which do not flow into the Mississippi River eventually. In total, there are 16 tributaries to the Mississippi River, and they run from the southwest portion of the state to the northwest and even northeast portion of the state [14]. Because most tributaries to the Mississippi River, within the state of Mississippi, primarily flow north-south, then, in most places, only a few dozen miles separate the banks of the Mississippi River from its tributaries [14]. A visualization of these tributaries and the Mississippi River is shown below.

(a) Major Tributaries and Mississippi River (b) Other Major Rivers

Figure 3: Major Mississippi Rivers

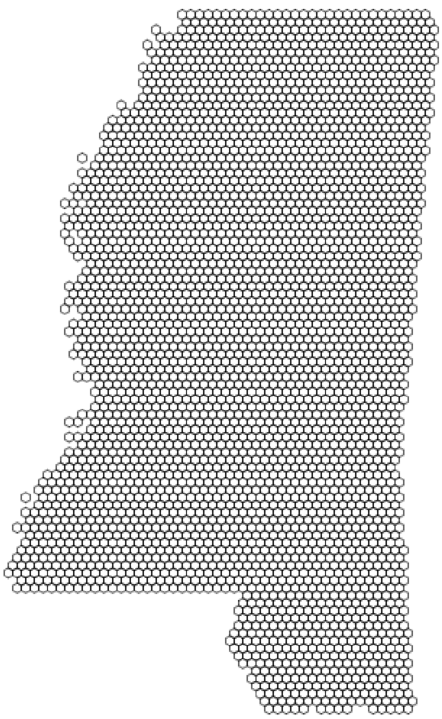
3.2 Geographic Density Estimates

As my data is represented at various levels and since I intend to analyze geographic locations which are very close to specific rivers, I use kernel density estimates to provide exact representations of the geographic density of certain features where applicable and to approximate other features down to continuous, longitude/latitude-level data otherwise. I utilize the methods outlined by Chris Brunsdon in his publication, titled "Estimating Probability Surfaces for Geographic Point Data: An Adaptive Kernel Algorithm," to do so [20].

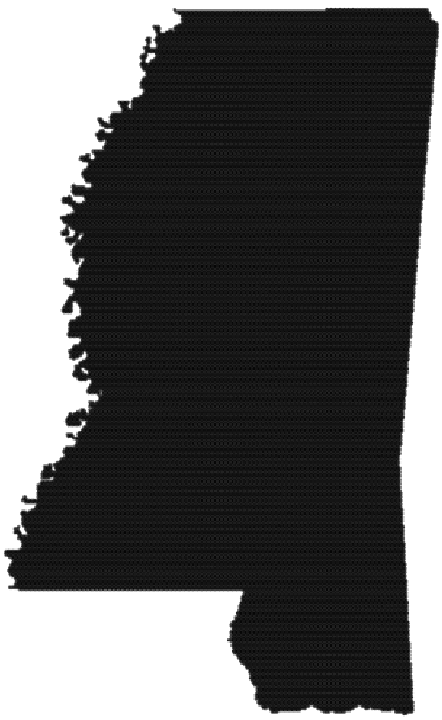
3.2.1 Grid Construction

To begin my process of developing geographic kernel density estimations, I first construct a sufficiently dense grid from the geographic area of Mississippi. As outlined by Chris Brunsdon, this is the first step in the process of developing geographic kernel density estimates [20].

The following figure shows, both, a less dense but more legible grid (figure 4a) and a sufficiently dense grid (figure 4b). Hexagonal blocks are utilized to build the grid, and—at each juncture between multiple vertices—I understand a 'point' to exist. These 'points' will function as the unit of observation for my geographic kernel density data, and they are intended to approximate a continuous representation of my geographic data.



(a) Less Dense Geographic Grid



(b) Sufficiently Dense Geographic Grid

Figure 4: Gridding Process for Mississippi

3.2.2 Kernel Density Estimators

After the construction of my sufficiently dense grid is complete, I use a geographic kernel density estimator function, as outlined by Chris Brunsdon, to produce estimates for the relative frequency of blight proliferation, low income density, non-white density, and proximity to various waterway specifications at each 'point' on my grid. The functions which do this, obtained from Chris Brunsdon's paper, are specified below. Importantly, for those observations which are not represented at the longitude/latitude-level, I weight them by the area which they represent so that they approximate longitude/latitude-level data. Additionally, for my blight proliferation data, I transform is so that it represents the proportion of buildings in an area which are considered blighted.

$$l(s_g) = \frac{c}{A_g} \cdot \sum_{i=1}^{n} \left[k\left(\frac{d_{i,g}}{h_g}\right) \cdot y_i \right] \tag{1}$$

Here, I present the first equation which calculates 'intensity,' given by $l(s_g)$, at each grid point [20]. In this equation, c is a constant of proportionality; A_g represents the area over which the kernel function is evaluated at grid point, s_g;[22] n is the number of observations; $k(x)$ is the kernel function—a unimodal, symmetrical, bivariate probability density function—for a value x; $d_{i,g}$ is the Euclidean distance between data points s_i and grid point s_g; h_g is the kernel bandwidth (*i.e.* the radius of the kernel function); and y_i is the number of objects located at data point s_i [20]. Notably, I employ a bandwidth specification so that the bandwidth of each kernel density function is given, for each grid point, by the circle of the smallest possible radius, centered at each grid point, required to contain a weighted quantity of data points which sums to a specified value [20].[23]

$$p(s_g) = \frac{l(s_g)}{\sum_{j=1}^{G} l(s_j)} \tag{2}$$

Now, after calculating 'intensity' estimates at each grid point, s_g, I use those intensity estimates—in accordance with Chris Brunsdon's work—to calculate kernel *density* estimates at each grid point [20]. G represents the total number of grid points, and $p(s_g)$ represents kernel density estimates at each grid point [20].

This process allows be to construct kernel density estimates for a grid which approximates a continuous representation of Mississippi. These kernel density estimates provide the relative frequency of each variable of interest at each grid point [20]. More specifically, these kernel density estimates provide the probability of observing an occurrence of the variable of interest at each specific grid point [20]. For example, a kernel density estimate may illustrate the probability of observing an instance of blighted property at each grid point or the probability of observing a low income household at each grid point.

[22] The area, A_g, is derived from the grid specification.

[23] This specification allows me to use data sets specified at various levels in conjunction with each other [20].

3.3 Instrumental Variables Model

While constructing my data set(s) and developing my kernel density estimates is a relatively laborious process, after completing these steps, I may utilize my density estimates in an instrumental variables model.

This model attempts to mitigate reverse causality and apply compellingly random exogenous variation to the instrumented variable. In this case I will use proximity to Mississippi River tributaries, controlled by proximity to the Mississippi River, as an instrument which introduces random, exogenous variation to my instrumented variable—blight proliferation. Finally, I utilize that exogenous variation in blight proliferation to estimate the causal impact of blight proliferation on economic/poverty-related outcomes, more specially, low-income density.

3.3.1 Theoretical Framework

As stated before, I surmise that close proximities to a Mississippi River tributary tend to experience more severe flooding events than other locations in the state. Moreover, I also surmise that locations close to a Mississippi River tributary tend to experience more severe flooding events than locations close to the Mississippi River itself. Substantial levy efforts along the Mississippi have reduced the intensity of flooding along the banks of the Mississippi [4], but these same levies have also forced elevated water levels to many tributary rivers of the Mississippi, many of which do feature the same level of or any substantial flood control [1, 4].

Therefore, I hypothesize that areas near the banks of major Mississippi tributaries—often only a few dozen miles from the banks of the Mississippi itself—will experience more substantial flood related damage, often causing disrepair in local structures and instances of blight. Consequently, proximity to a Mississippi tributary, I theorize, will introduce exogenous variation to local blight proliferation. This dynamic, controlled by impacts near the Mississippi River itself, should produce a robust causal estimate of bight proliferation in Mississippi [10].

Additionally, I hypothesize that locations near the banks of the Mississippi River, since they are so close in proximity to locations on the banks of the Mississippi Tributaries, should function as a compelling control in my instrumental variables analysis. It may be that locations bordering these major tributaries feature unique dynamics which may bias my results, but I hypothesize that areas near the banks of the Mississippi will feature these same unique dynamics. They are close in proximity, are structured around similar industries, and are characterized by the same delta culture [4]. In effect, I am using locations near the Mississippi River to represent a vector of controls which I could utilize in my instrumental variables analysis.

3.3.2 Necessary Assumptions in Instrumental Variables

Substantial artifice exists around the instrumental variables model, characterizing which instruments qualify as valid. As outlined by Professor Guido Imbens, in order for an instrumental variables model to be valid, it must meet the following requirements [10].

1. The instrument must impact the treatment variable of interest—in this case blight proliferation. This is known as the relevance assumption.
2. The instrument must only impact the outcome object of interest through the dependent variable of interest. In this case, my chosen instrument must only impact economic/poverty-related outcomes through blight proliferation. This is known as the exclusion restriction.
3. The instrument does not share common cause with the outcome object of interest. In this case, my chosen instrument does not share common causes with economic or poverty-related outcomes. This is know as the independence or exchangeability assumption.

Additionally, the observed estimate from this analytic framework only applies to compliers (*i.e.* those observations which adopt the treatment effect, in this case blight proliferation, due to the instrument, in this case increased flooding) [8].

In this model, there is compelling evidence to suggest that all three assumptions are met. First, it seems relatively clear that increased flooding does impact the prevalence of instances of blight in an area and that my instrument passes the relevance assumption.[24] Next, it appears that the primary, and potentially only, way in which increased flooding impacts economic and poverty-related outcomes is through property destruction and damage—both of which are accounted for in my definition of bight proliferation. Finally, the primary justification for the construction of major levies along the Mississippi was to promote shipping traffic from St. Louis into the Gulf of Mexico and to develop a straighter, deeper, and more predictable river [4]. Furthermore, levies were also constructed to help develop commercial agriculture in the area during the 1800s [4]. It seems clear that the current causes of poor economic outcomes near Mississippi tributaries does not share an origin with the increased flooding along the Mississippi River tributaries.

3.3.3 Empirical Model

For my empirical model, I use the proportion of households in an area which earn less than \$25,000 per year as my outcome variable.[25] I then perform the following, standard instrumental variables analysis. T_i gives the proximity to a Mississippi River tributary at each grid-point, and M_i gives the proximity to the Mississippi River itself at each grid-point.

$$\textbf{Reduced Form: } \textit{Low Income Density}_i = \alpha_1 + \rho T_i + \beta_1 M_i + \varepsilon_1 \tag{3}$$

$$\textbf{First Stage: } \textit{Blight Proliferation}_i = \alpha_2 + \varphi T_i + \beta_2 M_i + \varepsilon_2 \tag{4}$$

$$\textbf{Second Stage: } \textit{Low Income Density}_i = \alpha_3 + \lambda(\textit{Estimated Blight Proliferation}_i) + \beta_3 M_i + \varepsilon_3 \tag{5}$$

In this basic instrumental variables framework, I will actually utilize two different specifications, each of which utilize different bandwidth calculations. From this model, I hope to observe a robust causal estimate of the impact of blight proliferation on economic outcomes.

[24] For good reason, the relevance assumption is often considered to be trivial.
[25] As stated before, this data is acquired from the US Census Bureau.

4 Results

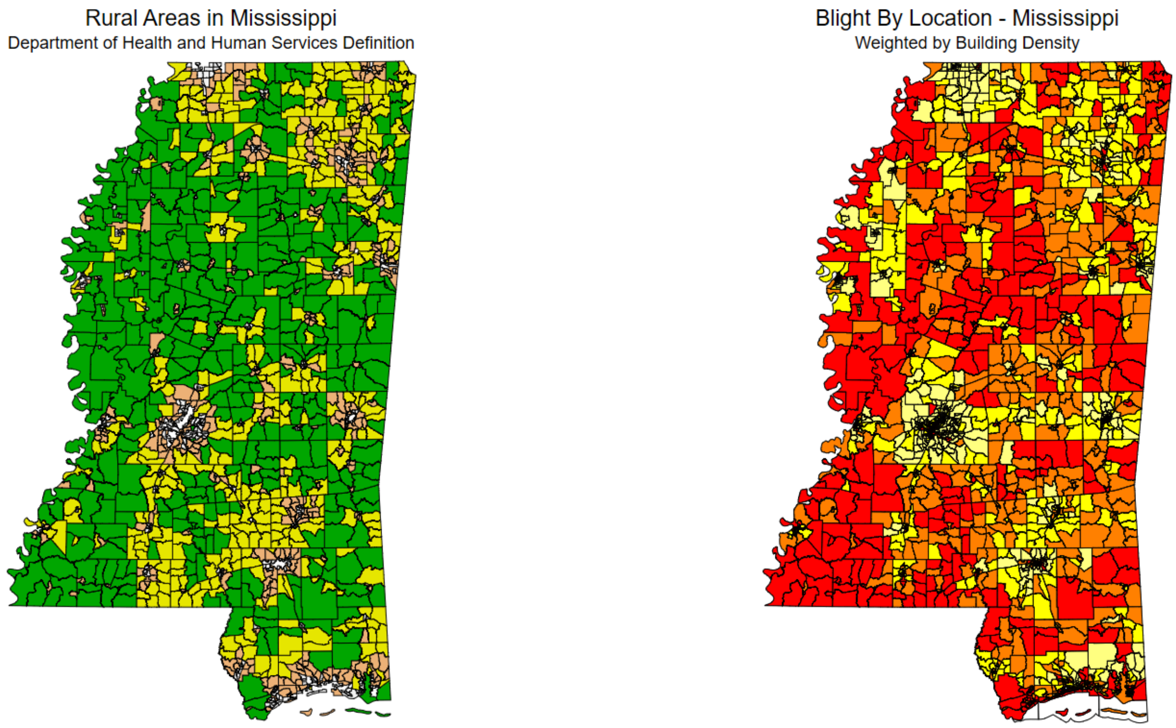
Here, many of my associative and descriptive results regarding Mississippi will be displayed through a series of maps. For my primary instrumental variable results, I will provide both figures and tables. Within this section, I first provide a descriptive analysis of population density (outlining my definitions of rural), blight proliferation, non-white density, and low-income density within Mississippi.

4.1 Descriptive Results

4.1.1 Rural Locations and Blight Proliferation

As discussed in section 1.2 and outlined in figure 1, visually, it appears that rural locations, in Mississippi tend to feature more blight proliferation than urban locations. This section will firmly establish this assertion. Throughout this analysis, I utilize the US Department of Health and Human Services definition of rural. I provide visualizations of rural locations and blight proliferation by census blocks. Later, heat maps, which are directly constructed from my kernel density estimates and, therefore, directly visualize these kernel density estimates, will be utilized regarding blight proliferation.

Below are two figures which illustrate the geographic locations of rural communities and areas featuring high blight proliferation.



(a) Green and Yellow Represents Rural Localities Using the Above Definition

(b) Red Represents Higher Relative Blight Proliferation

Figure 5: Population and Blight Proliferation Density in Mississippi

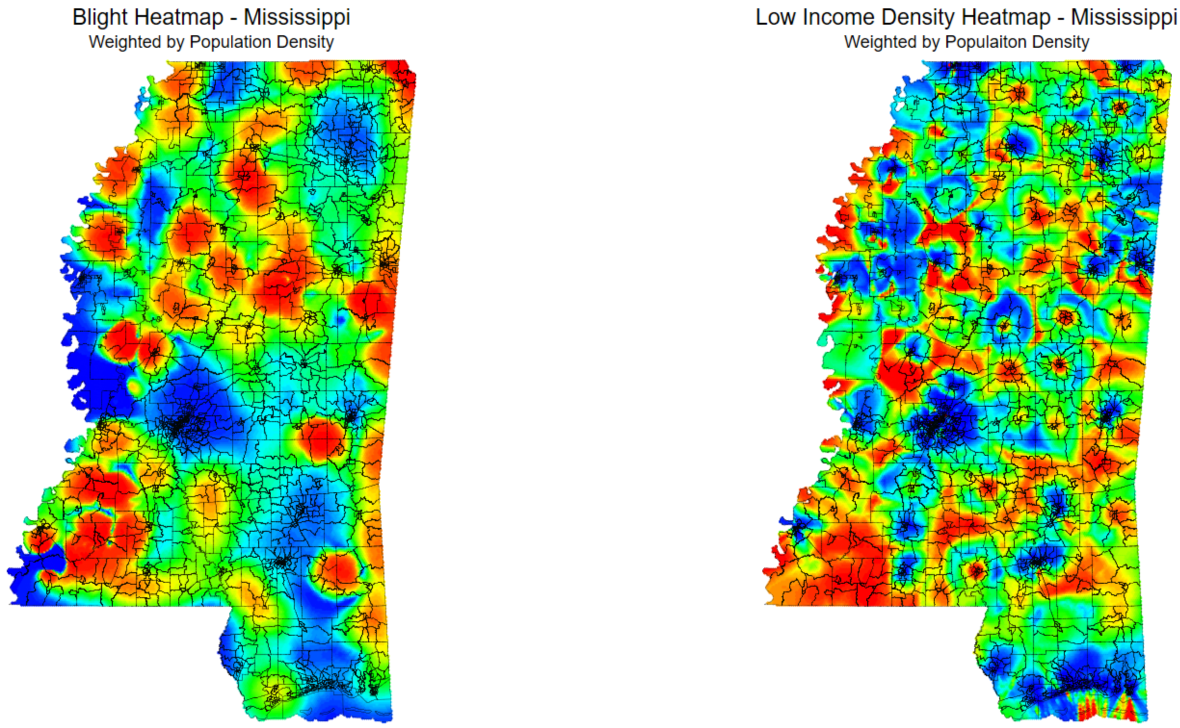
While my introduction section states that these figures appear to imply that blight proliferation is far more substantial within rural areas, I further establish this fact here. I regress the quantity of blighted buildings per building in a census block on a indicator for rural with the following form.

$$(\textit{Blight Proliferation Density})_i = \alpha + \beta(\textit{Rural Indicator})_i + \varepsilon \tag{6}$$

I observe that rural census blocks tend to demonstrate 12% more blighted buildings, weighted by the total quantity of buildings in the census block. These estimates feature a t-score of 13.51 and are significant at the 1% level. This confirms my hypothesis that, at least in Mississippi, blight proliferation represents a more critical danger to rural communities.

4.1.2 Low Income Density and Blight Proliferation

In this section, I construct kernel density estimates for blight proliferation and low-income density, and—along with my census block analysis—I provide heat map visualizations. I expect the localities with the highest low-income density to correspond to those localities with the highest blight proliferation density.



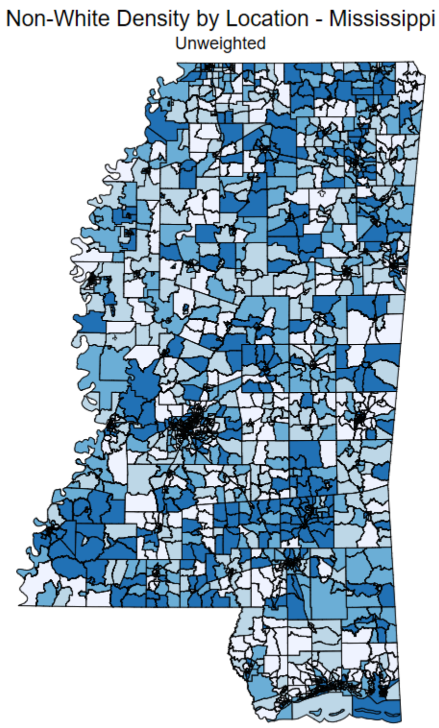
(a) Blight Proliferation – Kernel Density Estimates (b) Low-Income Density – Kernel Density Estimates

Figure 6: Blight Proliferation and Low-Income Density in Mississippi

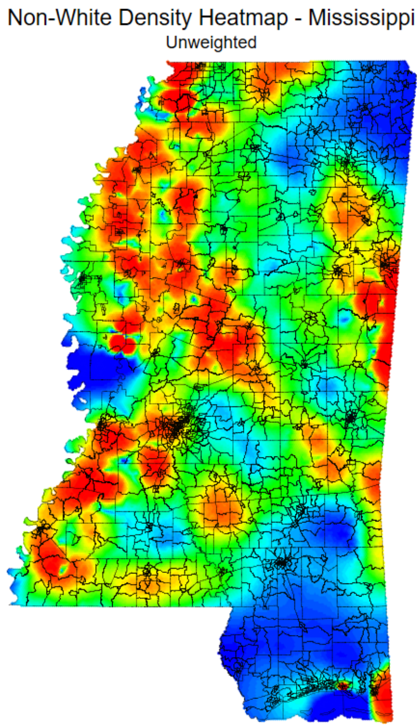
As expected, it appears that those locations with the greatest low-income density also tend to feature the greatest levels of blight proliferation. This fact is crucial to my instrumental variables estimation strategy which seeks to estimate a causal impact of blight proliferation on low-income density. Observing a simple correlation between blight proliferation and low-income density, at the very least, implies that there may be some causal impact. Additionally, I observe that less substantial blight proliferation occurs along the Mississippi River, and I also see that, in the southwest and northern portions of the state, where the density of Mississippi River tributaries is largest, the most substantial blight proliferation and low-income densities also occurs. This fact also bodes well for the validity of my instrumental variables model.

4.1.3 Non-White Densities in Mississippi and Associative Estimates

Next, I produce estimates for the density of non-white individuals at each grid-point. These estimates provide the expected proportion of individuals who are not white at each grid point. The following figures provide these estimates at the census block and grid-point level.



(a) Non-White Density – Census Block Level



(b) Non-White Density – Kernel Density Estimates

Figure 7: Non-White Density in Mississippi

Many of the locations with the greatest non-white density feature non-white populations substantially greater than 90%. Furthermore, visually, there appears to exist a substantial correlation between those areas which feature high blight proliferation densities and high non-white densities.

The following figure more clearly demonstrates this dynamic, and provides associative estimates between blight proliferation, low-income density, and non-white density. These estimates use two specifications for blight proliferation. The first is given as blighted buildings per building and the second is given as blighted buildings per person. The regression forms provide estimates for the correlation between those communities which feature a large low-income or non-white population and those communities which demonstrate high blight proliferation densities. The regression forms are specified below, and results are illustrated.

$$(\textit{Low-Income Density})_i = \alpha_1 + \beta_1(\textit{Blight Proliferation Density})_i + \varepsilon_i \tag{7}$$
$$(\textit{Non-White Density})_i = \alpha_2 + \beta_2(\textit{Blight Proliferation Density})_i + \varepsilon_i \tag{8}$$

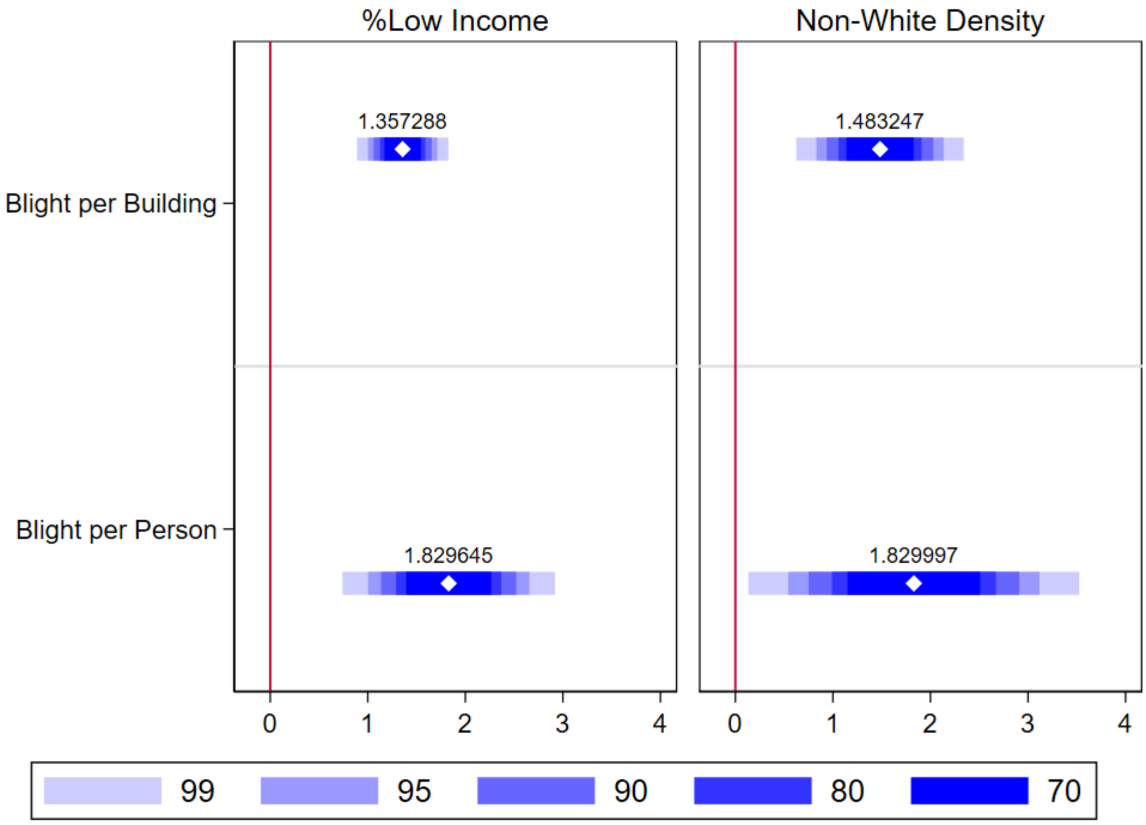


Figure 8: Associations between Blight, Demographics, and Economic Outcomes — Mississippi

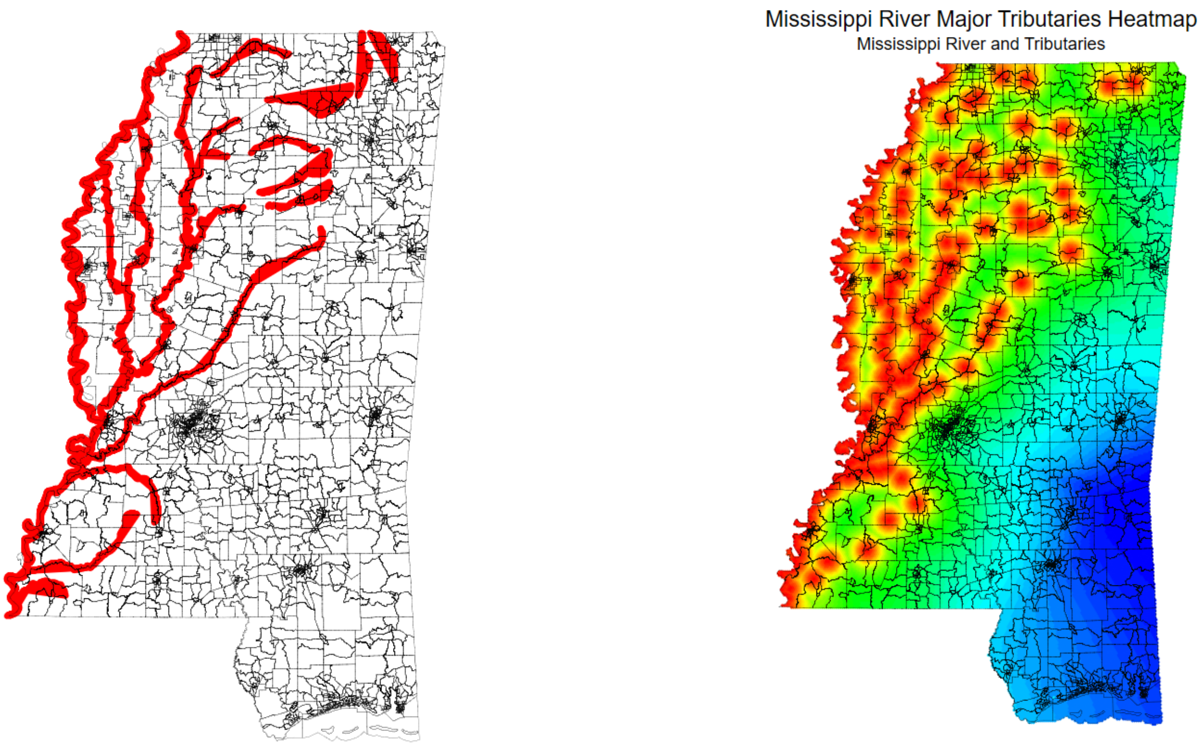
Here, A coefficient estimate of 1 demonstrates that a 1 percentage point increase in the 'likelihood' of observing blight proliferation at a specific grid-point is associated with a 1 percentage point increase in the 'likelihood' of observing a low-income or non-white household/individual at that same grid point. These results merely demonstrate correlation, and they also provide a useful baseline from which I will compare my instrumental variables results.

4.2 Instrumental Variables Analysis

I now move to perform my instrumental variables analysis using the kernel density estimates from the previous sections. I will first calculate kernel density estimates for proximity to major tributaries and the Mississippi River itself. I use the MARIS definition for major rivers.

4.2.1 Major Rivers – Kernel Densities

The following figures demonstrate the density of major Mississippi tributaries at each grid point. I utilize the same methodology to calculate these density estimates, and they calculate the 'likelihood' of a grid-point being located within close proximity, defined as 10 miles of a major Mississippi River tributary or the Mississippi itself. Here, the data will be visualized in conjunction, but—later—I will separate the kernel density estimates regarding the Mississippi River from those regarding the major tributaries.



(a) Mapping of Mississippi River and Tributaries

(b) Mississippi River and Tributaries – Kernel Density Estimates

Figure 9: Mississippi River and Tributaries Density in Mississippi

4.2.2 Instrumental Variable Results

Finally, after this prolonged development of data, I provide the results from my instrumental variables analysis. I use four total specifications in this analysis. Half of my specifications utilize instances of blight proliferation per local quantity of structures as the instrumented variable, and the other half uses instances of blight proliferation per population. Additionally, half of my specifications use just locations near the Mississippi as a control, while the other half uses the locations near the Mississippi and its tributaries as a control.

All approaches are valid and potentially introduce the appropriate variation, but I find the estimation strategies which use the Mississippi River in addition to its tributaries as a control vector—rather than just the Mississippi—to be the most compelling. My results may be interpreted as follows: a coefficient estimate of 2 states that a 1 percentage point increase in the 'likelihood' of observing blight proliferation at a specific grid-point causes a 2 percentage point increase in the 'likelihood' of observing a low-income household at that grid-point (should there exist a household at that grid-point). In effect, a 1 percentage point increase in the local density of blight proliferation causes a 2 percentage point increase in the local density of low-income households. I expect to observe a positive and significant sign on blight proliferation.

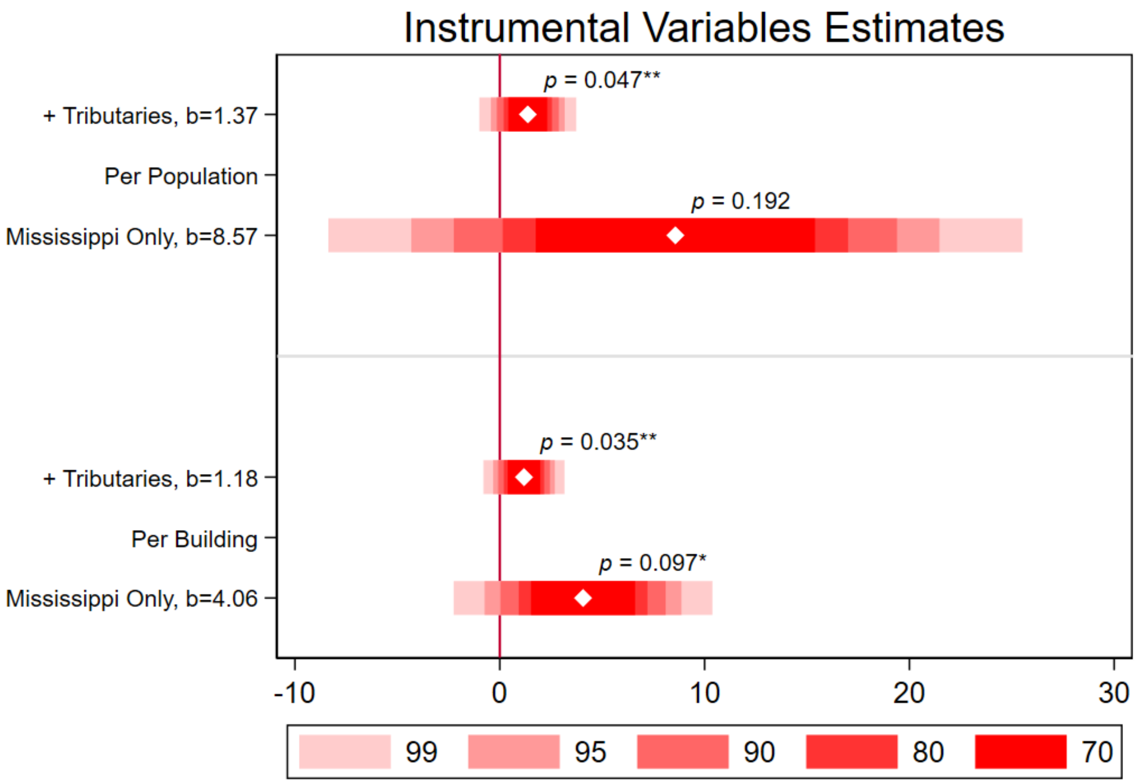


Figure 10: Instrumental Variables Results

Instrumental Variables Results

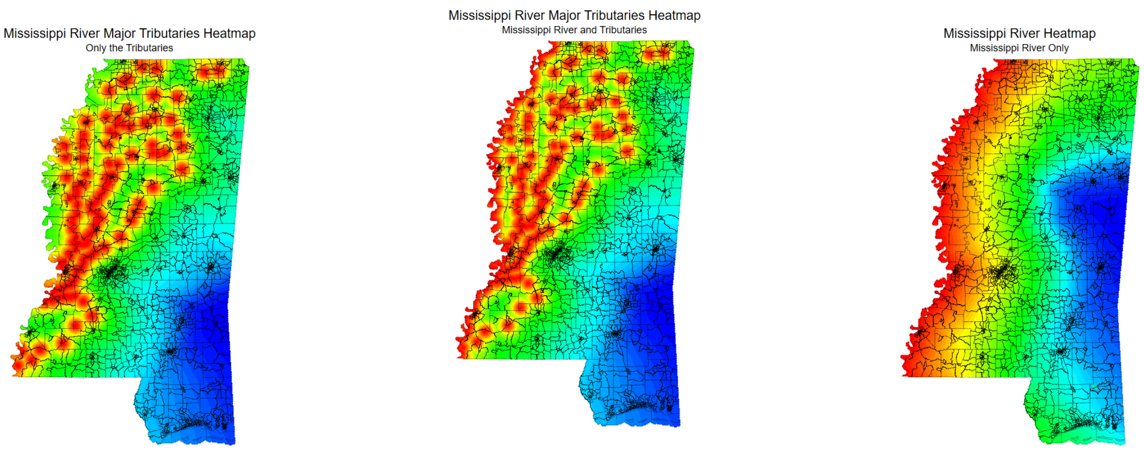
Blight Specifications	**Low-Income Density** b/se	**Control Type** b/se
Per Capita	1.37** (0.519)	Mississsppi + Tributaries
Per Building	1.18** (0.468)	Mississippi + Tributaries
Per Capita	8.57 (6.579)	Mississsppi Only
Per Building	4.06* (2.452)	Mississippi Only

*** = 10% Significance, ** = 5% Significance, *** = 1% Significance**

5 Discussion

My results, should they be valid, demonstrate a remarkable dynamic. I observe, in my most preferred estimates, that an increase in blight proliferation density by just 1 percentage point causes a 1.1-1.4 percentage point increase in low-income density (*i.e.* the proportion of local households which earn less than $25,000 per year). The size of this coefficient implies that blight proliferation represents one of the most potent factors perpetuating and causing disadvantage within a rural area. Additionally, since a large proportion of the individuals living near the Mississippi River and its tributaries are non-white (figure 7), my results also highlight how blight proliferation may further harm an already disadvantaged population.

Notably, I select the estimations which utilize both the Mississippi River and its tributaries as preferred controls because these specifications introduce the desired variation in my model. The following figures demonstrate, first, density estimates for proximity to a Mississippi River tributary and, then, the two possible control specifications.



(a) Mississippi River Tributaries – Kernel Density Estimates

(b) Mississippi River + Tributaries – Kernel Density Estimates

(c) Just Mississippi River – Kernel Density Estimates

Figure 11: Density Mappings for Different River Specifications

As can be observed, the kernel density estimates, across geographies, between figure 11a and figure 11b, are nearly identical. The only substantial difference between the two is the kernel density estimates in those areas near the Mississippi River. This dynamic introduces the exact sort of variation which I intended to pursue in my instrumental variables model. Conversely, in figure 11c, we observe kernel density estimates across Mississippi which are widely different than those shown in figure 11a. Therefore, when using just the Mississippi River as a control, I observe include variations in my instrument that I did not intend to analyze. Consequently, I strongly prefer those estimates which use the Mississippi River and its tributaries as the vector for my controls. These estimates predict a causal effect slightly greater than one.

Initially, a coefficient above one may seem large. One may ask how a variation in one factor (*i.e.* blight proliferation) could, with all else held equal, carry a multiplicative impact on low-income individuals. While this dynamic may appear too potent, I believe that the specific environment within the areas of Mississippi which study justifies this behavior. Because my results use locations near the Mississippi River as a control, then they compare two relatively poor communities to one another. The large coefficients which I observe, then, state that small variations in blight proliferation, within already poor communities, may function as a major determining factor in how resources and positive economic outcomes are distributed between these struggling areas.

Imagine that an investor wishes to develop a solar plant in the Yazoo-Mississippi Delta. That investor, when scouting communities where they may develop their plant could be heavily influenced their visual interpretation of the community. A community with more instances of dilapidated housing and unmaintained infrastructure items may appear less attractive to an investor. Evidence from economic developers in east Arkansas and Mississippi suggests that this dynamic holds true [3, 6].[26] Therefore, the investor may, eventually, select a community with slightly less substantial levels of blight proliferation than others. Consequently, a community featuring just slightly decreased occurrences of blight may receive substantially improved employment outcomes, infrastructure aid (through the additional power generated by the solar plant), and economic activity [3]. The benefit from a single project, especially if that project does not cause local environmental damage or promote poor health outcomes, could be substantial to a small rural community. In fact, often within the world of rural economic development, acquiring just a dozen extra jobs for a community represents cause for major celebration.

Moreover, scale effects could also generate such large coefficient estimates. Many of the communities analyzed may exist within a liminal space where shocks to the economy, culture, or psyche may enact substantial changes within the community—be they positive or negative. Just as small shocks to vulnerable individuals may push them into homelessness or unemployment [11], a vulnerable community may exist as disproportionately affected by relatively small shocks. Therefore, the vulnerable communities which I study may demonstrate especially sensitive behavior regarding blight proliferation. While these two explanations for the large magnitude of my coefficient estimates are both plausible, additional quantitative analysis may investigate exactly why blight proliferation appears to carry such a substantial causal impact on relatively low-income rural communities.

Additionally, my results represent a compelling argument against the promotion of out-migration efforts. Many individuals connected to public policy may argue that, if individuals within rural communities face decreased economic and poverty-related outcomes [20]—whether from blight proliferation or some other factor—then those individuals should seek to relocate to healthier or more sustainable areas [6, 9]. But, as demonstrated in section 1.2, despite substantial previous out-migration efforts and often immense economic pressure to move to an urban area, 20% of the nation's population still lives within rural areas, and the rate of out-migration has fallen to 0 [6, 19, 20]. This fact suggests that a substantial portion of the nation's population will always reside in rural areas. If additional out-migration is promoted, then the economic and poverty-related impact could be crippling for those who remain. A consensus exists stating that out-migration directly causes instances of blight [9], and my causal estimates regarding the impact of blight proliferation implies that any benefits experienced by those who migrate may be completely counterbalanced by costs inflicted on those who remain.

[26] Investor often judge the competency of local governments by how well they maintain public property such as medians, roads, and infrastructure.

Consequently, from my research, I do not believe that out-migration promotion represents effective policy for rural communities. Strengthening these communities through blight remediation efforts may more effectively and more efficiently promote improved economic outcomes for individuals residing there. Furthermore, much of our nation's culture production, from music to cinema to literature, has originated within rural America [9]. With healthier and more sustainable rural communities, economic outcomes may not only improve but also cultural contributions to American society may as well. To use an anecdote, from my time in the east Arkansas delta, after experiencing substantial out-migration, the first businesses to close were historic blues venues and iconic restaurants. Additionally, after some communities, such as Clarksdale, Mississippi, received substantial external aid, such cultural touchstones as historic music venues reopened, significantly improving the local economy and community satisfaction.

While largely sub-altern, blight proliferation appears to be, in fact, one of the most important factors in determining the sustainability and health of a rural area. As stated above, I estimate that a 1 percentage point increase in local blight proliferation density causes a 1.1-1.4 percentage point increase in the proportion of local households which earn less than $25,000 per year. While my methodology utilizes a series of approximations to arrive at these results, I believe them to be unbiased and robust. Further research may use more rich data than my own which does not need to be 'approximated down' to continuous, latitude/longitude estimates in order to be utilized. Additionally, further research may conduct a more deep analysis of differential effects and utilize new areas of study. Nevertheless, it still appears that blighted buildings and the state of disrepair that they approximate prove to carry tremendous negative impacts on rural areas. Combating the 'epidemic' that blight and disrepair represents in the rural South may prove to be one of the more pressing development issues of our time. I hope that, by providing a robust causal estimation, I have taken important early steps in these efforts.

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