A SPATIAL THEORY OF SCHOOL CLOSURE: AN EXAMINATION OF SCHOOL CLOSURE IN AMERICA

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ABSTRACT

This dissertation seeks to uncover the primary factors associated with public school closure in the United States during the five year period 2007 – 2012. Specifically, it addresses three questions related to school closures. First, what are the most important socio-economic factors associated with an individual school being closed? Second, are school districts influenced by their neighbors in making school closure decisions? And finally, what is the role of the spatial organization of cities in shaping school closure outcomes? The econometric analysis is conducted using a multilevel model to estimate the correlation of several variables hypothesized to have a relationship to the school closure process. The random effects model estimates the probability of each school district closing a school. These probabilities are mapped and analyzed using the Getis-Ord Gi* procedure for exploring data that are clustered across geographies. Overall, school enrollment, race, and poverty were the most consistently correlated to school closure. School districts also appear to influence one another, but this is a local process of spatial influence. The final question is addressed by reducing the data set to urban districts only. Relying on an urban classification system developed in the late 1980s, the model attempts to account for the impact of the spatial arrangement of urban space on the school closure process. The results find a substantial effect of spatial form of so-called "industrial" cities on the school closure process. Finally, this project examined differences in the spatial distribution of closed schools compared to new schools. School closure disproportionately impacts low-income and minority students of color; it is primarily an urban process; and schools in closer proximity to the metropolitan principle cities are increasingly likely to close. New schools, in contrast, are located in

urban regions outside the metropolitan principle cities, but new schools are highly concentrated, primarily in areas of higher relative incomes and lower shares of African American students. Overall, this project establishes the geography of school closure in the era of No Child Left Behind. It concludes that school closure is indeed a process that is grounded and shaped by racial and economic institutions.

APPROVAL PAGE

The faculty listed below, appointed by the Dean of the School of Graduate Studies, have examined a dissertation titled "A Spatial Theory of School Closure: An Examination of School Closure in America," presented by Drew Evan Westberg, candidate for the Doctor of Philosophy degree, and certify that in their opinion it is worthy of acceptance.

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As the flood waters crested in Cedar Rapids, IA over eight years ago it would have been impossible to imagine that I would ever attempt going back to economics. The next days, weeks, and months were beyond anything I could imagine. The stress, the fear, the uncertainty were palpable and relentless. It was truly a disaster. That event changed my life and it put me on this path. Though the flood shaped the path, it was my colleagues that helped me take that leap back into the student desk. I owe them everything for their kindness, camaraderie, sympathy, lack of sympathy, and above all their love and support. Sandi Fowler represents the best of us. She is tough, witty, nurturing, and set her expectation extraordinarily high. I hope I met them at least most of the time. It was my honor to work for her and my privilege to learn from her. Angie Charipar was my friend, my confidant, and my co-conspirator. She helped me through many difficult days. Her smile, laughter, and outpouring of love and support made those days some of the best of my life. Angie and Sandi made this transition possible and I will never be able to thank them enough. Liz Jacobi was my rock, my solace, my never-ending source of support and inspiration. She attacks life in all the best ways, and I truly hope to be more like her when I grow up. These three good and decent public servants made my transition back to graduate school as a 30-year-old exciting, appropriate, and doable. I could never have completed this task without them.

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To June, I love you honey. I wrote this for you.

DEDICATION

This is dedicated to Professor Frederic S. Lee.

Though I am sure he would find many faults in this analysis, it is my hope that he would appreciate the target. May we all be as persistent and unforgiving in the quest to construct a better world.

For Teale and June.

This is for you both. Thank you for making me a better human being.

CHAPTER 1

EDUCATION, SPACE, AND CAPITAL ACCUMULATION

This dissertation seeks to uncover the primary factors associated with public school closure in the United States during the five year period 2007 – 2012. Specifically, it addresses three questions related to school closures. First, what are the most important socio-economic factors associated with an individual school being closed? Second, are school districts influenced by their neighbors in making school closure decisions? And finally, what is the role of the spatial organization of cities in shaping school closure outcomes? Each of these questions addresses a different but related element of the process generating school closures.

School boards across the country are increasingly choosing to close schools. The effects of these decisions fundamentally affect the social, political, and economic resources available to affected neighborhoods and residents. Research going back to the 1970s has been capturing the social and psychological ramifications of school closures. There is one constant theme: it is not easy for anyone involved.

1.1 The Problem

Closing a school is not necessarily a bad thing. The building itself could be old, outdated, or woefully inadequate for individuals with disabilities. The challenge of school closure for urban planners, sociologists, economists, educators, and local activists is to ensure that entire neighborhoods are not stripped of essential economic, political, and social resources. Closing a school removes access to public education from a physical location - a neighborhood - and re-allocates it elsewhere (possibly not even in the same city). Of course, students that utilized the building are re-assigned to different schools, but what about the neighborhood itself?

Neighborhoods occupy space. They are not transitory. Therefore, the closure of a school is a political decision to explicitly remove educational resources from those neighborhoods. In his 1973 book *Social Justice and the City,* Marxist Geographer David Harvey emphasized the allocative and

distributional effects of location decisions for public facilities. He argues, "Most social policies are directly framed as attempts to maintain a given distribution of income within a social system or to redistribute income among the various social groups that make up a society" (Harvey, 1973/2009: 52). In this light, the decision of a school board to close a school is a direct redistribution of economic access and opportunity from one neighborhood to another. Regardless of how that decision is justified, it is a decision to make one neighborhood richer and another poorer.

Herein lays the power of space, its organization, and reorganization. Real economic resources are both allocated and distributed across space. Consequently, the human act of organizing space is an act of distributing access to real economic resources, or "social provisioning" (Gruchy, 1987). As cities are ultimately designed by people the allocation of uses to spaces and the distribution of infrastructure in and around those spaces either act to "control, liberate, or expand" human agency (Commons, 1931). To explain these choices then, researchers must understand the impact of space and spatial reorganization on the distribution of access to social provisioning. Marxist geographers and political theorists have been pursuing this line of exploration since the urban revolts of the late 1960s (Castells, 1979; Gordon, 1977; Harvey, 1973/2009, 1982; Katznelson, 1994; Lefebvre, 1970; Santos, 1975, 1977, Smith, 1984, 1996;). These efforts have focused on the role of capital accumulation - at both the global and local level – in shaping the decisions made by political and economic elites regarding the organization of space.

School closure – a political action – fits squarely into this line of reasoning. Locally, households and enterprises seek out locations within cities that best suit their needs. These choices are heavily influenced by their respective budgets. However, local governments allocate uses to spaces by income in many ways, including zoning codes, building codes, parking requirements, rental requirements, and more. Through a distinctly separate process, school districts (and the boards that govern them) make location decisions for district resources. They decide when old schools close, when and where new schools are built. These decisions are undoubtedly influenced by the socio-economic context of those geographies. As a result, there is an interacting relationship between city

policies of spatial allocation and school policies of resource location. This interaction is one of the powerful mechanisms that helped shape the American Ghetto according to Douglass Massey and Nancy Denton. In their foundational book, *American Apartheid: Segregation and the Making of the Underclass*, the authors illustrate the powerful force of residential racial segregation on the opportunity sets available to the so-called "underclass," which consists largely of poor racial and ethnic minorities. Broadly speaking, in the U.S. students are assigned to school buildings based on the location of their house. Hence, families with children and the means to move to with better schools will do so, resulting in the concentration of low-income households in specific school catchment areas (Massey & Denton, 1993: 141-142).

The global pursuit of capital ushers in other forms of spatial allocation and re-allocation. Milton Santos, a Brazilian Marxist Geographer, focused his research on the powerful role of the "two circuits of the urban economy." Global forces of capital adapt to new technologies and new innovations, leading to new means of wealth accumulation. These adaptations call for new spatial structures to be constructed in new places, or existing places must be reshaped to facilitate "growth." Harvey's 1982 classic text, *The Limits to Capital* focused on the global ability of capital to lay waste through its expansion to entire regions. But, in doing so, this spatial devaluation plants the seeds of future accumulation through a so-called "spatial fix."

Devalued regions and neighborhoods can act as a sort of spatial savings. During times of crisis, these areas can be relied upon for reorganization – often with the help of the State – to facilitate capital accumulation. The result is a cyclical spatial flow of capital, or a churning of space to ensure viable outlets for capital during periodic crises. Global forces act to alter the means of capital accumulation and consequently the spatial forms that generate "success." Local forces also organize space to generate "economic success." Both processes lead to a growing divergence of access to the social provisioning process that is increasingly accounted for by spatial location.

In pursuit of capital, both local and global forces reconstruct institutional and social relationships within their cities, their "socio-spatial formations." The closing of public schools is only one outcome

of this process, but it is a tremendously important outcome to the lives of students, parents, teachers, administrators, staff, neighbors, and society as a whole. This dissertation seeks to better understand the various factors influencing the school closure process in the U.S. Specifically, it provides an empirical exploration of the role of space and its organization in the school closure process.

1.2 An Overview

The dissertation seeks to address three distinct but related questions regarding school closure in America. First, are school closures associated with race and other socio-economic factors? Are schools being closed in predominantly black neighborhoods, or Hispanic neighborhoods, or just poor neighborhoods? Using a panel dataset from 2007 – 2012, I test whether race, ethnicity, and income are correlated with a school being closed. The results are clear. Schools with above average shares of African American students and/or students on free and reduced lunch, are more likely to close. Schools in cities are more likely to close than public schools in rural areas, on average. Schools with smaller enrollments, relative to the mean, are far more likely to close.

Second, the school district itself plays an important role in shaping the school closure dilemma. The analysis finds that almost 40 percent of the variation in school closure is attributable to the school district itself. The strongest associations of school closure at the district level are geography and time. Over time, the probability of a school district closing a school has typically gone up; the same can be said of urban and suburban schools. Finally, a school district's decision to close a school is somewhat related to decisions by neighboring school districts, but these are primarily districts within the same metropolitan area.

These findings add to the current state of empirical knowledge of the school closure phenomenon. These results are important for explanatory purposes, but it is also important to assess areas of high risk. Using a multilevel model, I estimate the school closure risk level of each school district based on the schools closed in that district between 2007 and 2012. This approach is widely utilized by epidemiologists that seek to map out areas of high risk of disease. The results illustrate the critical

importance of institutional arrangements at the state level as well as the importance of the regions past (i.e. its correlation to the present form of capital accumulation).

Finally, I evaluate the role of capital accumulation on the spatial organization of cities and its subsequent relationship to school closure. Using a classification scheme developed in the late 1970s, large U.S. cities are categorized based on the form of capital accumulation they were originally designed to support. The results suggest that cities originally designed to support mass industrial activity have endured a substantially higher burden with respect to school closure than mercantile and so-called "sunbelt" cities. These results have important implications for spatial theorists as well as education researchers.

This project makes three contributions to the existing school closure narrative. First, it provides a global assessment of the current school closure research, and addresses this question on a national level using econometric techniques. Second, it evaluates the role of spatial proximity in school closure at the school district level. It maps the school districts within the continental U.S. that have the highest and lowest odds of closing public schools, permitting future analysis on the local structures that are generating these undesireable outcomes. Third, this analysis attempts to connect the school closure process to the process of capital accumulation via urban form. If a connection can be made, it will permit further work exploring the interactions between specific urban contexts and the success of public schools. Finally, this research explores the spatial distribution of access to education. Following Harvey (1973/2009), I compare the locations of closed schools to those of new schools. Ultimately, this question is the driving force behind this project: Are we restricting access to education in America?

1.3 A Roadmap

The next chapter outlines the ontological foundations of this project. Each of us has our own views of how the world is structured, but too often these do not formally recognize the spatial nature of human existence. This chapter will formally outline a synthesized position that both accounts for

space and presents a more detailed view of social structure. Chapter three delves into the literature on school closures. Chapter four applies an institutional analysis of school closure in the United States, relying on the Institutional Analysis and Design (IAD) framework (Kiser & Ostrom, 2000). Chapter five provides an empirical examination of the nature of school closure. In particular, it focuses on the geographic and recent historical trends of closures themselves. Chapter six presents the econometric analysis of school closure between 2007-2012. Using logistic panel methods, it evaluates the correlations between the socio-economic characteristics of a school and the likelihood of that school closing. Chapter seven approaches school closure as a disease. The analysis maps the relative risk levels for each school district, and it identifies the contributions to that risk of particular explanatory factors. Chapter eight explores the differences between closed schools and new schools, including the role of spatial organization. Finally, chapter nine summarizes the conclusions of this project. It discusses the project's limitations, unanswered questions, and next steps for this research.

CHAPTER 2

ON SOCIO-SPATIAL FOUNDATIONS

Every research project is grounded in some set of beliefs as to what is real and what constitutes knowledge. Unfortunately, these philosophical underpinnings are seldom explicitly stated. The purpose of this chapter is to clearly outline my own ontological and epistemological positions, which are the foundation of this research project. This philosophical foundation has two important implications. First, the interpretation of causality takes on a far less positivist point of view. Second, it understands that space as a social structure and is central to human existence, which has far-reaching consequences for social reform.

The next section outlines the ontological building blocks of this philosophical foundation. It attempts to stitch together elements of critical social theory and radical urban planning literature. Section two explores epistemology; it outlines what constitutes knowledge based upon the Marxist conception of overdetermination. Section three synthesizes these elements into the theoretical foundation for this project. Then the final section concludes the chapter with a complete presentation of this "socio-spatial" ontology and a discussion of next steps.

2.1 Ontology: What Exists?

Ontology is the study of what exists. It is the study of what is real. This methodological field of research is dominated by four broad classifications: empiricism, positivism, structuralism, and realism.[1] This dissertation will contain elements of empiricism and positivism. However, the dominant strand of ontological thought for this project is the realist paradigm. I adopt the Critical Realist approach developed by Bhaskar (1978; 1989), Archer (1995; 1996), and Lawson (2003).[2] However, I do not reject the structuralist perspective outright. Rather, I adopt certain aspects of Structuration theory (Giddens, 1984). This theory is largely consistent with the realist perspective but

[1] For a thorough discussion of each school of thought, see Arvanitidis (2015).
[2] For a digestible introduction to Critical Realism see the special essay by Gorski (2013).

is much better in understanding the nature of structures themselves and the interaction between structures and human actors. Finally, both realism and structuration theory (although to a lesser extent) are guilty of misunderstanding the importance of space, its arrangement, and development over time. In the view presented in this chapter, the production and arrangement of "social space" plays a crucial role in understanding complex social phenomena.

Next, I outline the primary components of Critical Realism. Then, I introduce those elements of Structuration theory that are complementary to this realist point of view. The section ends with the incorporation of space from the radical perspective within the fields of planning and geography.

2.1.1 Reality is Stratified

In his 1978 book, *A Realist Theory of Science*, Roy Bhaskar provided the outline of the "Basic"[3] form of the philosophy of Critical Realism. It argues that world is real, "structured, differentiated, and stratified, and that it is the business of … science to uncover these structures" (Fitzpatrick, 2005: 13). Structures are "relatively enduring" and they act to shape the choices available to individual human actors. However, the realist view also embraces the notion that through human agency individuals are able to affect these structures, ultimately altering the set of available choices moving forward. Consequently, Critical Realism is focused on the interaction between human actors and the structures that guide their choices.

One of its central tenants is that reality is stratified into three layers: the empirical, the actual, and the real. The upper-most layer is the realm of the observed, what Bhaskar calls "the Domain of Empirical." Human beings observe events; these events are empirical and so can be accounted for. These events are single occurrences. As such, they are not the only possible outcomes; they are simply those outcomes that were actually observed. Just as a single observation is assumed to come from a parent distribution in econometrics, Bhaskar theorizes that events emerge from a "parent" of

[3] There are three veins of Critical Realist thought: Basic, Dialectical, and metaReality. This work focuses solely on the basic form. Future work will seek to integrate the Dialectic. A brief overview of each can be found at: https://roybhaskar.wordpress.com/what-is-critical-realism/.

another sort, another level of reality – "the Domain of Actual" – that contains the mathematical set of all possible events. Therefore, as more events are observed, the formerly unobservable distribution (what one might reasonably call the "structure") of possible outcomes becomes increasingly apparent; that is until the underlying structures generating these outcomes are changed by human agency. These underlying, or "deep" structures, represent the most fundamental level of reality, what Bhaskar refers to as "the Domain of Real" (1978: 13).

This perspective on reality brings with it a fundamentally different view toward causality. Fitzpatrick (2005: 3) writes,

> Realist explanations of actual social events and phenomena are not "mono-causal" and deterministic, but rather "complex" (with intricate feedback loops linking multiple causal mechanisms); "emergent" (from this complexity new properties emerge which cannot be deduced from the individual components); and "non-linear" (small changes in these complex relationships can bring about sudden and dramatic outcomes.

This view suggests a more pluralistic view towards causation. This occurs due to the stratified nature of reality. Not only are empirically observed events a subset of the actual, or possible set of events, but the "deep" underlying structures that cause them (in the domain of the real) are constantly interacting with other structures, as well as human agents through causal mechanisms. Fitzpatrick (2005) illustrates this pluralistic approach to causation through an application of the Critical Realist philosophy to the question of homelessness. One component of Critical Realism is its rejection of positivism and its view toward empirical law-like results. Fitzpatrick rejects the notion of any law-like empirical causal relationships between particular "risk factors" and homelessness. Rather, she argues there are multiple "pathways into homelessness" that will vary by specific circumstances (Fitzpatrick, 2005: 6). Consequently, the case for causation within the realist prerogative is necessarily more flexible:

> Realism…reinstates these "risk factors" as "real" causes of homelessness if they can be shown to have a tendency to bring about homelessness, even if they only bring about actual homelessness on some occasions. For realists, the varying circumstances of each homeless person highlighted above is to be expected in an open

> social system where a multitude of structures are contingently (and unpredictably) related, and where there is scope for human agency within the range of options that these structures enable. Thus these mixed patterns do not negate the idea of "causes" of homelessness, but merely the positivistic notion of causation as predictable, empirical regularities (ibid).

These observable events (i.e. social activity) occur within a social system. The social system is ultimately reproduced (and modified) by the interactions between structures and human agency. Bhaskar (1989) argues though that the existence of structures depends upon the social activities "they govern." Therefore, structures are "social products" that are consequently "possible objects of transformation." This leads him ultimately to a view of society is, "…an articulated ensemble of such relatively independent enduring structures; that is, … a complex totality subject to change both in its components and their interrelations" (Bhashkar, 1989: 61).

2.1.2 Elements of Structuration Theory

This brief overview of Critical Realism reveals two essential components: social structures and human agency. These structures interact with human agency to reproduce the environment for social action, society. Clearly, this definition places a substantial burden of social science on the form and function of each structure. But, what exactly what is a social structure?

Anthony Giddens (1984: 16-34) provides an important clarification and expansion on the idea of a structure. He argues that structures are "sets of rules and resources", but they contain important structural dimensions that ultimately permit structures to influence human action. These "rules and resources", in keeping with the stratified nature of reality, must act in relatively enduring ways to interact with human agency and generate empirically observed events. More broadly, these relatively enduring structures bring order to social interaction and reproduction of the socio-spatial formation. Giddens writes, "Let us regard the rules of social life, then, as techniques or generalizable procedures applied in the enactment/reproduction of social practices" (ibid).

Giddens (1984: 30) identifies three "structural dimensions … signification, domination, and legitimation" that serve in the reproduction of society. Structures of signification relate to rules and

resources that provide social interpretation and meaning. Ultimately, these structures find their mode of expression in communication, both verbal and non-verbal. Structures of domination reflect power. They are rules and resources that reproduce the existing social relations to production within and across socio-spatial formations. Importantly, Giddens highlights the inevitability of power in social relations. He writes, "'Domination' and 'power' cannot be thought of only in terms of asymmetries of distribution but have to be recognized as inherent in social association" (Giddens, 1984: 31-32). In his *structuration* framework, structures of domination are expressed through the rules and resources associated with the "authorization" and "allocation" of resources expressed through political and economic institutions. Finally, structures of legitimation seek to ensure the cognitive associations of the maintenance of these social relations. Exemplified by the legal apparatus – particularly in the privilege and honor bestowed upon the institution of private property – the social elites are able to reinforce their position of dominance over the reproduction of social reproduction. These three "structural dimensions" exist to provide meaning and context to the masses, legitimate the role of elites within that system of social reproduction, and ultimately enshrine power and status to members of the social elite. Collectively, these structural dimensions support sets of rules and resources in the social reproduction of the socio-spatial formation.

However, Giddens introduces a concept that helps articulate the relationship between human actors themselves: *the dialectic of control*. The dialectic of control emphasizes the dialectical and iterative process of negotiation between human actors. Each negotiation results in new starting positions for subsequent rounds. Giddens (1984: 16) introduces this important notion concisely,

> Power within social systems which enjoy some continuity over time and space presumes regularized relations of autonomy and dependence between actors or collectivities in context of social interaction. But all forms of dependence offer some resources whereby those who are subordinate can influence the activities of their superiors.

This dialectical process of negotiation was perhaps best articulated by John R. Commons (1931). He argued that conflict emerges within power relations. The resulting order or outcome from that

conflict is largely determined by the direction and degree of dependencies between the actors involved. However, the dialectic of control, as utilized by Giddens, explicitly makes it an element of his ontological foundation. This dialectic of control requires a rethinking of the classification of structural dimensions.

Taken to its logical end, the dialectic of control begs for a fourth structural dimension: liberation. If structures of domination exist so too must structures of liberation. As Soja (2010: 37) writes, "…unjust geographies of political power can also be enabling, creating the foundations for resistance and potential emancipation. It is important to remember this double-sidedness, how the spatiality of (in)justice can be both intensely oppressive and potentially liberating…." To call on Lawson, these two structures are "internally related." These two elemental properties of social structures are two aspects of the same thing; they cannot exist without the other; they are a duality. Within a so-called dialectical relationship between the powerful and the dependent, simultaneous structures as "isolable sets of rules and resources" exist for both parties to exploit in negotiation. This dialectical interaction between structures of domination and liberation then, ultimately generate outcomes of "order." This recursive interaction subsequently modifies the conflicting agential positions along a continuum of power. Contradictions within structures that reinforce domination and legitimation may reposition actors within the negotiating process; the result can be a dramatic shift in the relations of dependence. This becomes particularly evident with respect to the production and arrangement of space.[4]

This stratified, structured reality requires integrating the concept of *emergence* into one's view of reality. These various levels are not independent from one another; yet, they are not one reducible to the other. Bhaskar (1978: 112) puts the sequence as follows:

> If the elements of the lower-order [the domain of the real] are real then so must be the causes that determine the conditions of their

[4] Space does not take on any more or less important role within a capitalist system reliant on private property. The arrangement of socio-spatial formations still plays a substantial role in shaping the ways human beings interact. However, under a system of private property the process through which space is arranged is fundamentally different from say a system of communal property. For an application of Structuration theory to the urban environment see Moos and Dear (1986).

> operation, i.e. the comprehensive entities formed out of them. If black bodies are real then so are physicists, if charged particles are real, then so are thunderstorms. In short, emergence is an irreducible feature of our world, i.e. it has an irreducibly ontological character.

Here, Bhaskar illustrates the complex nature of reality. If it can be argued that deep structures, such as DNA, are an element of reality, then so too must be the organisms that emerge from various combinations of DNA. Relying on the same logic then, if human beings are real (though themselves emergent), so too are the physical and social structures that emerge from their actions. It follows then that socially produced social spaces must also have an "irreducibly ontological character" and cannot be reduced to their individual inhabitants (Lefebvre, 1974). Santos (1977/1985: 3) adheres to this perspective, but he argues that this point of view misunderstands the centrality of space. He writes, "History, after all, is not written outside of space, and an a-spatial society does not exist. Space itself is social."

Socially produced spaces, whether rural or urban, are observable and therefore dwell within the domain of the empirical. However, no single social space represents all possibilities (the domain of the actual). Instead, these social spaces are ultimately formed by the interaction of "relatively enduring" structures and the causal mechanisms that permit the expression of human agency. Human beings exercise their own powers to change their environments, and the result is an entirely unique totality of structures. Althusser (1965) referred to such totalities as social formations, "…concrete complex whole comprising economic practice, political practice and ideological practice at a certain place and stage of development." However, Santos' position reinforces the role of space as a central structure of such formations, arguing that formations are both social and spatial.

2.1.3 The Socio-Spatial Dialectic

To meet the argument put forward by Santos, I turn to Edward Soja's (1989) socio-spatial dialectic. This ontological relationship posits that human beings are a social species that exists in space through time. However, time is a one-way phenomenon; it moves forward. Society and space interact with one another recursively and multi-directionally. Importantly, these interactions generate

new and unique socio-spatial formations. These spatial reorganizations are necessarily disruptive of the prior social order, though the resulting socio-spatial organization will ultimately reflect the working of Giddens' *dialectic of control*. This relationship between society and space bears further exploration.

Reality is stratified into observable events that emerge from the set of all possible events, which itself (the set) emerges from the underlying deep (social) structures that interact with human agency to reproduce society. However, humans exist in space and ultimately the interactions of social structures with human action organize that space to meet the needs of those with power. Consequently, spatial organization is reflective of structures of domination, signification, and legitimation that tend to serve powerful elites. However, this space also contains the seeds of structural disruption via the socio-spatial dialectic from the reconfiguration of space (or not) through the interaction of human agency and existing structures.

The dialectical process, which governs both the dialectic of control and the socio-spatial dialectic, revolves around the notion of a thesis, anti-thesis, and an ultimate synthesis. The seeds of conflict are sewn into each success. The thesis contains within it the seeds of its eventual destruction (anti-thesis). Ultimately, these two aspects of a single unity must collide; this collision results in a temporary order. This conflictual nature is ever present. Just as Giddens argues that power is indivisible from "human action", the dialectic of control requires the same to be true of human conflict. Every interaction will be undertaken within an unequal distribution of power and leverage.

The previous section combined elements of Critical Realism and Structuration theory. It also incorporated Marxist perspectives on the centrality of space to human existence. Consequently, the ontological position taken here adheres to a social, historical, and spatial view of a stratified reality. The next section explores epistemology, outlining this project's position on what constitutes knowledge.

2.2 Epistemology: What is Knowledge?

The uneven distribution of power and leverage reflects the class-based reality of human existence. Reznick and Wolff (1987; 2004) argue that *class* – defined as the process of surplus production, accumulation, and distribution – and the *dialectics of overdetermination* are the critical entry points to their form of Marxism. This view extends "classical Marxism," which views the social relations to production in a deterministic way, by incorporating the infinite possibilities within the *domain of the actual* that emerge from a real social world that constantly defines, orders, and recreates itself. This view sees the complex, stratified reality as "overdetermined." Resnick and Wolff (1987: 2) write, "To say that a theory is an overdetermined process in society is to say that its existence, including all its properties or qualities, is determined by each and every other process constituting that society." Knowledge about the real world cannot exist in a void; again, to rely on Lawson's phrase, it is fundamentally "internally related" to all other knowledge about the real world; one object of knowledge cannot be defined outside of all others.

This overdetermined epistemological foundation bears a strong resemblance to the philosophical position of *pragmatism* associated with the work of John Dewey and Charles Sanders Peirce. In particular, Peirce's so-called "pragmatic maxim" comes remarkably close to Resnick and Wolff's use of overdetermination. Peirce (1878: 132) argued that the definition of any object was impossible without understanding its relation to everything else. He wrote, "Consider what effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then the whole of our conception of those effects is the whole of our conception of the object." In a similar vein, Resnick and Wolff (1987: 4) write, "If all possible entities are overdetermined, none is independent of any of the others. Moreover, each entity will have a different, particular relation to every other entity. Each entity only exists as – or, is caused or constituted by – the totality of these different relations with all other entities." These two concepts ultimately define an object based upon its relationship to all other objects within the real or practical world. An object of inquiry therefore is

not subject to some law-like causal force that exerts itself *ad infinitum* outside of historical time. All objects are historically – and spatially – contingent.

Using this framework, it is clear then that no socio-spatial formation is the deterministic result of an economic "superstructure." Instead, they are emergent phenomena resulting from the interactions of social structures, mechanisms, and human agency within an open social system, wherein meaning is socially constructed and is constantly evolving. Due to this dialectical relation, wherein all aspects of reality stand in particular relation to all others, the notion of any law-like causal force shaping social formations or events within them is untenable. Instead, they are formed by and through a socially overdetermined class process of surplus production, distribution, and appropriation.

2.3 Ontological Foundations: A Synthesis

The process of surplus production, i.e. class, structures human action and consequently the spatial organization of social formations. The overdetermined nature of spatial organization ensures both the outcomes and the class process within a social-spatial formation are unique. However, the ultimate form of that spatial organization and subsequent choices to reshape these spaces reflects the role of class within and acting upon that socio-spatial formation. This is Soja's "socio-spatial dialectic." The organization of space is a socially produced social structure that "controls" or "expands" human choice and action. This structure is defined by its relations to class. The production and "circulation" of the social surplus takes place in space – space that was organized by the economic and political elites to ensure the appropriate "conditions" for capital accumulation. The spatial organization of social formations also reflects and reinforces class through its spatial organization of the social relations to production. These relations are maintained through structures, i.e. "rules and resources," of signification, domination, and legitimation. Spaces are defined and socially stigmatized through the overdetermined meaning assigned to them, e.g. "the ghetto." Those meanings are reinforced through formal documents, rules, and procedures that define permissible spaces, e.g. zoning codes, building codes, comprehensive plans, etc. These structures dominate the physical space and hence

reflect the implicitly desired class structure of the social formation's elites. These spatial structures are further institutionalized within social formations through means of legitimation, hierarchical political decision-making and social status (via location). However, the socio-spatial dialectic and the dialectic of control ensure that new socio-spatial organizational forms emerge out of (and often on-top of) prior forms. These forms emerge through structures of domination and liberation, wherein the distribution of power and leverage within the dialectic of control is altered and leads to a new order that modifies socio-spatial structures of signification, domination, and legitimation.

This conception of the socio-spatial dialectic reinforces the importance of spatial organization in creating political changes within a social formation's structure of class. As space is a socially produced structure acting upon and ultimately shaped by the social relations to production, fundamental change in the class process cannot occur without creating new spatial arrangements that reinforce those desired social relations. If this insight is not fully appreciated, attempts at social and political change will be undermined by the incongruent spatial form of the socio-spatial formation.

2.4 Ontological and Epistemological Foundations: A Summary

This chapter outlined the philosophical foundations of this project. It integrates the approaches of Roy Bashkar's *Critical Realism* and Anthony Giddens' *Structuration Theory* in a way that avoided Archer's critique of the "duality of structure." Giddens argues that within the duality of structure, human agency is acted upon but simultaneously changes social structure. Consequently, the two analytical categories cannot be separately assessed; rather, they must be "bracketed" (Arvanitidis 2015, Stone, 2001). Archer counters that the "enduring" nature of social structures and the stratified reality within Critical Realism requires these two to exist separately – though in no way does she mean they do not mutually affect one another. Rather, structures change slowly through the historical application of human agency upon them. They are not constantly changing. Archer's argument claims the greater weight here. However, the clarity of Gidden's thinking with respect to the role and elemental properties of these structures adds analytical power. The socio-spatial ontology developed

here adheres to the Critical Realist view of a stratified reality, but borrows complementary elements of structuration theory and radical geography: dimensions of structures, the dialectic of control, and the socio-spatial dialectic.

In addition to this synthesis between two philosophical positions, this chapter also incorporated the epistemological conditions of overdetermination and class, drawing upon the Marxist tradition developed by Resnick and Wolff. This "anti-essentialist" view rejects the idea of determinism within the social world. Due to the internally-related nature of all objects of knowledge, taking a teleological view to the social world is illogical. Rather, the world is a complex of history, space, structures, and human agents that act (in thinking and unthinking ways) to affect the world around them. Cities like Detroit, Chicago, or New York are defined in part by their relation to one another both in the material world but also in the cognitive beliefs about them that too are shaped by the social structures society has created over time. All knowledge is historically, socially, and spatially contingent.

This socio-spatial ontology has two important implications for the analysis of social phenomena. First, it rejects any concept of law-like empirical regularities in determining social outcomes. Rather, it adopts Fitzpatrick's view that the complex interaction between structures and human agency requires "multiple pathways" to reaching the same outcome. The role of analysis then is to uncover the primary structures at work and attempt to make these pathways explicit. Second, this ontology makes space central to human existence. This is critically important in understanding social phenomena that occurs in space. The ontological position itself makes clear that the arrangement of space and the process of its production are socially structured. Consequently, particular forms of spatial organization may impact the likelihood of particular pathways. Logically, and perhaps most importantly, this ontological position suggests that spatial arrangements must be examined as part of any effort to change the frequency of undesirable events.

This chapter outlines the philosophical foundation of this research project. It requires that the school closure process be analyzed from three perspectives: social, historical, and spatial. It also

rejects any idea of deterministic relationships. Instead, it insists on a pluralistic view in explaining the various pathways to school closure. The next chapter begins to outline the most common paths into school closure based on the current body of research. It explores the social impacts of school closure, the changing nature of school closure through time, and ultimately explores the relationship between school closure, geography, and spatial location.

CHAPTER 3

PATHWAYS TO SCHOOL CLOSURE AND ITS IMPACTS

The primary objective of this chapter is to introduce the dominant academic perspectives on the issue of school closure. These points of view represent specific veins of research on this question, beginning with the foundational work of Andrews (1974). The work to date can be divided into two distinct points of view. The first, and most prevalent, argues that school districts close schools largely in pursuit of cost savings and improved performance (Arsen and Ni, 2012; Bifulco & Reback, 2011; Jack & Sludden 2013; Lerman 1984;). The second vein of research argues that school closure is a process based on race and class that is ultimately political in nature. Within this perspective, several Marxist contributors[5] have introduced the role of the state in helping to facilitate and frame these closure processes (Basu 2004; Bondi 1987, 1988, 1989; Lipman 2011). They contend that this racially-driven political process often directly contradicts the cost-savings arguments offered up by rational choice scholars. These two lines of research are important, but they are inconsistent with the socio-spatial ontology presented in Chapter 2. They do not account for the production, arrangement, and reproduction of space as a central element to the school closure problematic. Therefore, I argue that spatial arrangements of the socio-spatial formations play a central role in the school closure process. These formations though are shaped and reshaped by the process of capital accumulation. As a consequence, the interactions between the local and global structures that affect the spatial distribution of public facilities/resources are hypothesized to play an influential role in driving school closure outcomes.

The next section summarizes the effects of school closure, primarily focusing on the social effects of displacement on students and teachers. Section two will introduce the three theories of school closure that emerge from the current research narrative. Section three will introduce my contribution

[5] See Bowles and Gintis (2011) for a Marxist perspective on the evolving role of education in the United States. See the work of Jessop (2008) on a Marxist perspective of the role of the State.

to the narrative of school closure. The chapter concludes with a discussion of the overdetermined nature of school closure and its implications for these theories.

3.1 Effects of School Closure?

Beginning with Andrews (1974), researchers have been trying to understand the effects of school closure. This body of work has explored the social, economic, and neighborhood impacts of closing schools. Researchers have documented the social and psychological effects of displacement on students, faculty, parents, and the broader neighborhood. Students displaced by school closure indicate feelings of significant loss, fractured social relationships, and feeling stigmatized at their new schools (Churchill & Carrington 2000; Kirshner, Graetner, & Pozzoboni 2010;). Teachers too exhibit a sense of loss from school closure, but they face added anxieties related to the fear and trepidation about their future careers (Ayala & Galletta 2012; Churchill & Carrington 2000; Deeds & Patillo 2014; Morton 2009; Riseborough 1994). Similar anxieties are largely shared by parents of children displaced by school closure. In addition, they often harbored strong resentments toward the process used by the authorities to make the final decisions (Churchill and Carrington 2000). More broadly still, the closure of a school negatively affected the broader neighborhood's sense of community (Bushrod 1999; Oncescu & Giles 2014).

Research into the neighborhood effects of school closure has been limited. Early research into this question indicated strong perceptions of neighborhood decline were associated with school closure (Andrews 1974). However, subsequent analysis of school closure in Seattle failed to find evidence of increased out-migration, higher rates of crime, or falling real estate prices (Cuban, 1979; Johnson 1978). On the other hand, schools can serve as community anchors. The loss of the school puts social networks in limbo for teachers, staff, and students alike (Ayala & Galletta 2012; Basu 2004, 2007; Kearns et al 2009; Witten, McCreanor, Kearns, & Ramasubramanian 2001; Velencia 2003;).

Research has also focused on the impacts on student achievement from displacement. Empirical evidence indicates that within the first year, students are negatively affected by their school's closure and their subsequent displacement. However, this same research concludes that the effects on student achievement disappear after one year (Brummett 2012; de la Torre & Gwynn 2009; De Witte & Van Kalveren 2014; Engberg et al 2012; Ozek, Hansen, & Gonzalez 2012; Sherrod and Dawkins-Law 2013;). However, this reversion to prior achievement levels is only true if students are a.) Reassigned to better performing schools and b). Displaced students remain at those schools. Unfortunately, the evidence suggests this not likely to be the case for all students. Reassigned students are more likely to leave their new school during the first year post-displacement (de la Torre and Gwynne, 2009). Worse yet, if students are not sent to higher achieving schools, or choose to attend lower achieving schools, the adverse effects persist (de la Torre and Gwynn, 2009). A 2015 evaluation of school closings in Chicago underscores the complexity of school reassignment. It finds that only 66 percent of students displaced by school closure in 2013 chose to go to the school they were assigned (which was higher performing). Nearly one quarter of the 12,000 students displaced chose to attend a school that performed worse than their former school (de la Torre et al, 2015).[6]

School closures have financial consequences too. School districts often justify closings based on financial burdens. Closures are supposed to generate cost savings. However, recent research calls into question the validity of this claim. School closures do not generate the cost savings that districts expect, assuming they can be quantified at all (Andrews, 1974; Dowdall, 2011; Valencia, 1985). Neighborhoods feel the financial impact of closing schools too. Bogart and Cromwell (2000) estimate the financial impact of a school closure in Shaker Heights, OH. Their analysis suggests the loss of a school within a neighborhood reduced the average value of the property by more than $5,700. The invidious distinction of being home to a failing school coupled with a breakdown in

[6] Elacqua et al (2012) reinforce the difficulty with finding viable alternative schools even in systems beyond the United States (i.e. Chile).

neighborhood social capital impacts property values. These effects accumulate, placing affected neighborhoods on a path of decay (Downs, 1981; Veblen, 1899).[7]

The school closure literature has taken a geographic perspective on the issue as well, contrasting the effects of rural school closure and urban school closure. School closure in rural areas is almost inseparable from the issue of school consolidation. As rural populations decline, and consequently school enrollments, rural schools face the increasingly difficult task of financing operations under existing institutional arrangements. Porter (2012) attempts to uncover positive feedback loops whereby school closures due to population loss then lead to greater population loss. He finds "weak support" for this vicious cycle, but his empirical results reinforce the conventional wisdom surrounding rural school closure. Lyson (2002) evaluates the importance of schools to rural communities in upstate New York. The results indicate schools play central roles in both the social and economic vitality of the community.

Kearns et al (2009) identify two themes from their interviews of students, teachers, and parents that had experienced closure of their rural school. First, the bureaucrats did not fully understand the nature of a rural school. Second, as those making the decisions did not fully grasp the role of the rural school, they also failed to understand the potential impacts to social and community cohesion. In particular, parents voiced several concerns along this line. The authors note, "Parents saw the school as more than just an educational institution. Rather it was understood to be the focal point of the community and for some people the school was the only site at which they had contact with other local people. Community spirit was built through the school and for many the school was the heart of their community" (Kearns et al, 2009: 137).

Post and Stambach (1999) reinforce the central role of schools in rural communities. They conducted a series of interviews of students, teachers, administrators, board members, and more.

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[7] According to Sampson and Raudenbush (2004), this social stigma is exacerbated by high levels of racial and ethnic minority concentration within declining neighborhoods.

Their year-long efforts identified the opposing value systems that were increasingly in conflict in the rural school noting, "Our data suggest that rural school consolidation remains the flash point of an enduring social tension. There have long been strains between the centralizing movements of governing bodies and the decentralizing interests of local communities seeking to retain their own identity…" (Post & Stambach, 1999: 114). It must be worth noting that many of these same findings are seen throughout the urban school closure qualitative data as well.

3.2 Perspectives on School Closure

The broad body of research to date on the school closure issue has been conducted through the often contradictory lenses of racial/class bias as opposed to decisions based on operational/financial efficiency. The latter of school closure argues that rationally acting school boards choose which schools close based on a cost-benefit analysis. The most prominent analysis of efficiency regarding school closure was the application of microeconomic optimization to the school closure decision by Lerman (1984). The author sets up a linear model in which a rationally acting school board must compare the potential operational savings against the new transportation costs associated with increased busing of students and capital costs of upgrading receiving schools. He then applies his model to a single school district to illustrate the utility of the model. The model is an excellent illustration of the *homo economicus* rational actor that carefully weighs the costs and the benefits of closing an individual school. If there are resulting net benefits from the closure that could be allocated to those households adversely impacted by the closure (through lower tax rates), the decision to close the school is Pareto efficient. He developed a model that suggests closure decisions made for efficiency concerns would revolve around three important cost centers: teacher salaries, building maintenance and repair costs, and student transportation costs. If the benefits of closing a school (the reduced costs to the district) are greater than the additional costs imposed by student relocations to existing facilities, then rationally acting school boards would decide to close that school.

In addition to minimizing costs, researchers have also looked at the important revenue impacts associated with changes in enrollments. Schools and districts that lose enrollments lose the federal and state dollars that "follow" each student. Extant research reinforces the importance of student enrollments. Billger and Beck (2009) and Billger (2010) find that the impact of enrollment in closure decisions in Illinois depends on whether the school is an elementary, middle, or high school. She finds that elementary schools are the most sensitive to changes in enrollment. On average, a one-unit increase in the natural log of school enrollment decreases the probability of that school closing by nearly 10 percent.[8]

Changes in enrollment are clearly important. They not only affect school district revenues, but enrollments are also used to assess capacity utilization. School buildings with low capacity utilization can quickly become targets for closure on efficiency grounds (Jack & Sludden, 2013). However, enrollments can change for several reasons. On one hand, school buildings may be located in areas that have lost population. This is typically a consideration in rural school closure research, but similar issues prevail in urban neighborhoods that have suffered population losses. Local governments can affect enrollments in direct and indirect ways. As the urban renewal projects of the late 1950s and early 1960s exemplify, entire neighborhoods can be replaced with large infrastructure projects. This policy directly removes the number of households within a geographic area and can have long-term consequences for enrollments in schools serving that area. Indirectly, local governments may not provide adequate service levels to specific neighborhoods, making them less desirable places to live.

Changes to enrollments can also be brought about by state-level policies regarding "school choice." Policies that encourage the development of charter schools and open enrollments may lead to an "acceleration of failure" for traditional public schools that are financially on the brink (Arsen et al., 2002). The political factors surrounding school closure are reflections of the dominant neoliberal

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[8] However, she finds that enrollment is not a meaningful predictor of school closure for middle and high schools.

ideology of student mobility (Hursh, 2015; Lipman 2011). Two of the most prominent policy tools are charter school and open enrollment enabling legislation. Charter schools, in their current form, have been a tool of reform since the early 1990s. They operate as independent public schools, receiving funds from the districts they are located within. This creates a financial pressure that many authors argue contribute to the likelihood of closing public schools (Arsen & Ni, 2012; Bifulco & Reback, 2011; Jack, 2014).

The second perspective taken by school closure researchers focuses on issues of race and class. This line of research began with the early work of Valencia (1984, 1985) who focused on the impacts of school closure within Hispanic/Latino communities in Los Angeles. More recently, research on large urban school closures has specifically focused on closings of predominantly Black and poor schools (Dowdall, 2011; Lipman, 2011). Researchers have documented the impacts to families, students, teachers, and staff (Kirshner et al 2010). It has also raised important challenges facing populations that are less mobile and consequently more likely to be "stuck in place" (de la Torre et al., 2009, 2012, 2015; Sharkey, 2013). Additionally, these researchers have been aggressively countering the dominant story based on rationally-acting school district boards.

As noted above, the rationality point of view is typified by the Lerman model. This approach follows a long tradition within orthodox urban economics that focuses on the role of transportation costs in shaping location decisions. Following the work of Alonzo (1964), Muth (1969), and Mills (1972) the majority of urban economic models seek to explain location decisions through the tradeoff between proximity to the central business district and transportation costs. Following Tiebout (1954), these models typically assume homogenous individuals who are perfectly mobile. Consequently, these models assume that individuals move to the jurisdiction that provides the level of public services (and taxation) that each individual is willing to pay. His model concludes that rational economic actors will "vote with their feet" and move to the jurisdiction that most closely aligns with their own desires for the provision of public goods and services.

The Lerman model fails to account for the heterogeneity based on race and income calling into question the model's explanatory power. The facts of residential segregation based on race and income are well known (Wilson, 1987). Low-income families have far less mobility than households with higher incomes (Pentland, 2014). African American households have faced a long history of residential segregation due to the evolution of public policy (Gotham 2002; Massey & Denton 1993).[9] This process of "ghetto formation" was ultimately led by racism and fear, but it became institutionalized through federal housing policy at the global level and real estate practices and school receiving zone formation at the local level. In fact, Wilson (2009) argues that the issues of race and income in the American city are increasingly difficult to differentiate. Low-income and black households in particular face severe mobility constraints. Consequently, one must add class and race back into the Tiebout sorting framework to explain residential segregation. Recent attempts have tackled this from the vantage point of school choice (Campbell, West, & Peterson 2003; Greene, 2003; Rhode & Strumpf, 2003; Urquiola, 2005). Though all three studies conclude these location decisions are "voluntary," they also conclude that residential segregation is a typical outcome of the American urban experience.

Few studies have sought to evaluate school closure as the dependent variable at all (Lerman, 1984; Billger & Beck, 2009; Billger 2010; Phipps & Anglin, 1993). Using panel data across the state of Illinois (excluding Cook County), Billger concludes that the primary factors driving closure decisions of high schools in Illinois are enrollments, rural locations, and higher per-pupil expenditures (Billger & Beck, 2009). However, when examining elementary and junior high schools she finds that the overwhelming drivers are the proportion of the student population that is black and low-income (Billger, 2010). Consequently, there is some evidence to suggest this theory holds merit. This theory appears to be in stark contrast to Lerman's rational decision-making explanation.

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[9] Massey and Tannen (2016) find that overall rates of racial residential segregation have declined since 1970. However, the authors also previously identified that over half of all Black residents of American metropolitan regions live in communities that exhibit "high" or "hyper" degrees of residential segregation, as measured by a dissimilarity index score of 60 or greater (Massey and Tannen, 2015).

In addition to a potential racial and economic bias, the earliest research on school closure in the U.S. and Canada portrays a deliberative process that is a great deal more reflective of strategic behavior than rational planning (Basu, 2004; Bondi 1987, 1988, 1989; Boyd & Wheaton 1983; Doern & Prince, 1989; Finnigan & Lavner, 2012). In one of the most compelling examples of "how power defines reality," Basu (2004: 425) follows the process of consolidating six school districts in Ontario, a process elegantly named "amalgamation." Less than ten months following consolidation, the new school board was provided a report suggesting the district had more than 11 million sq. ft. of excess capacity. The board's reaction was to suggest closing 138 schools, over 87 percent of which were elementary schools.[10] City residents reacted strongly against the proposal. So much so that that provincial government altered the district's funding formula and provided it with a one-time influx of funds to conduct a three-year planning process that evaluated the closure of 30 schools. Basu (2004: 428) writes, "The change from a formula that necessitated the closure of 138 schools at once to thirty schools over a period of three years *is an exemplary case of how power defines reality" (my emphasis added).*[11] Basu (2007) raises a fundamental question regarding school closure: was the decision and choice of schools placed under risk a bureaucratic exercise based on rational criteria, or were decisions based on power negotiations where schools in neighborhoods with greater civic capacities were avoided? She argues that the ultimate criteria used for selection were simply adjustments to make the school closure decision more palatable to a majority of school district residents.

This example of strategic behavior by school authorities is supported by several other case studies on school closure. Bondi (1987, 1989) finds that school authorities used "corporatist strategies" to divide competing groups ultimately pitting neighborhoods that are "safe" against those selected for closure. Finnigan and Lavner (2012) find that school board members and administrative staff limit participation of affected parties to committees and public hearings. Moreover, school authorities can

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[10] Basu also highlights the board's "technical and political planning response," where they place blame on the provincial government yet fully implemented the provincial government's desired policies.

[11] The changes to the formula included the addition of "consideration for non-educational uses," "child-care space", "minimum walking distances", and "a minimum capacity of 70%".

and do change the rules governing formal opportunities for public input and consultation during the school closure process. Yet, the authors find, wealthier households are able to influence the school board decision-making process through informal means. Finnigan and Lavner (2012: 147) found,

> As one Board member noted, "Because they yell at you at Board meetings…the press assumes that that's where the protest is coming from when, in fact, what's happened is that the effective protest has already occurred, and it's over. Community members who were 'politically more aware' and would call up or arrange personal meetings were found to be the most influential.

Lucas (1982) uses a case study of school closure in rural Saskatchewan to illustrate the sense of alienation felt by community members throughout the political process of deliberation and following the school closure decision. Phipps and Anglin (1993) test the Lerman model on two Canadian schools. The authors conclude the board failed to act in accordance with the Lerman model; they did not act rationally. Instead, they argue, the board acted "to minimize community reactions." These case studies suggest that school closure is far from rational. Rather, it is a political process aimed at redistributing resources away from some groups (low-income minorities) to others (wealthier households).

The research on school closures can be divided into two distinct approaches. The dominant approach seeks to understand school closure from an operational efficiency perspective. It focuses on questions of enrollment, budget crises, student performance, and more. The second perspective instead focuses on the political nature of school closure and the disproportionate impacts it seems to have on communities of color. However, these two narratives are incomplete. Neither takes full account of the important role of space, its role in shaping individual actions, and the structures that govern the production and reproduction of social space. Next, I introduce a spatial theory of school closure.

3.3 A Spatial Theory of School Closure

This body of research to date on school closure fails to meet the philosophical view of human beings as socio-spatial-temporal creatures; it does not account for space. It fails to address two

important questions related to school closure. First, it does not assess the role of spatial proximity. Tobler (1970: 236) states, "…the first law of geography: everything is related to everything else, but near things are more related than distant things." It follows from "Tobler's Law" that neighboring administrative units (i.e. cities, school districts, counties, states, etc.) should be "more related" than units that are far apart. This suggests that school districts adjacent to one another will influence one another . If true, school closure would be a spatially clustered phenomenon being generated by the "deep" structures that are temporally and geographically contingent. Second, it does not account for the spatial organization of cites/neighborhoods that close schools. Urban geographers have been raising questions about the role of capital accumulation in shaping urban environments since the 1970s (Castells, 1979; Edel 1992; Gordon, 1977; Harvey, 1982; Lefebvre, 1970; Watkins, 1980). A common thread in this literature has been to classify cities based on the relationship between their periods of development and the primary means of capital accumulation at that time (i.e. commercial/mercantile, industrial, corporate/financial). Gordon (1977) makes the most explicit case for the link between the dominant form of capital accumulation and urban formation. He argues that as the primary means of wealth accumulation changed from commercial means to industrial complexes to corporate control, new cities were built to accommodate this new dominant form of capital. These new cities better suited to quantitatively facilitating the necessary output of the times. During the Industrial Age, new cities were dense grids that facilitated labor pooling but also adequate transportation of finished goods to their consumers. Importantly, cities were also designed to facilitate social cohesion through the continued physical separation of those with wealth from those without it. Gordon referred to this as "qualitative efficiency." During each new era of capitalism, the successful cities were both quantitatively and qualitatively better suited to sustainably maintain production requirements.

Watkins (1981: 162) provides an important means of testing Gordon's thesis.[12] Prior to Watkins, attempts to classify cities relied on the year that city surpassed a specific population threshold. However, Watkins argues this process, "use[es] historical concepts in a (sic) ahistorical manner." Instead, he argues the dating process should focus on the period of time in which a city's physical infrastructure was most decidedly shaped. His "new theory of urban growth and urban age" is,

> … not concerned with the birth of an era but rather the decade when a particular city-building epoch ended. The theory claims that those cities which stopped growing at an above-average rate on or before 1870 will possess an industrial structure that reflects the dominance of mercantile [capital]….

This approach to classifying cities is much more in line with Gordon's approach. It seeks to date a city based upon the form of capital it was designed to suit best. Watkins uses his theory to classify the largest 300 cities in the U.S. at that time into three different categories broadly in line with Gordon's own classification scheme: mercantile, industrial, and Sunbelt cities. Table 3.1 illustrates the distribution through 1979.

Table 3.1: Watkins Urban Age Classification

Type	Count	Pct.	Decade of Peak Growth
Mercantile	15	5.1%	< 1870
Industrial	92	31.2%	1880 – 1930
Sunbelt	189	63.8%	1940 - 1970
Total	296		

Source: Watkins (1981: 174).

Though the school closure narrative explores relationships between race and class, it does not ultimately connect this socio-spatial phenomenon to specific urban forms. This is an important gap in the school closure literature. The Gordon thesis suggests urban form reflects the dominant form of capital each city was designed to serve. Watkins extends this analysis to suggest that urban form need not be set from the onset, but can be remade during periods of growth. If, in fact, urban form

[12] Gordon (1977) is Chapter 2 in Rise of the Sunbelt Cities edited by Watkins. It seems likely that this classification scheme was designed to follow Gordon's thesis.

plays an important role in the overdetermination of school closure, then it provides a direct link between school closure outcomes and the changing nature of capital accumulation. Such a result would lend support to a theory of school closure based on urban form and its remaking by the forces of capital accumulation.

This spatial theory of school closure begins with the idea that "successful" cities are both quantitatively and qualitatively congruent with the dominant form(s) of capital accumulation. However, even if a city is at one time in accord with the demands of capital, the physical and durable nature of its infrastructure is far less flexible than capital itself. Over time, capital will change while the city's physical structure will remain rooted in its original form, even if it is slowly modified over time. The city will continue on, but its future success will largely depend on the degree of incoherence between the now dominant form of capital and the city's physical form. But, as more time passes, there are fewer options to build new cities to serve new capital. Instead, old cities must be remade. Those chosen cities will have a physical form that is most amenable to the now dominant form of capital and/or is most easily remade to meet those needs. As cities are remade, the physical structure of the urban education system must also be reshaped and one might expect school closures to become increasingly common in those places.

3.4 School Closure: A Review

This chapter has provided two important elements to this exploration of school closure in the U.S. First, it identified the extent of the literature's coverage of the impacts of school closure on individuals and the communities these schools serve. These impacts are serious and reinforce the importance of understanding school closure and the process in which it is done. Second, the chapter introduced three theoretical points of view regarding school closure: operational efficiency, racial and economic bias, and spatial form. In keeping with the philosophical foundations of this project outlined in Chapter 2, I do not see these theories as mutually exclusive. Instead, the Marxist epistemological position of overdetermination suggests that all four should be considered as plausible

causal explanations that are themselves an incomplete description of the school closure narrative. Taken further still, it is likely that these separate theories are largely intertwined, acting causally in various ways upon one another.

The next chapter will examine the issue of school closure from an institutional perspective. Given the philosophical foundation of this project, the outcome of school closure must be examined through an epistemological perspective of overdetermination. Hence, the notion of school closure cannot be defined or examined effectively outside of its institutional context. If that context changes, so too does the class process that is school closure. Using an institutional analytic framework, the next chapter will call out the primary theoretical relationships expected to play a role in the school closure process.

CHAPTER 4

AN INSTITUTIONAL ANALYSIS OF SCHOOL CLOSURE

The purpose of this chapter is to apply the Institutional Analysis and Design (IAD) framework to the issue of school closure in America. It is divided into three sections. First, the IAD framework is introduced. Second, I then use the framework to explore public education and the question of school closure. A number of hypotheses emerge from the analysis. In the next chapter, these hypotheses will be used to construct and estimate a model of school closure in the U.S.

4.1 The IAD Framework

Kiser and Ostrom (1982) first introduced "The working parts of institutional analysis" as a tool for political economists to examine, "Patterns of human action and the results that occur in interdependent choice-making situations…" (Kiser & Ostrom, 1982: 57). Figure 4.1 illustrates these "working parts."

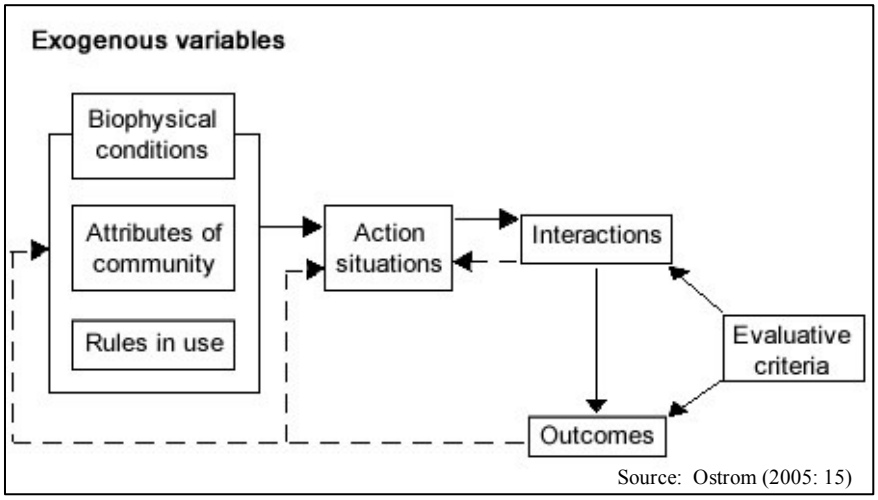
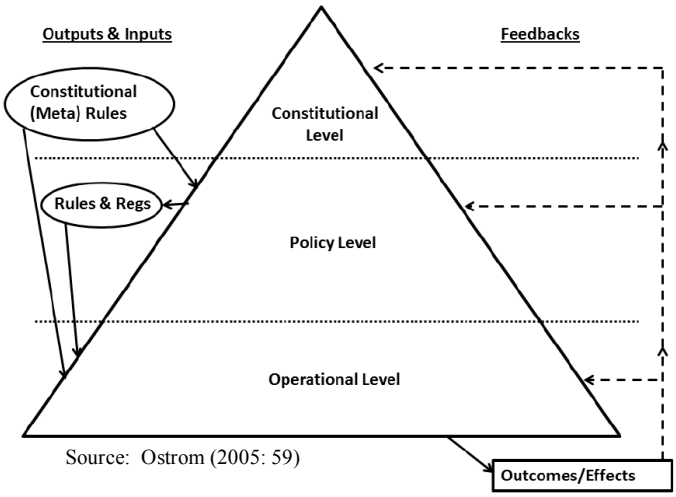


Figure 4.1: The IAD Framework

The "choice-making situation" is the "action situation," which is the focal point of the IAD framework. Ostrom (2011: 11-12) states, "The first step in analyzing a problem is thus to identify a conceptual unit – called an action situation – that can be utilized to describe, analyze, predict, and explain behavior within institutional arrangements…The actor in a situation can be thought of as a

single individual or as a group functioning as a corporate actor." The choices these actors make generate a set of outcomes (e.g. close a school, keep a school open, build a new school etc.). But, the situation itself (along with the actors involved) is being shaped and influenced by three broad categories. First, the "Biophysical Conditions" or "Material conditions" relate to the physical world in which the action situation resides, such as a city or neighborhood. Second, the "Attributes of [the] Community" include but are not limited to socio-economic factors like race, income, and educational attainment. Finally, action situations are influenced by "Rules in Use." This category can be broken down further into three layers of rules: constitutional, collective-choice (or policy), and operational. Figure 4.2 illustrates the manner in which rules in use (both formal/legal and informal) affect a set of outcomes.



Source: Ostrom (2005: 59)

Figure 4.2: Hierarchy of Rules

Figure 4.2 flows from the top of the diagram (the Constitutional-level rules) to the bottom (Operational-level rules) with feedbacks occurring throughout. Constitutional-level rules are existence rules. They state what actions will and will not take place; they define what agencies can and cannot exist (e.g. school boards). Once Constitutional-level rules lead to the creation of particular groups/agencies, those agencies install policy rules at the collective level, guiding all actions under the purview of that group/agent. These rules set expectations related to permitted

actions. They are developed and determined "collectively" by the legislative arm of the group/agency. Finally, the operational level rules focus on the ongoing nature of permitted actions, such as an elementary school. These rules identify how policy goals will be met through day-to-day activities. Importantly, all three levels of rules are enacted throughout the hierarchy of public education in the U.S. Just as legislatures make rules about the existence of school districts, these same districts make decisions about the existence (and location) of schools. Both decisions are Constitutional level choices. This hierarchy provides an important framework for understanding the ways varying rules-in-use affect action situations.

Combined, the Biophysical/Material conditions of the world, the attributes of the community, and the rules-in-use (Constitutional, Collective-choice, and Operational) give structure to an action situation. But, even within the action situation, certain rules structure the choices of individual actors. Table 4.1 highlights seven rules that govern actors within an action situation (Ostrom, 1986: 17).

Table 4.1: Rules within the Action Situation

Rule	Definition*	Example
Position	"Position rules that specify a set of positions and how many actors hold each one."	School Board shall have seven (7) members.
Boundary	"Boundary rules that specify how actors were to be chosen to enter or leave these positions."	Students within a specific geographic boundary will attend a specific school.
Scope	"Scope rules that specify the outcomes that could be affected."	The District may open, repurpose, or close a school building.
Authority	"Authority rules that specify which actions are assigned to an actor in a position."	The School District Superintendent is responsible for providing the Board with data to use in decision-making.
Aggregation	"Aggregation rules (such as majority or unanimity rules) that specify how the decisions of actors at a node were to be mapped to intermediate or final outcomes."	The Board approves a school closure on based on a majority vote.
Information	"Information rules that specify channels of communication among actors and what information must, may, or must not be shared."	The public is allowed to provide feedback to the School Board during a public comment period limited to three minutes per person.
Payoff	"Payoff rules that specify how benefits and costs were to be distributed to actors in positions."	The Board approves construction of a new school but must finance this construction through the imposition of higher taxes.

*These definitions are quoted from Ostrom (2010: 420).

This rule classification system outlines the rules that ultimately structure the action situation. For instance, boundary rules play a particularly important role in managing public education. School boards must decide who is excluded/included from which school and based upon what criteria. A typical approach is to geographically assign students to school buildings. Another is the provision of open enrollment and/or charter schools within districts. These policies permit flexibility and "choice" for students/parents that would prefer a different school from their geographic assignment. Both of these rules have important effects on the financial sustainability of the district and specific schools. Consequently, changing these rules may have significant effects on a school closure decision. As a result, any model of school closure must take these rules into account and attempt to understand their role(s) in shaping the action situation. Ostrom (1986: 17) argues,

> These seven variables plus a model of the decision maker must be explicitly stated (or are implicitly assumed) in order to construct any formal model of an interdependent situation. We can consider these seven to be a universal set of necessary variables for the construction of formal decision models where outcomes are dependent on the acts of more than a single individual.

Together, the IAD framework articulates the context surrounding the action situation, wherein the rules in place define which individuals are allowed to participate, how those individuals are allowed to participate, and what options are even available for consideration. But given that entire context, how do individuals ultimately go about making decisions? As noted above, Ostrom states that any model of the action situation must also have a "model of the decision maker." The next section develops the model of the decision-maker as a "Boundedly Rational Agent." Then I will apply the complete IAD framework to the problem of school closure in the U.S.

4.2 Bounded Rationality and Organizational Behavior

The theory of human behavior comes down to a choice between simplicity (perfect rationality) versus complexity (bounded rationality). The former may be appropriate for logical model development where the theoretical results are deductively derived. Using rational expectations in this way vastly simplifies the analysis. However, in empirical/institutional work the notion of perfect

rationality offers little benefit. Rather, it obscures the ways in which institutions affect outcomes by affecting the ways in which people access and process information. Consequently, most applied researchers assume some degree of boundedly rational behavior.

One of the first embodiments of boundedly rationality was Herbert Simon's "administrative man" (Simon, 1956). This archetype operates based on habits, rules of thumb, and norms that facilitate the organization of complex information. Moreover, the individual is "boundedly rational" in that they are susceptible to the limits of their own cognitive capacity as well as the information "canals" that support those limits. Bounded rationality emerged as an empirical grounding of *Administrative Behavior* (Simon, 1945). Within the political science and public administration literature, this concept has taken on an increasingly dominant position. Jones (1999: 297) writes, "There is no longer any doubt about the weight of the scientific evidence; the expected-utility model of economic and political decision-making is not sustainable empirically. From the laboratory comes failure after failure of rational expected utility to account for human behavior." This project employs Simon's notion of bounded rationality to examine the behaviors of the organizations and agents involved in the school closure decision.

Jones (1999: 298) argues that behavior is "…intendedly rational. [Actors] want to make rational decisions, but they cannot always do so." He argues that individuals face procedural limits to their rationality, referring to restrictions inherent to the process of decision-making. Procedural limits already play a strong role in the IAD framework, as laid out in Table 4.1 above. But, Jones also raises the importance of "attention" and "emotion" as key factors affecting decision-making within larger organizations.

Jones articulates the characteristics of boundedly rational agents, which are derived from a large body of empirical and experimental research (Jones, 1999: 306-307). First, individuals do not take into account all aspects of a particular problem. Instead, they attempt to restrict their attention to a small subset of factors deemed most appropriate to the situation. This also means that individuals will ignore any information they deem as irrelevant to those factors. Unfortunately, individuals are

not good at actually understanding what factors are important; worse still, human emotions can cause individuals to radically and swiftly alter sets of relevant factors. Second, individuals respond differently to situations based upon how it is framed. Generally, people respond more favorably to a scenario that focuses on gains rather than losses. Third, boundedly rational agents have poor self-control, and consequently, they impose "binding rules" to limit poor behavior in the future. Fourth, not only is it impossible for individuals to calculate the trade-offs for all possible outcomes, but the task becomes immeasurably more difficult in a "multi-attribute" scenario. In similar complex situations individuals rely on habits, rules of thumb, and norms instead of attempting to make the so-called rational choice. Finally, individuals stick to choices even in the face of evidence to the contrary. This is true of ideological positions, but it is also applicable to methods of inquiry as well.

In total, the boundedly rational actor makes decisions in a fundamentally different way than an agent that is perfectly rational. Their decision-making is driven largely by attention and emotion. Consequently, Simon argued the boundedly rational economic agent was not a utility maxizmer but instead, "pursue[d] a path that will permit satisfaction at some specified level of all of its needs" (Simon, 1957: 270-271). Jones (1999) argues that organizations are reflections of their individual members. Therefore, boundedly rational organizations are also seen as "satisficing," rather than profit maximizing. This has a number of important implications for the manner in which organizations, such as school boards, make decisions.

Recent empirical work has attempted to demonstrate that organizations do indeed make decisions in-line with bounded rationality (Jones, 1999, 2003; Jones & Baumgartner, 2004; Jones, Baumgartner, & True, 1998; Jones, Sulkin, & Larsen, 2002). This line of research has developed a theory of "policy punctuations" that extends upon the traditional view of incremental change. Incrementalism suggests that the policy arena is constantly in a state of adjustment – albeit small – to the political environment. The traditional view is that institutional frictions make large movements/adjustments in policy exceedingly difficult, "They keep the course of public policy steady and unvarying in the face of lots of changes; that is, they do not allow for continuous adjustment to

the environment" (Jones, Sulkin, & Larsen, 2003: 151). Over a large number of observations, these incremental adjustments will adhere to a random distribution. In other words, changes in policy are the results of exogenous shocks. Instead, Jones et al. argue that policy decisions "will be both more stable (ignoring many important signals) and more punctuated (reacting strongly to some signals)" (Jones, Sulkin, & Larsen 2003: 152). In this view, changes in policy are endogenous to the action situation. A boundedly rational decision-making process would illustrate relative "stasis" with periods of extreme change. Jones (1999: 2) highlights the distinction:

> Rather than making moderate adaptive adjustments to an ever-changing environment, political decision making is characterized sometimes by stasis, when existing decision designs are routinely employed, and sometimes by punctuations, when a slowly growing condition suddenly bursts onto the agendas of a new set of policymakers or when existing decisions makers shift attention to new attributes or dimensions of an existing situation. Complex interactive political systems do not react slowly and automatically to changing perceptions or conditions; rather, it takes increasingly pressure and sometimes a crisis atmosphere to dislodge established ways of thinking about policies. The result is periods of stability interspersed with occasional, unpredictable, and dramatic change.

Jones et al. utilize the distribution of policy changes to evaluate whether a policy process adheres to a model of boundedly rational behavior. A boundedly rational decision-making process will adhere to a "leptokurtic" distribution. Such a distribution is highly concentrated about the mean, but has "fat" tails indicating an unusually high frequency of outliers. Figure 4.3 illustrates this type of distribution compared to a normal distribution of the same data. Most of the policy choices (change in budget authority) revolve around the mean, which is evident by the substantial deviation of the frequencies around the mean from the normal distribution. This indicates that policy choices do not deviate from the mean as frequently as they would in a random policy world of perfectly rational actors. Then the frequency declines precipitously as the policy decisions move farther away from the average decision. Again the leptokurtic distribution deviates from the normal in that the frequencies are almost entirely below the normal distribution. In this region, policy changes of this magnitude

are substantially less frequent than would be expected in a world of perfectly rational agents simply reacting to exogenous shocks.

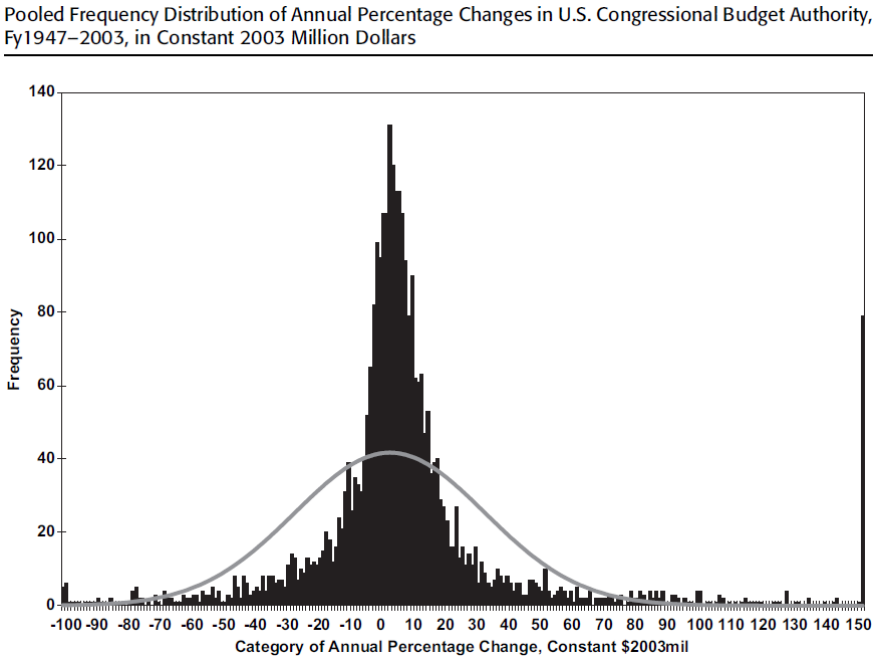


Figure 4.3: Illustration of a Leptokurtic Distribution[13]

Figure 4.3 illustrates the concept of "fat tails." Notice at extremes in the distribution the frequencies are remarkably higher than a normal distribution would expect. This can be seen both in terms of budget cuts and budget increases, though the right tail is substantially longer. This distributional analysis illustrates a policy process that is remarkably consistent over time but is subject to periods of extreme fluctuation, an example of the thesis of punctuated equilibrium. Hence, this distribution indicates a process of changing policy-level rules that adheres to a theory of bounded rationality.

The IAD framework is an appropriate tool to address the question of school closure. It provides a rigorous method to organize and analyze the school board decision to close a particular school. The framework calls first for a thorough understanding of the context of the school closure process, including the physical/material features of public schools, the attributes of the communities that

[13] Jones & Baumgartner (2005)

utilize public schools, and the rules (Constitutional, Policy, and Operational) that govern the use of public schools. Then, the framework requires the researcher to examine the internal characteristics of the action situation, paying particular attention to the actors involved and their interests in the decision-making process. Importantly, this element of the analysis requires the researcher to express a theory of human behavior. With the elements of the IAD framework laid out, it is now time to apply use the framework to explore the process of closing schools in the U.S.

4.3 Applying the IAD Framework

The application of the IAD framework will proceed in the following order. First, I will examine the physical / material characteristics of public schools. This will include a discussion about the "club good" nature of public schooling, the "polycentric" context of public schooling in the U.S., the overall trend of school district consolidation since 1950, and finally the interaction between these elements and urban form. Second, the analysis will discuss the attributes of communities that consume education in public schools. These communities can vary dramatically across a host of cultural, demographic, economic, and geographic factors. Third, the rules governing public schooling (and public schools) will be explored. This discussion will also account for the governance structure of education in the U.S. This overtly hierarchical organizational form imposes significant "institutional frictions" in the flow of information to and between actors in the action situation. Finally, the analysis will evaluate the bounded rational actors within the action situation, using a large urban district in Iowa as proxy. The application will conclude with a summary of the hypotheses generated through the application of the IAD framework on the issue of school closure.

4.3.1 Physical and Material Conditions.

The physical and material context for public schooling in the U.S. revolves around four important considerations. First, public schools are "club goods," wherein access to a school is excludable but consumption of school services is (largely) non-rival. This places substantial importance on the manner in which students are excluded from some schools but included in others. Second, schooling

occurs primarily within metropolitan areas that contain many local governments and school districts. Following Ostrom, Warren, and Teibout (1961), this polycentric situation incentivizes competition in service delivery and permits a process of household sorting based on school quality preferences and household income. Third, the administration of school districts across the United States has undergone a mass consolidation since 1952, as the number of school districts has fallen by more than more than 81 percent.[14] Finally, the majority of school closures occur in urban areas; therefore, urban form may play a meaningful role in structuring the school closure decision. Cities have their own histories. Each was designed in a specific time and place to serve the needs of its people (Gordon, 1977). In doing so, physical infrastructure was installed to facilitate capital accumulation. However, as the primary mode of capital accumulation changes over time, the spatial arrangements of cities have changed in response (Harvey, 1982). Cities that are incompatible with the dominant form of capital accumulation may face enormous pressure to reshape their physical forms to become more coherent with the dominant form of capital. According to the two strands of thought in school closure, this process of community transformation will almost certainly impact the provision and distribution of schooling. The more frequent narrative would focus on the cost-effectiveness of providing schooling within these transitioning geographies. However, the secondary narrative would instead argue that elected officials will make provisioning and distributional decisions based largely on the socio-economic context of a location. Taken together, school districts are increasingly centralized organizations that compete against one another for students, but they also assign students to specific schools based largely geographic location. As a consequence, the local policies (present and past) that shape the household sorting process interact with and reinforce school district rules of student exclusion. Next, I examine these points in greater detail.

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[14] If we take into account that the estimated number of districts in the U.S. in 1947 was 108,579 then loss is more than 88 percent, according to the U.S. Census Bureau, 2012 Census of Governments: Organization Component Estimates. See Table ORG005: Special-Purpose Local Governments by State: Census Years 1942 to 2012 - United States -- States 2012 Census of Governments.

Following Bushouse (2009, 2011), the provision of public education services is perhaps best classified as a club good (Buchanan 1965). A club good is one of four possible types of economic goods. Figure 4.1 illustrates this good classification system along with the general characteristics for each good. From the figure, we can see that it is relatively easy to exclude individuals from accessing the club good/resource. But, once membership is attained consumption of that good by one individual does not subtract from the good/resource available to others in the group. This good typology helps to consider the factors that can interfere with the efficient provisioning of local education services.

		Subtractability of Use	
		High	Low
Difficulty of Excluding Potential Beneficiaries	High	Common Pool Resources	Public Goods
	Low	Private Goods	Club/ Club Goods

Figure 4.4: Four Types of Goods[15]

Club goods are excludable goods that may be jointly consumed. The notion of excludability has been a key distinction in good type since at least Samuelson (1954). The concept revolves around the institutional capacity of the provider (not necessarily producer) of the good or resource to control a consumer's access to it. In a private transaction, the consumer must pay a price to the owner for access to that good. Club goods are excludable in this same sense. Through some mechanism – a mechanical arm outstretched across the road or an arbitrary boundary line – the agent responsible for providing that good or service can restrict access to it. Consequently, analysis of club goods requires us to ask the following questions: Who is providing the good? What are the mechanisms for exclusion? Who is excluded? How is the exclusionary mechanism modified?

[15] Ostrom (2009: 413)

The notion of subtractability is more nuanced. Traditionally, microeconomics textbooks present this based on the concept of "rivalry in consumption." If one person's consumption interferes with another's then the good is said to be "rival." Bushouse (1999) argues that this either-or presentation is flawed. Specifically, in the case of club goods the degree of rivalrous behavior depends upon the number of consumers. The club good only takes on the "rivalrous" characteristic if the number of consumers in the particular market is extremely high relative to the capacity for its provisioning. Ostrom and Ostrom (1977) prefer to consider this component in terms of "jointness of use." As a result, they compare goods that are consumed jointly (such as education, transportation, and other social infrastructure type goods) to those that are consumed by individual households. Both aspects of this characteristic are useful in analyzing the mixed economy of public education.

Public education is – at least spatially – a club good. The school district is a politically defined governmental unit. It can exclude students that do not live within its borders from consuming the educational services provided within its buildings. More to the issue here, school districts determine which geographic units (parcels) are assigned to each school building in the district. They spatially define who can and who cannot consume education services at a given school, subject to open enrollment policies at the state and district levels. However, once the student has gained access to an educational building and the services housed within it, those resources are consumed jointly by all members.[16] Consequently, the providers of public education must consider policies regarding the exclusivity of the good. Since school districts "exclude" based primarily on spatial location, the successful provisioning of educational resources will be affected by rules regulating the location decisions of households.

Figure 4.5 illustrates the complex interaction at play in the provisioning of educational services based primarily on the location of households. The structure to this interaction depends heavily on the incomes of residents within the school district, i.e. the membership of the club. Yet, the incomes

[16] If education were a CPR good, then each student would be subtracting information from a fixed resource pool. Clearly that is not the case in education.

of residents within a school district will be strongly influenced by local land use policies, particularly those policies that are designed to separate uses based on income, e.g. zoning codes, building codes, transportation regulations, etc.

Figure 4.5 illustrates an essential element to the school district's decision-making regarding the level of education services. Here we see that local policies designed to exclude poor households from rich households help to overdetermine the level of education provided by school districts. Policies of exclusion tend to be policies that drive up property values to levels that poor households cannot afford. For example, zoning codes may require "minimum lot sizes" that are substantial in size and therefore cost (Lukeman & Kane, 1994). In general, land use policies that restrict density in certain zones are significant drivers of residential segregation, particularly for the isolation of the wealthy (Lens & Monkkonen, 2016; Rothwell & Massey, 2010). This important interaction between two governmental units illustrates the complexity of providing public education services in the U.S. But, it is not the only complicating factor. The task becomes considerably more challenging when the service is being provided within larger metropolitan areas.

Household Incomes

School District Quality of Education Services		High	Low
	High	Most Likely	Less Likely
	Low	Less Likely	Most Likely

Household Incomes

High	Low		
Most Likely	Most Likely	High	Degree of residential segregation reinforced by local land use policies
Less Likely	Less Likely	Low	

Figure 4.5: Structural Interactions of Governance

Metropolitan areas include a large number of school districts, increasing the competitive pressures on individual school districts. Ostrom, Tiebout, and Warren (1961) argue that the provision of public goods happens within polycentric political and institutional arrangements. According to Ostrom et al (1961: 831-832) polycentricity means having,

> …many centers of decision making that are formally independent of each other. Whether they actually function independently, or instead constitute an interdependent system of relations, is an empirical question in particular cases. To the extent that they take each other into account in competitive relationships, enter into various contractual and cooperative undertakings or have recourse to central mechanisms to resolve conflicts, the various political jurisdictions in a metropolitan area may function in a coherent manner with consistent and predictable patterns of interacting behavior.

This notion of polycentricity requires a vastly more complicated view of the provisioning of a public service. The "State" does not simply provide public education. Vincent Ostrom and his colleagues argued that the polycentric nature of local public service provisioning required the researcher to look at five basic elements: production, provisioning, financing, coordination, and dispute resolution. With respect to public education, the sites of production are school buildings.

However, that production is supported by a web of contractors, vendors, local infrastructure providers, local governments, and ultimately state and federal agencies. The provisioning of public education is done via school districts, governed by rules at the district, state, and federal levels, and is modified by local decisions regarding taxation and land uses. Financing public education consists of an interaction between federal, state, and local rules and revenues. Ultimately, the coordination inherent in the production, provisioning, and financing of public education fits within the Institutional Collective Action (ICA) framework (Feiock, 2013), which seeks to understand how multiple organizations engaged in a coordination problem can supply appropriate institutions to address their shared operational challenges.[17] These myriad coordination mechanisms then determine the type of dispute alternatives available to the actors involved. This complex view of public schooling suggests that the actors within any action situation are too limited in their cognitive abilities to process all of the relevant factors. Consequently, this competitive and complex environment reinforces the assumption that human behavior is intendedly rational, largely governed by habits, rules of thumb, and social norms that affect levels of attention and emotion.

Given the polycentric nature of the U.S. metropolitan area, myriad decisions of acting agents interact with one another to create a dizzying array of complexity. This point is further illustrated by relying on the Ostrom conception of a "local public economy." Ostrom and Ostrom (1977: 83) define a public good as, "a good or service subject to joint use or consumption where exclusion is difficult or costly to attain." They note, "The essential difficulty in organizing public economies, thus, is on the consumption side of economic relationships." As public goods are costly to exclude, so-called *collective consumption units* are free to consume as much of that specific good or resource as was privately desired. This, of course, is the free rider problem. These CCUs can be local governments, households, and private firms that rely on public-type goods for their operations. Of course, these same agents in many cases also function as *production units*. "Governmental agencies and private

[17] Within the context of urban education, Weatherly et al (1983: 24) appears to be one of the first to call for "consultation…on a regular basis" between school districts and local governments.

enterprises can be viewed as potential production units concerned with the supply and delivery of public goods and services" (ibid). Here the complexity emerges. Local governments, in particular, play roles on both sides of this "market."

Collective consumption units tend to delineate specific geographical areas for service provision, such as a city, a homeowner's association, or in this instance, a school district. All the households within the boundary are tied, in some fashion, to the consumption of a particular public good. Ostrom and Ostrom (1977) note the inherent difficulty in using prices for signals in this regard. The price paid by households to the collective consumption unit has nothing to do with their reservation price for that good or service. Rather, it is determined by the governing structure of the CCU and paid through the imposition of taxes and fees. They rightly point out, "Whereas the income received for providing a private good conveys information about the demand for that good, taxes collected under the threat of coercion say little about the demand for that public good or service" (ibid, p. 84). Consequently, each school district – a CCU - must make certain *constitutional*, *collective*, and *operational decisions* related to the class process of public education. Who will be permitted to benefit from the service? How will it be produced? Where will it be produced? Who will oversee its production? How will monitoring and enforcement take place?

Production units are quite distinct from CCUs. According to Ostrom and Ostrom (1977: 85) "A production unit, by contrast, would be one that can aggregate technical factors of production to yield goods and services meeting the requirements of a [CCU]." These production units may be contained within the CCU itself – such as a streets department, housing department, or parks and recreation department within a city (the city being the CCU). Or the CCU can contract out the provisioning of a specific public service to a private enterprise. In this way, the CCU is still ultimately responsible for the provision of that public good or service, but it has relegated production and delivery of that good or service to a for profit enterprise, not-for-profit, or another CCU. As a result of this complex vector of services being provided by CCUs through multiple means of production (sometimes for the exact same service), Ostrom and Ostrom (1977: 88-89) argue,

> Each citizen, in such circumstances, is served not by "the" government but by a variety of different *public service industries*. Each public service industry is composed of the [CCUs] serving as providers and production units serving as suppliers of some types of closely related public goods or services that are jointly consumed by discrete communities of individuals.

The foregoing analysis raises a number of challenges in terms of articulating the nature of public education. First, it clearly operates within a polycentric context. Both internally and external to the public education industry, multiple independent agents make decisions affecting the production, provisioning, financing, and coordination of education service delivery. As a result, school districts within urbanized areas face increasing competition from private education providers and other forms of public education service provision, e.g. charter schools. This increased competition affects the manner in which school district board members view rules regarding the exclusivity of the consumption of their education services. Second, and closely related, education is a spatially grounded function that is provided for by a collective consumption unit (CCU), the school district. The governing body of the school district is ultimately responsible for making constitution, collective- , and operational choice decisions. Moreover, the CCU is also responsible for determining the menu of education services that will be provided to the households within its boundaries and the manner of that provision. Finally, the services provided will fall along the good typology continuum introduced earlier. As Bushouse (1999) makes clear, the nature of these goods has important implications for the institutional arrangements necessary to sustainably provide the service. However, this polycentric competitive environment masks a massive centralization of decision-making authority within the education industry since the World War II.

Since 1952, the number of school districts in the United States has declined by more than 80 percent, a loss of more than 50,000 districts. Figure 4.3 illustrates this dramatic transformation. The process of consolidation occurred primarily between 1945 and 1970, when districts were disappearing at a rate of almost 2,600 per year. That rate of district consolidation fell substantially to roughly 73

districts per year after 1972. Strang (1987: 352) argues that this massive consolidation represents a fundamental shift in the nature of public education.

> These figures suggest qualitative change in the typical school district. In the 1940s most districts consisted of informal community arrangements with little organizational structure. By 1980 most districts were bureaucratically organized, relatively insulated from the communities they served, and oriented toward the larger professional definition of educational administration.

This transition toward Weberian-bureaucratic government was largely driven by increases in federal funding and control of the education process, state-level funding, and rates of urbanization (Meyer, Scott, & Strang, 1987; Strang, 1987). Chubb and Moe (1990) argue that increased bureaucracy makes an organization more rigid and less able to adapt to changing conditions. Bohtke (2001) finds that increased levels of bureaucracy at the school and school district level are negatively correlated to student performance.

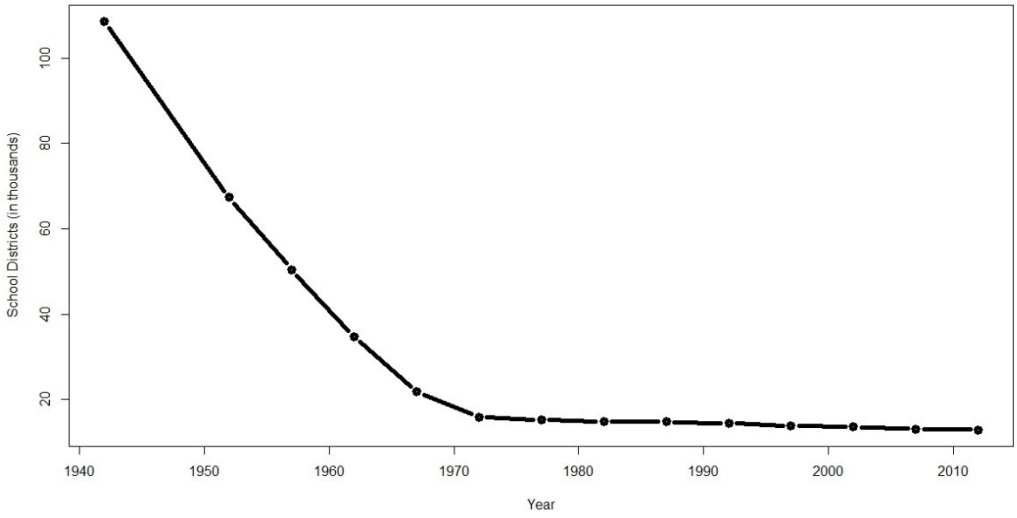

Figure 4.6: School District Consolidation in the U.S. (1942-2012)[18]

Robinson (2004: 36) explored bureaucratic rigidity among school districts in Texas. In stark contrast, he finds that "bureaucratization may actually reduce rigidity in organizational responses to their

[18] U.S. Census Bureau, 2012 Census of Governments: Organization Component Estimates.

environments…further research should look at the impact of bureaucratization on organizational outputs rather than taking for granted that bureaucratization fosters inertia and consistency." Robinson also notes that school budgeting in Texas adheres to a leptokurtic distribution that is in line with the theory of punctuated equilibrium. The process appears to be remarkably stable, but at specific yet unpredictable moments the decision-making of the organization becomes incompatible with the environment, leading to a substantial change in policy- and collectivelevel rules. Therefore, I conclude that school districts are now larger and more bureaucratic than they were in the early 20th century. Robinson's findings suggest that organizations that are relatively more bureaucratic tend to be more flexible in responding to a changing environment, but the leptokurtic distribution of changes in policy decisions reinforces the understanding that school board decision-making is consistent with bounded rationality – governed largely by attention and emotion.

The transformation of the school district into a professionally managed bureaucratic organization is a direct result of the municipal reform movement. Between 1880 and 1945 approximately, the reformers of the Progressive Era reformed municipal government in dramatic ways. Knoke (1982: 1,314) explains the reform agendas in the following way, "While one reform tradition emphasized substantive improvements in housing, transportation, sanitation, crime control, and the like, the "structural" or administrative reformers put their faith in altering the formal machinery of government as a solution to major urban ills…." The traditional narrative surrounding the movement suggests reformers were interested in making government more "efficient and effective", more professional, less susceptible to special interests, etc.[19] However, Hays (1964) provides a compelling argument that in fact the reformers were primarily members of the business community seeking to reshape the administrative apparatus to their benefit.

Their rhetoric suggested a benevolent intent, but instead he argues, "

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[19] Not only did the progressive era bring in corporate reform interests, but it also coincided with the development the new discipline focused on corporate management. Woodrow Wilson wrote the classic text, "The Study of Administration" in 1887, which can fairly be seen as the birth of the Public Administration discipline.

> Behind this contemporary rhetoric concerning the nature of reform lay patterns of political behavior which were at variance with it… The urban political struggle of the Progressive Era, so the argument goes, involved a conflict between public impulses for "good government" against a corrupt alliance of "machine politicians" and "special interests… Available evidence indicates that the source of support for reform in municipal government did not come from the lower or middle classes, but from the upper class. The leading business groups in each city and professional men closely allied with them initiated and dominated municipal movements (Hays, 1964:157-159).

The role of administration has long been an important variable in the calculus of capital accumulation. Gordon (1977) outlines the influence of the political and economic elites on the ultimate form and shape of American cities. Each city was built during a historically contingent period that was largely governed by a particular form of capital accumulation. The form of capital dominant at the time of America's first cities (e.g. New York, Boston, Philadelphia) was "commercial" or what Lefebvre (1970) calls "mercantile" capital. There was no separation of use by income at this time. Wealthy households lived next to poor households. Both lived next to sites of artisan production. As the industrial revolution began to gain momentum (largely on the backs of the slaves[20]), wealth began accumulating to the political and economic elites in society. But, internal contradictions in the organization of urban space began to create significant class conflict, straining social relations. One solution, Gordon argues, was for the political and economic elites to construct new cities; cities that helped mask this growing divide between the wealthy and poor. These Industrial cities (e.g. Chicago, Detroit, Toledo, etc.) were designed and built with two things in mind: 1.) Maximize economic productive capacity and 2.) Alleviate the social tensions by separating the rich from the poor. This worked well for a time, but eventually the internal contradictions of that spatial form, too, began to unravel. The isolation (but concentration) of workers made organizing much easier, leading again to social tensions and economic strife. In response, the political and economic elites built newer cities in the American south and south west. Here too, elites utilized

[20] See Darity Jr. (1992)

administration to build communities that facilitated the two criteria of capital accumulation and social cohesion.

Gordon's narrative illustrates two important issues for schooling in America. First, political and economic elites do utilize professional administrative machinery to construct systems that facilitate economic growth. This is not only relevant to new forms of schooling (i.e. charter schools) but also to the disjuncture between current modes of capital accumulation and older urban forms. Following the rise of Corporate cities, political and economic elites have sought to reshape older cities to meet their criteria better, particularly as the dominant form of capital accumulation is increasingly knowledge and information. According to Powell and Snellman (2004: 201) define the knowledge economy as,

> …production and services based on knowledge-intensive activities that contribute to an accelerated pace of technological and scientific advance as well as equally rapid obsolescence. The key components of a knowledge economy include a greater reliance on intellectual capabilities than on physical inputs or natural resources, combined with efforts to integrate improvements in every stage of the production process, from the R&D lab to the factory floor to the interface with customers.

Following this logic, knowledge-based production requires far more interpersonal interaction. Hence, the economic productivity of Corporate cities would no longer meet the demands of capital accumulation. But, with few options for new cities (without going abroad), political and economic elites are forced into Harvey's "spatial fix." They must remake old spaces into new spaces that accommodate both capital accumulation and social cohesion. As a consequence, the urban form that is most easily remade into the desirable environment (through administrative powers) will see the greatest amount of change. This will undoubtedly have a substantial impact on the school closure action situation.

Three hypotheses emerge from this analysis of the physical/material conditions of public schooling in the United States. First, the nature of the complex interaction between local land use policies and school assignment decisions reinforces the conventional wisdom that "better"

neighborhoods will have better schools. I use property tax receipts per pupil to explore the relationship between ability to pay and the likelihood that a district will close a school. Second, given the close relationship between the excludability of public education and the polycentric nature of its provisioning, application of the IAD framework suggests that school districts in more competitive environments will seek to close undesirable schools more frequently than districts operating in less competitive environments. To assess just how competitive the schooling environment is, I utilize a proxy variable that is the number of school districts within a ZIP code. I expect that school districts in ZIP codes with relatively more school districts will be more willing to close schools. Finally, I utilize a dataset developed by Watkins (1980) to classify cities by their period of most significant growth. My hypothesis is that both Commercial (Mercantile) and Industrial cities will close more schools than Corporate cities. In conclusion, the application of IAD framework has led to the development of the following hypotheses:

> H_1: School districts generating more local revenue per pupil will be less likely to close schools.
>
> H_2: School districts operating in counties with relatively higher counts of school districts (i.e. competitors) will be more likely to close a school.
>
> H_3: Schools located in Mercantile and Industrial cities will be more likely to close than schools in Corporate cities.

4.3.2 Community Attributes.

Next, the IAD framework requires us to address "community attributes" that affect the action situation. Ostrom (2010: 6) describes community attributes as, "Attributes of a community, which may include the history of prior interactions, internal homogeneity or heterogeneity of key attributes, and the knowledge and social capital of those who may participate or be affected by others." It follows from Chapter 3 that the primary community attributes antagonizing the action situation are financial efficiency, race, and geography. However, the analysis above also highlights the important role of household incomes. Financial efficiency is largely determined by school board decisions, as are the political decisions they make. As a result, these factors are more appropriately located within

the Rules-in-Use category. However, the racial and demographic make-up of the community is clearly an important element of the school closure story. Additionally, the current body of research is clearly split between an "urban" process versus a "rural" process. This too is an important differentiating factor. In addressing both narratives, I make the following hypotheses:[21]

> H_4: Schools with higher shares of African American students and/or Latino/Hispanic students will be more likely to close.
>
> H_5: Racial/Ethnic heterogeneity within a school will decrease its probability of closing.
>
> H_6: Schools with higher rates of free and reduced lunch will be more likely to close.
>
> H_7: Schools located in large central cities have a higher probability of closing.

4.3.3 Rules-in-Use

The rules that school districts utilize to fulfill their purpose are critical to understanding school closure. Rules are nested and are formed at various levels throughout the organization. Ostrom and Ostrom (1977) divide these rules into three categories: constitutional, collective choice, and operational. Constitutional decisions are questions of formation. Should an organization be created? Should a specific service be provided? If so, how? What limitations should be put in place to constrain activities of the new organization? Constitutional rules govern the manner in which agents evaluate collective choice questions. Collective choice questions are policy-level questions. They may set targets for certain outcomes, set operational guidelines, or institute new rules in reaction to constitutional level rule changes. Finally, operational rules are constrained by both constitutional and collective choice rules. Hence, they are the most restricted and govern the actual production, monitoring, and enforcement of the good being produced.

The local public economy (LPE) of public education operates within a nested system of rules and resources, i.e. structures. The hierarchical nature of this system is consistent with Hooghe and Marks'

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[21] These hypotheses are quite likely collinear. The correlation of the variables used to assess them are discussed in footnote 38.

characterization of a Type 1 governance structure, wherein rules are handed down from higher levels of the organization to lower levels (Hooghe & Marks, 2003). This is true both within the district as well as the education system as a whole. However, Bushouse (1999) makes clear that these rules are formed at all levels of the Type 1 governance structure. If we focus on the district itself, the question of closing a school or keeping it open is a constitutional choice decision. The criteria the school board will use in making that decision is a mixture of collective choice rules determined by federal and state governments and the school board itself.[22]

Education in the United States is delivered via a Type I governance structure. It is organized hierarchically with constitutional rules being determined by the federal Department of Education. Most recently, this comes in the form of the 2001 No Child Left Behind (NCLB) act, an extension of the Elementary and Secondary Education Act first passed in 1965.[23] The NCLB sets in place a structure of performance expectations that apply to specific schools and subsequently their school districts.

This most recent evolution of the bill increased the amount of federal funding available to address poor performing schools. Performance is based on "annual yearly progress" (AYP) rates of proficiency within science and reading. Schools that fail to meet these standards more than two consecutive years are required to offer the parents of children at these schools the option of sending their child to a better performing school within the district. In some cases, additional funds are made available to provide tutoring and other "supplemental education services." If the school fails to meet proficiency standards for four consecutive years, the school is required to take "corrective action" and consequently develop a plan to address the situation. If after one year under the corrective action

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[22] See Basu (2004) for a vivid story as to just how flexible these criteria can be.

[23] According to the New America Foundation's Federal Education Budget Project, which according to politicsunspun.com, the New America Foundation is a "centrist" organization, see "Who's who" under their "Resources" page.

policy the school still fails to meet the proficiency standards, then it is required by the NCLB to implement an "Alternative Governance" structure from one of the following options:[24]

1. Close the school and reopen the same school as a public charter school.
2. Replace all staff relevant to the failure designation.
3. Contract out the management of the school to another entity.
4. Turn the operation of the school over to the State education agency.
5. Engaging in a fundamental reform/restructuring effort.

According to the U.S. Department of Education, this final option can be implemented through any one of a number of options that involve closing the school and/or closing the school and reopening it in some additional way. Under Title I of the Act, state education agencies can receive grant funds to allocate and assist local education agencies in their efforts to implement school improvement actions.

The federal rules affecting school closure in the United States are associated with the 2001 No Child Left Behind (NCLB) Act.[25] The Act addresses two areas of concern: education performance and poverty. First, the Act introduced education standards for reading and math that individual schools were required to meet. Failure to meet these criteria over consecutive years places individual schools in differing "school improvement" categories of: School Improvement, Corrective Action, Restructuring Planning Year, and Implement Restructuring.[26] Second, the NCLB also provides district funding through Title I of NCLB based on the income status of the school district's student population. These funds are allocated based on four different funding formulas that accelerate the funds to the District based on the share of students living below the poverty threshold. The Basic Grant Formula allocates funding to any District with "...at least 10 poor children and 2 percent of its

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[24] No Child Left Behind, Sec. 1116, 20, U.S.C.A. §6301-6578, 2002

[25] This law was quite recently substantially revised, changing the rules of the educational system dramatically. However, those changes are not being evaluated here. Rather, this research project focuses squarely on the NCLB regime.

[26] See the Federal Education Budget Project overview of NCLB at http://febp.newamerica.net/background-analysis/no-child-left-behind-overview.

students in poverty."[27] This effectively ensures that all school districts receive some Title I funding. The second funding formula is the Concentration Grant Formula. It is threshold based, targeting school districts where at least 15 percent of the student population live below poverty. Therefore, school districts with less than 15 percent of its student population living below the poverty threshold are not eligible for funding via this formula. As a consequence, two districts could receive the same amount of funding through Title I whether they met the minimum threshold (15%) or have much larger shares (some are well above 90%) of students living in poverty.[28] This effect is intended to be offset by a third funding formula ("Targeted Assistance Grant Formula") that allocates more funding per child in poverty. As a result, higher-poverty districts receive more Title I funding per child than lower poverty districts. Finally, Title I provides funding through the Education Finance Incentive Grant Formula. This grant formula is intended to:

1. Reward states that spend higher amounts of their own resources on public education and distribute those dollars equitably.
2. Provide additional funds (doubled) to high-poverty districts in states that do a poor job meeting the objectives noted in (1).

In total, Title I allocated over $14 billion dollars in 2014.[29]

Somewhat perversely, schools that are placed in a school improvement category must use their Title 1 funds to address the turnaround requirements. In the second and third years of being in "School Improvement," districts must set aside 10 percent of that schools' portion of Title I funding for professional development. However, in year three that share rises to 20 percent of the schools' Title 1 funding for "Choice and Supplemental Education Services." These funds must continue to be held back from the school and devoted to these corrective measures. As a result, funds that are targeted to assist poor student populations are redirected, in some instances, to support the reduction

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[27] Ibid. http://febp.newamerica.net/background-analysis/no-child-left-behind-act-title-i-distribution-formulas

[28] Ibid.

of student enrollments and the subsequent "corrective measures" of the turnaround process. In addition, in 2009 Secretary of Education Arne Duncan announced revisions to the School Improvement Grant program under the Elementary and Secondary Education Act (ESEA) that would permit states and later schools to compete for larger Title I grants to implement dramatic corrective measures, i.e. school closure (Redding & Rhim, 2014: 23-24). In the first year of the revised program, more than 1,300 schools began implementing their turnaround process; more than 74 percent (962) of those schools chose the "transformation model" (ibid).

Clearly, the constitutional decisions of the district are shaped by the rules established at the federal level and the resources (incentives) provided to adhere to those rules. These turnaround schools tend to have higher shares of low-income populations. Title I funds are intended to support these activities but recent changes have increasingly directed Title I funding away from direct assistance and toward dramatic restructuring of poor performing schools. Two hypotheses result from this interaction of collective choice at a higher level and constitutional choice at the lower levels of a Type 1 governance system. First, Title I funding for the District is hypothesized to increase the probability of school closure. These funds are targeted to schools with larger low-income populations that tend to perform poorly on education assessment examinations, relative to more affluent schools. The second hypothesis regarding rules-in-use is that school districts receiving greater shares of federal funding will also be more likely to close a given school. This is due largely to the understanding that higher levels of federal funding come with rules attached. These rules

> H_8: School Districts that receive higher shares of Title I funding will be more likely to close a given school.
>
> H_9: School districts where federal funds constitute a relatively higher share of overall district revenue will be more likely to close a given school.

There are also rules-in-use at the state and local levels that must be accounted for. Bushouse (1999) divides rules-in-use into two categories: regulation and funding. Regulation decisions, and many funding decisions, occur at the state level. State level rules include funding formulas, permissions regarding open enrollment and within-District transfers, as well as calendar approvals

and more. School districts allocate funds, but they also set certain standard expectations regarding performance within the district, and can set policy regarding the distribution of students. Much of the school closure literature notes the important role played by enrollments in affecting school board perceptions of a potential problem. As a result, school districts may use changes in enrollment over time to monitor facility use. These rules-in-use generate two additional hypotheses.

> H_{10}: Schools that witness large declines in enrollment over time are more likely to be closed by a School District.
>
> H_{11}: School districts in states that permit open enrollment will be more likely to close schools than districts in non-open enrollment states.

Lerman (1984) identifies three additional factors that illustrate rules-in-use at the school district level. He argues that the decision to close schools revolves around cost factors such as teacher salaries, building and maintenance costs, and student transportation costs. These cost factors are largely driven by collective-choice rules-in-use at the school district level. School boards may adopt maintenance plans that define capital repair and replacement schedules, or they may choose to defer maintenance. School districts that are geographically larger may face higher transportation costs. The same may be true for districts where the schools are widely distributed throughout the district. Regardless of the cause, rules-in-use may generate costs burdens on districts. The result may be a higher likelihood that a district may be forced to close a school. This generates one additional hypothesis from the Lerman theory of school closure

> H_{12}: School districts that have relatively higher expenses on student transportation, building maintenance, capital investments, and instructional staff are more likely to face higher financial burdens and will be more likely to close schools.

We now have at least a cursory understanding of the essential elements of the IAD framework. The next step is to describe the context of the specific action situation in question. Then, we need to define the actors within that action situation along with a theory of human decision-making.

This project is focused on the school board decision to close a given school. Therefore, the action situation is a school board meeting wherein board members must decide whether or not to close a

school. There are four primary actors within this action situation: the school board members, the school district superintendent (and staff), members of the speaking public, and students. The school district meeting is a public hearing that provides opportunities for staff, board members, and members of the public to enter comments into the public record. With the understanding that school board members are boundedly rational beings, it is important to understand the ways in which an actor's position and/or role in this process can shape outcomes in meaningful ways. In the following application of the IAD, I will rely on the constitutional documents of the largest school district in the state of Iowa, the Des Moines Community School District (DMCSD). Their documents are instructive in exploring a traditional school board structure and assist in clarifying the locations of influence and power in this politically fraught situation.

4.3.4 The Set of Actors

The Des Moines Community School District board consists of seven elected members that each serves a four-year term. To be eligible to stand for election members must be: "a qualified voter of the district and the designated director if appropriate, a citizen of the school district, an eligible elector of the district, and free from a financial conflict of interest with the position."[30]

The number of students being affected by the action situation is defined by area attendance zones. Each zone represents the spatial monopoly for each site of education service production and consumption. The District website suggests its policy on boundary realignment is to routinely review existing area attendance zone boundaries and revise them to:[31]

- Balance enrollment in buildings as well as optimizing space in our buildings
- Allow more neighborhood students to attend their neighborhood school
- Align when possible school feeder systems

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[30] Des Moines Community Schools District Administrative Code, Series 200, Code 260.1, available at www.dmschools.org/departments/administration/polcies-and-procedures/series-200/#204 , accessed 5/18/2015

[31] www.dmschools.org/elementary-school-attendeance-areas/faq/ , accessed 5/18/2015

Table 4.2: Positions and Roles

Positions	Roles	Eligibility
Board President	Preside over meetings; Sign all contracts	Determined by the Elected Board
Vice President	Execute the powers of the President as needed	Determined by the Elected Board
Board Members	Participate in meetings and guide District policy	Elected either at-large or by District; Must be a citizen of the district, eligible elector, and be free of any financial conflict of interest
Superintendent	Charged with carrying out policies of the Board of Directors, including the daily oversight of District operations	District employee, appointed by the School Board directly
Students	Primary resource for School District; Input and Output	Live within a school attendance zone or be approved for open-enrollment; if non-legal resident then must pay tuition;
Electing Public	Parents and interested members of the electing public; Many of which pay property taxes to taxes to the District	A resident (homeowner or renter) of the district
Non-electing Public	Members of the community outside of the District that may have an interest in District matters.	All

The District is managed by a school Superintendent. The Superintendent is the chief executive officer of the school district and is responsible for the day-to-day oversight of District operations. The Superintendent is responsible for the following:

- The execution of [the District's] policies;
- The management of the work of the departments, the duties of which, apart from those required by law, the superintendent shall assign.
- The observance of [the District's] policies by all those persons employed by the district.
- The enforcement of all provisions of the law relating to the operation of the schools or other educational, social and recreational agencies or activities under the charge of the board.

Table 4.2 outlines the positions, roles, and eligibility requirements of each actor in a given school closure decision. Table 4.3 provides permitted actions of each actor and potential outcomes that could come from the Board's decision. Three important takeaways emerge from both tables. Table 4.2 highlights the importance of eligibility requirements, in particular the requirements for Board members and students.

Board members must be "citizens" of the district and must be eligible voters. Both of these eligibility requirements clearly exclude both legal and non-legal aliens but also exclude those members of society who have lost their voting eligibility status, such as those institutionalized or

recently released from prison. Students are also subject to eligibility requirements, but these are more flexible. Students are assigned specific schools based on the geographical location of their place of residence. However, students may apply for "Within-District Transfer" if they wish to attend a different school within the District. These decisions are approved administratively and are primarily made upon existing capacity of the receiving schools.[32] In addition, students that live outside the district may "open enroll" into the District based on approval and subject to certain limitations. Students open enrolling into the district are responsible for their own transportation and if the transfer occurs in Grade 10 or after that student will not be eligible to participate in athletics for the first 90 days of enrollment.[33] In addition, Table 4.1 highlights the essential role of students as the primary resource to the district along with property taxes.

Table 4.3: Actors, permitted Actions, and Possible Outcomes

Positions	Permitted Actions	Potential Outcomes
Board President	Non-voting unless the V.P. takes over; Controls the discussion; Calls for the vote	NA
Vice President	Voting member of the Board.	Vote to close or keep open
Board Members	Voting member of the Board.	Vote to close or keep open
Superintendent	Establishes the agenda; Frames discussions; Provides information.	Implement the Board decision
Students	Speak at public forums; provide information formally and informally to Board members.	NA
Electing Public	Speak at public forums; provide information formally and informally to Board members.	Remain in District; Leave district
Non-electing Public	Speak at public forums; provide information formally and informally to Board members.	All

[32] www.dmschools.org/enrollment-registration/within-district-transfer/within-district-transfer-procedures/ , accessed 5/18/15.

[33] www.dmschools.org/enrollment-registration/open-enrollment-limitations-stipulations/, accessed 5/18/15.

Table 4.2 highlights the critical roles of information sharing, information processing, and potential reactions to collective decisions. The ultimate decision-making role is played by the School District Board of Directors. The information they base their collective decision on comes from the Superintendent, Students, voting members of the District, and non-District influences. This raises an important question: which source of information do board members care about most? Is the information from the Superintendent valued more, or in Jones' (1999, 2002) terms paid greater attention to than the information from the public at large?

Table 4.2 also highlights the possible outcomes of the school board decision. Any given school will either close or stay open. District residents (with or without school-age children) may choose to stay or leave. The Superintendent will go about implementing the Board's final decisions. Yet, Table 4.2 also illustrates the precarious position of students. Students are in fact the primary resource (both input and output) to the district, and yet they play a mostly passive role in the decision. They may play a role in the ultimate decision to attend their newly assigned schools, assuming they are being displaced by a school closing.[34]

Consequently, this chapter argues that actors within the action situation are boundedly rational (Jones, 1999). Superintendents (and their staff) bring the school closure question to the attention of board members. In this way, the problem is framed by school superintendents who set forth both the problem and the initial criteria used in assessing the degree of the problem at hand. Hence, board members rely on information from staff first in this process. Secondly, school board members play particular roles – both formal and informal – in this process. Through repeated discussions and interactions with one another and other actors within the situation, board members adapt the problem and its scale to the political context. Third, actors face fundamental uncertainty regarding the nature of the problem. As a result, their ability to determine the relative importance of multiple causal

[34] de le Torre et al (2015) show that in the most recent round of school closings in Chicago (2013) over one-third of displaced students ultimately began attending a different school than they were assigned by the District.

factors is severely impaired. Finally, school board members, the superintendent, and members of the affected public evaluate the potential outcomes in terms of trade-offs based upon their own personal (often conflicting) goals. Hence, the final decision represents an impossible task of simultaneously maximizing a vector of pay-offs across various interests. The ultimate result is a collective-choice decision based on a narrowed set of weighted criteria.

Figure 4.7 applies the Jones and Baumgartner (1999) test to school board decision-making between the 2007 and 2008 school years. In total, the figure illustrates changes in spending levels for nearly 15,000 school districts. The leptokurtic distribution is clear and the kurtosis is large (16.57). The distribution is similar to the Jones et al hypothesis of punctuated equilibrium. The tails of the distribution have substantially higher frequencies than would be expected under the normal distribution.

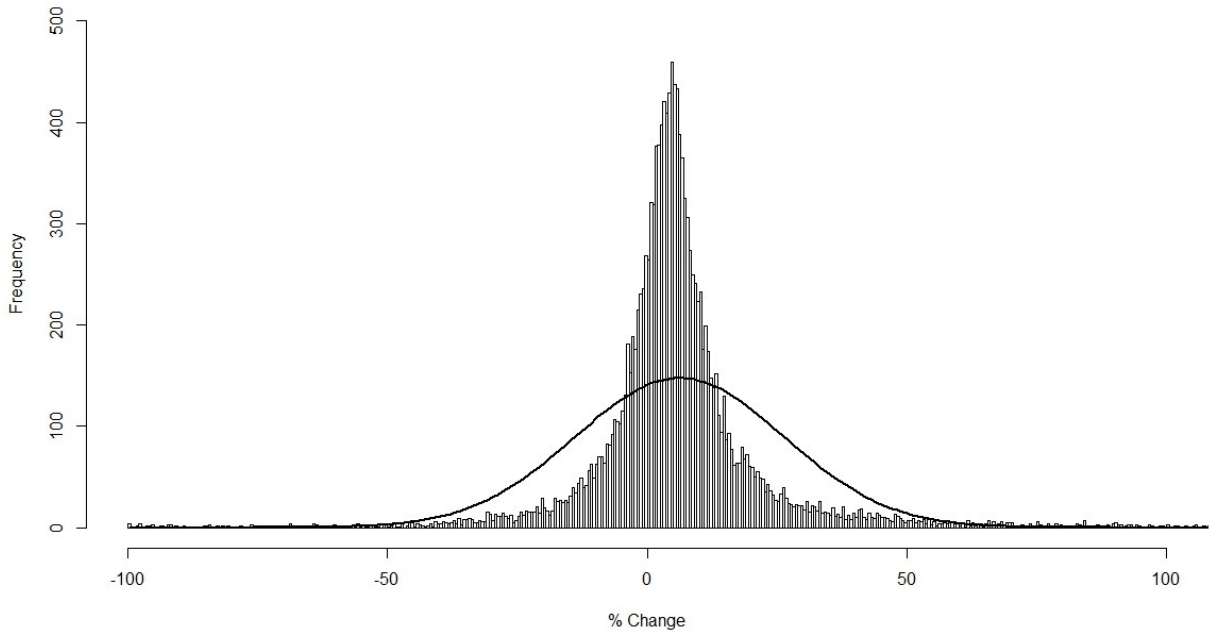

Figure 4.7: Changes in District Expenditures (2007-2008)

According to the punctuated equilibrium theory, this histogram suggests that school board decision-making does not adjust randomly. Instead, school board decision-making is structured such that boards tend to make small adjustments.[35] However, the high frequency on the tails of the distribution suggests that some districts are forced to make dramatic changes. In fact, Figure 4.7 is consistent with Robinson (2004) who explored school board budget changes in the state of Texas. He finds that districts in Texas also adhere to this boundedly rational approach to administrative decision-making. However, Robinson (p. 36) also finds that non-bureaucratized districts "are characterized by *greater* degrees of punctuation." The decision to close a school is often justified on financial grounds. Hence, a logical hypothesis from this discussion is that less bureaucratized districts will be more likely to close schools, given their increased likelihood of punctuated behavior.

> H_{13}: School districts that are relatively less bureaucratic will be more likely to close schools than districts that are more bureaucratic.

Overall, this evaluation of the action situation highlights the importance of the actors themselves in deciding whether to close a school or not. The IAD framework assumes that actors are boundedly rational, implying that social norms, customs, and mores may play much larger roles in the decision-making process than they would assuming rational actors. This model of human behavior ultimately then, leads then to the final hypothesis from the application of the IAD. School districts have unique characteristics that cannot be modeled.

> H_{14}: School district idiosyncrasies are important factors shaping the school closure process and must be accounted for.

Some school districts generate statistically different distributions of possible outcomes. Perhaps they faced some natural disaster, economic hardship, or rare demographic transition. Or, more importantly for the purpose of this analysis, perhaps they utilize quite different collective-choice and operational

[35] Appendix A-1 illustrates the distributions between 2009 and 2012. Each shows a similar leptokurtic distribution.

level rules. If so, the analysis needs to be able to identify those districts that stand out to guide future analysis.

4.4 The IAD: A Summary

This chapter has introduced the IAD framework as an analytic tool used to guide institutional analysis. The framework was utilized to develop a number of hypotheses to explore related to school closure in the U.S (see Table 4.3). Broadly, these hypotheses revolve around the four theories of school closure discussed in Chapter 3: race and poverty, operational efficiency, geography, and urban form. However, the hypotheses also examine two additional research areas: rules-in-use and local economic conditions. The former examines questions of bureaucracy and school choice. The latter looks at the strength of the district's local contributions per pupil. The next chapter explores the empirical geography of school closure. Then, Chapter 6 will introduce the econometric model and examine each of the hypotheses listed below in Table 4.4.

Table 4.4: Summary of IAD Hypotheses

Hypothesis Number	Hypothesis
H_1	School districts generating more local revenue per pupil will be less likely to close schools.
H_2	School districts operating in ZIP codes with relatively higher counts of school districts (i.e. competitors) will be more likely to close a school.
H_3	Schools located in Mercantile and Industrial cities will be more likely to close than schools in Corporate cities.
H_4	Schools with higher shares of African American students and/or Latino/Hispanic students will be more likely to close.
H_5	Racial/Ethnic heterogeneity within a school will decrease its probability of closing.
H_6	Schools with higher rates of free and reduced lunch will be more likely to close.
H_7	Schools located in large central cities have a higher probability of closing.
H_8	School Districts that receive higher shares of Title I funding will be more likely to close a given school.
H_9	School districts where federal funds constitute a relatively higher share of overall district revenue will be more likely to close a given school.
H_{10}	Schools that witness large declines in enrollment over time are more likely to be closed by a School District.
H_{11}	School districts in states that permit open enrollment will be more likely to close schools than districts in non-open enrollment states.
H_{12}	School districts that have relatively higher expenses on student transportation, building maintenance, capital investments, and instructional staff are more likely to face higher financial burdens and will be more likely to close schools.
H_{13}	School districts that are relatively less bureaucratic will be more likely to close schools than districts that are more bureaucratic.
H_{14}	School district idiosyncrasies are important factors shaping the school closure process and must be accounted for.

CHAPTER 5

THE GEOGRAPHY OF SCHOOL CLOSURE

The purpose of this chapter is to examine the empirical facts of school closure in the United States. These facts illustrate several important trends. First, schools are closing at an increasing rate over the first decade of the 21st century (and three times faster, on average, than in the 1970s). Second, school closures are taking place primarily in large- and mid-sized cities and remote rural communities. Third, almost all geographic growth in the total counts of schools is taking place in large- and mid-sized suburbs. These stylized facts suggest a spatial reorganization of the location of schools in America from rural and inner-cities to large- and mid-sized suburbs.

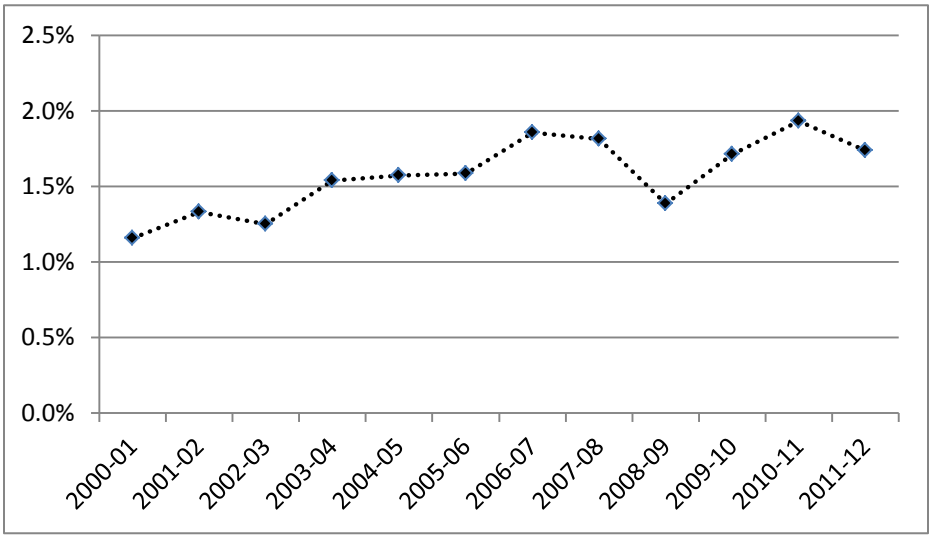

Figure 5.1: School Closure Rate 2000 - 2012[36]

From 1995 through 2011, more than 21,000 schools were closed displacing more than 3.1 million students in elementary or secondary schools. Early research on the school closure problem estimated that approximately 7,000 schools were closed in the 1970s, meaning that school closure in the first decade of the 21st century is proceeding at least three times faster (Valencia, 1985). Figure 5.1

[36] U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "Public Elementary/Secondary School Universe Survey," 1995-96 through 2011-12. (This table was prepared September 2013.)

illustrates the trend of the rate of school closure (closed schools to total schools in a given year) as it relates to regular[37] elementary and secondary schools in the United States. The figure clearly demonstrates that the rate of school closure is increasing annually, raising a critical question: What economic, political, and/or social factors are driving this increasing rate of school closure in America?

Two important points are highlighted by Figure 5.1 above. First, school closures are an increasingly probable outcome in the lives of American school children, teachers, and parents. Second, increases have been modest throughout the decade but saw a 35 percent jump between the 2008-2009 and 2009-2010 school years, the heart of the Great Financial Crisis.[38] These data indicate important roles for both property and financial markets (operating either individually or jointly).

Disaggregating the data by state over the same time horizon illustrates the geographic component to this process. Table 5.1 below shows the ten states with the most school closures between 2001 and 2011. The state of Ohio leads the nation in school closure as it shuttered 819 public schools – approximately 7.9 percent of all schools closed nationally over the period. Perhaps surprisingly, over half of the states in the top ten are in the Midwest. Three states are in the Northeast, with California and Texas representing the West and the South respectively. These data suggest that different processes are driving school closure in different parts of the country. In addition to this regional variation, the table also identifies two significant outliers based on population. Both Nebraska (6th) and Kansas (9th) are in the top ten, but these states are sparsely populated relative to the remaining states.

The role of population becomes more complex after accounting for the rate of closures on a per capita basis. The rate of school closures per 10,000 residents by state from 2001 – 2011 is illustrated

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[37] This is an official category for the NCES. Schools can be located in either "regular", "Special Education", "Vocational", or "Alternative" categories.

[38] One possible hypothesis is that the housing crisis seriously damaged the financial positions of school districts across the United States. Another possible scenario is that school districts held financial investments during this time and were faced with meeting established budgets based on overly optimistic revenue forecasts. These hypotheses will be examined further in Chapter 3.

in Table 2, again for the top ten states. Nebraska and Kansas move up the list. However, now the states that are most likely to see a school closure on a per capita basis are overwhelmingly states with lower populations. The lone outlier in Table 2 is the state of Michigan (now 9th) with a population approaching 10 million residents.

Several inferences can be drawn from this cursory analysis. First, regional variation appears to play an important role in shaping school closure outcomes. The Midwestern states account for the majority of states in both Tables 1 and 2, suggesting a strong role played by population loss. Conversely, none of the states from the Northwest are present in either table. Second, high population states tend to have the highest frequencies of school closures. However, the states of Nebraska and Kansas offer important exceptions to this tendency. Third, states with lower populations tend to have higher rates of school closure on a per capita basis. Here, the trend of low population states having higher rates of closure is much stronger, with the striking exception of the state of Michigan.

Table 5.1: Count of School Closures by State, 2001 - 2011

State	Count	2010 Population	Closure per 10,000 pop	Share
Ohio	819	11536504	0.710	7.86%
Michigan	778	9,883,640	0.787	7.47%
California	659	37,253,956	0.177	6.33%
Texas	610	25,145,561	0.243	5.86%
Illinois	443	12,830,632	0.345	4.25%
Nebraska	405	1,826,341	2.218	3.89%
Pennsylvania	388	12,702,379	0.305	3.72%
New York	376	19,378,102	0.194	3.61%
Kansas	351	2,853,118	1.230	3.37%
Massachusetts	317	6,547,629	0.484	3.04%

Source: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "Public Elementary/Secondary School Universe Survey," 1999–2000, Version 1b; 2000–01, Version 1a; 2001–02, Version 1a; 2002–03, Version 1a; 2003–04, Version 1a; 2004–05, Version 1b; 2005–06, Version 1a; 2006–07, Version 1c; 2007–08, Version 1b; 2008–09, Version 1b; 2009–10, Version Provisional 2a; and 2010–11, Version Provisional 2a.

Table 5.2: Rate of School Closures per 10,000 residents by State

State	Count	2010 Population	Closure per 10,000 pop	Share
Nebraska	405	1,826,341	2.218	3.89%
South Dakota	145	814,180	1.781	1.39%
North Dakota	89	672,591	1.323	0.85%
Kansas	351	2,853,118	1.230	3.37%
Wyoming	64	563,626	1.136	0.61%
Maine	136	1,328,361	1.024	1.31%
Washington, D.C.	53	601,723	0.881	0.51%
Iowa	243	3,046,355	0.798	2.33%
Michigan	778	9,883,640	0.787	7.47%
West Virginia	141	1,852,994	0.761	1.35%

Source: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "Public Elementary/Secondary School Universe Survey," 1999–2000, Version 1b; 2000–01, Version 1a; 2001–02, Version 1a; 2002–03, Version 1a; 2003–04, Version 1a; 2004–05, Version 1b; 2005–06, Version 1a; 2006–07, Version 1c; 2007–08, Version 1b; 2008–09, Version 1b; 2009–10, Version Provisional 2a; and 2010–11, Version Provisional 2a.

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The data can be disaggregated further still by economic geography on an urban-rural spectrum. Table 5.3 below highlights the annual geographic distribution of all regular schools from 2007 through 2013.[39] Several trends are apparent. Beginning in 2007, the geographic category with the largest share of regular schools was *Large Suburb* - suburbs with more than 250,000 residents that are separate from a principle city but inside an urbanized area. The second highest share belonged to *Large City* – principal cities with populations in excess of 250,000. The next significant categorical location of regular schools belonged to the *Rural Distant* (between five and 25 miles from an urbanized area[40]) and the *Rural Fringe* (less than or equal to five miles from an urbanized area) categories. In total, the largest cities and suburbs were home to more than 36 percent of all regular schools over the five-year period.

By the 2013-2014 school year, the largest suburbs and cities had accumulated a larger share of regular schools, whereas rural areas were losing their share of regular schools. Table 3 provides context for this analysis. As we would expect, large population centers are home to the largest shares

[39] The 2013-2014 data are preliminary at this time. Hence, this school year will not be included in the econometric analyses in Chapters 6-8.

[40] An urbanized area is an area with a population in excess of 50,000 according to the U.S. Census Bureau.

of regular schools in the U.S. Over time, this trend increases as large population centers gain in share while rural regions lose ground. Overall, these data seem consistent with increasing rates of urbanization.

Table 5.4 illustrates the school closure rate (total school closures as a share of all school closures in that year) within each geographic category. The clearest takeaway is that the *Large City* category has typically seen the highest rate of school closings over the seven-year period. Second, the *Midsize City* category has seen similarly high rates of school closure. Finally, the two worst years for school closure were the 2010-2011 and 2007-2008 academic years respectively.

Table 5.3: Share of Regular Schools by Geographic Category

Geographic Category	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Large City	12.9%	13.2%	13.4%	13.4%	13.4%	14.1%	14.9%
Midsize City	5.5%	5.5%	5.5%	5.6%	5.5%	5.7%	6.0%
Small City	6.8%	6.8%	6.7%	6.6%	6.7%	6.6%	7.0%
Large Suburb	23.7%	23.7%	23.6%	23.6%	23.5%	27.0%	27.7%
Midsize Suburb	3.0%	3.0%	3.0%	3.0%	2.9%	3.3%	3.5%
Small Suburb	2.0%	2.0%	1.9%	2.0%	1.9%	2.1%	2.2%
Town Fringe	4.3%	4.2%	2.0%	2.0%	1.9%	3.0%	3.2%
Town Distant	5.5%	5.4%	6.8%	6.8%	6.5%	5.7%	6.0%
Town Remote	4.2%	4.1%	4.8%	4.7%	4.6%	4.5%	4.8%
Rural Fringe	12.0%	12.8%	13.5%	13.7%	14.2%	10.6%	10.6%
Rural Distant	12.3%	12.4%	12.3%	12.2%	12.0%	11.1%	11.3%
Rural Remote	7.6%	7.6%	7.5%	7.5%	7.3%	6.9%	7.0%

Source: NCES Common Core of Data, Public Elementary/Secondary School Universe Surveys 2007-2014.

Table 5.4: School Closure Rate by Geographic Category

Geographic Category	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Large City	2.6%	1.5%	2.2%	2.0%	2.5%	1.8%	2.3%
Midsize City	2.3%	1.4%	2.2%	1.6%	2.3%	1.8%	1.8%
Small City	1.7%	1.7%	1.8%	1.9%	1.3%	1.4%	1.1%
Large Suburb	1.1%	0.8%	1.1%	1.4%	1.0%	0.9%	0.8%
Midsize Suburb	1.3%	1.1%	1.2%	1.5%	1.2%	1.5%	1.1%
Small Suburb	1.4%	1.2%	1.3%	1.5%	1.5%	0.9%	1.1%
Town Fringe	1.3%	1.1%	1.4%	2.1%	1.1%	0.7%	0.8%
Town Distant	1.6%	1.4%	1.7%	2.2%	1.5%	1.3%	1.2%
Town Remote	1.6%	1.3%	1.4%	2.3%	1.7%	1.3%	1.8%
Rural Fringe	1.2%	0.8%	0.9%	1.2%	1.1%	0.9%	1.0%
Rural Distant	1.5%	1.2%	1.3%	1.7%	1.6%	1.2%	1.4%
Rural Remote	2.4%	1.6%	2.0%	2.3%	1.7%	1.2%	1.4%

Source: NCES Common Core of Data, Public Elementary/Secondary School Universe Surveys 2007-2014.

In summary, the four tables above reinforce the role played by population, population movements, and regional idiosyncrasies in affecting school closure outcomes. Table 5.3 illustrates the role of urbanization on the location and distribution of schools throughout the United States. Tables 5.1 and 5.2 reinforce this trend as school closure counts and rates appear to be heavily skewed toward the Midwest. They also suggest that something unusual is taking place in the states of Nebraska, Kansas, and Michigan. However, the takeaways from Table 5.4 are much less clear. A slightly disproportionate effect is exhibited in both larger and midsize urban areas, but the academic years 2007-2008 and 2010-2011 appear to have been substantively different and worse. On the surface, these data suggest a hollowing out of the urban core as well as the most remote rural regions. However, these data can also be viewed as the net result of an urbanization process simply playing itself out. These apparent empirical findings tend to ring true with conventional wisdom; decisions regarding facility operations appear to be driven by population (i.e. enrollment) figures. Perhaps more than any other, Table 5.4 appears to lend support to those claiming a disproportionate effect felt by those in large inner cities.

5.1 A Story of School District Consolidation

These school closures have taken place in the shadow of a massive consolidation of school districts in the U.S. As previously illustrated in Figure 4.3, the number of school districts in the United States collapsed between 1952 and 1972. Over 50,000 school districts were eliminated in this twenty year period. This massive restructuring represents a continuation of the fundamental driving force in education since Horace Mann's first foray into the development of public schools: economies of scale. By 1977 the job appears to have been done. .

The geographic trend in school district consolidation exhibits regional variation. At first, it seems as though the trends follow reasonable demographic patterns. The states that have gone through the most significant consolidation appear to be primarily rural, Midwestern states. In fact, of the states with the ten highest rates of school district consolidation, only Nevada (8th) is outside of the Midwest. In total, these states eliminated over 92 percent of their total school districts in 1952. However, a less clear pattern emerges in those states that actually added school districts. By far, the Northeastern states of Connecticut, Vermont, Massachusetts, and Maine were the most aggressive in adding districts. The remaining states adding districts included mostly southern states (Louisiana, Tennessee, Alabama, Florida, Mississippi, and South Carolina), with the exceptions of Utah and New Jersey. In total, these states increased the number of their school districts by 70 percent, adding more than 670 new school districts over the sixty year period.

Ironically, this trend toward consolidation in education directly counters the trend in special district formation. The U.S. Census defines a special purpose district, "as separate entities with substantial administrative and fiscal independence from general-purpose local governments."[41] Examples of special districts include transportation authorities, soil and water conservation authorities, park districts, and other similar districts. The definition specifically excludes school districts.

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[41] See https://www.census.gov/govs/go/special_district_governments.html.

Figure 5.2 illustrates the trend in the formation of special service districts in the U.S. over the same period. Clearly, two different processes are at play in the production of special districts and school districts.

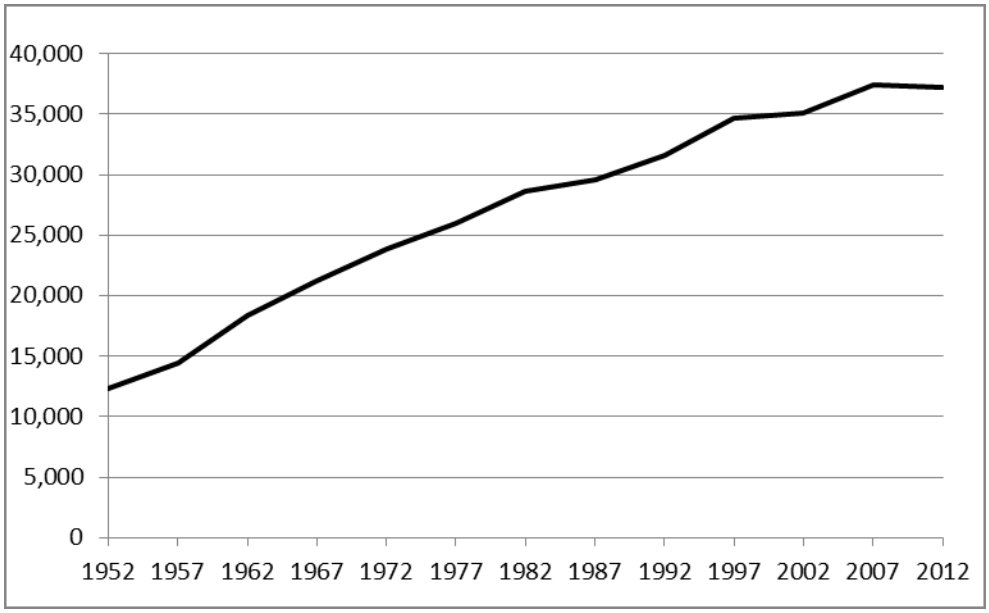

Figure 5.2: Total Special Districts in the U.S.[42]

The processes illustrated in Figure 4.3 and 5.2 appear to support Hooghe and Marks (2003) description of the two theoretical forms of governance. "Type 1 Governance" systems, are typified by a hierarchical system of a limited number of *general purpose* (multi-service, multi-function) entities. These governance structures are *durable* and consequently not easily modified once established. In addition, these organizational structures serve *nonintersecting members*, meaning their service areas are geographically delineated. "Type II Governance" forms are far less structured, usually large in number, operate at multiple scales, and are considered *task-specific jurisdictions*.

This direct comparison of these two distinct governance structures underscores the distinct nature of public education in America. A school district is task-specific, suggesting it could be managed through a Type II structure. In fact, this was largely the form of education in America prior to the

[42] U.S. Census of Governments, 1952-2012

reforms Horace Mann. Ultimately, however, the provision of public education in the U.S. is managed through a Type I governance structure. Direct comparison of Figures 4.3 and 5.2 clearly shows that education-specific districts are separate from other types of special governance districts. The difference rests in the rigid, hierarchical structure of the system of education in the U.S. Education in the United States is delivered primarily through a Type I governance structure. It is organized hierarchically with constitutional rules being determined by the federal Department of Education.

The determination of education as a Type I structure is an important piece to the story on two accounts. First, it suggests that decision-making is more centrally located within the overall structure, potentially insulating decision-makers from various interest groups. Centralization, coupled with the insulation provided by a strict bureaucratic structure, reinforces the institutional power of the Superintendent and education officials at the state and federal levels to implement drastic change. Second, Type I governance structures are shaped and reshaped hierarchically from the top (U.S. Department of Education) down. As a consequence, officials at higher levels of the governance structure are increasingly insulated, but the interests of these officials and their organizations are increasingly sensitive to global forces of capital accumulation. It follows then, that reform-minded education activists at higher levels of the education structure are likely to make attempts at aligning their reforms with global capital.

5.2 An Ontological and Epistemological Examination

Examining these data through the ontological framework developed in in Chapter 2 reveals the roles played by global and local forces of capital accumulation that shape socio-spatial formations. This philosophical foundation states there are real global and local forces affecting socio-spatial formations. These forces are primarily driven by and reacting to the *class process* of producing, accumulating, and distributing the social surplus. Over the past four decades, the global economy has undergone a remarkable transformation. Global capital has driven massive restructuring of economies, particularly with respect to the manufacturing sectors in the United States. The so-called

"rustbelt" consisting of the Midwest and Northeastern states illustrates the spatial and socio-economic results of this transformation. The new form of capital takes its spatial form in "global cities," according to Saskia Sassen (2000). These cities become the places where the now globally produced social surplus is accumulated and subsequently distributed.

Table 5.5 below illustrates the strength of global cities based on the A.T. Kearney Global Cities Index. The index is a weighted average of five criteria: business activity, human capital, information exchange, cultural experience, and political engagement. The Brookings Institute tracks the role of

Table 5.5: Top Global Cities in 2014

City	2014	2012	2010	2008
New York	1	1	1	1
London	2	2	2	2
Paris	3	3	4	3
Tokyo	4	4	3	4
Hong Kong	5	5	5	5
Los Angeles	6	6	7	6
Chicago	7	7	6	8
Beijing	8	14	15	12
Singapore	9	11	8	7
Washington, D.C.	10	10	13	11

Notes: This ranking is the A.T. Kearney Global Cities Index released by www.atkearney.com.
Source: http://www.citylab.com/work/2015/03/sorry-london-new-york-is-the-worlds-most-economically-powerful-city/386315/

the largest metros across the globe. According to their 2014 report, even though approximately one-fifth of the global population resides in the 300 largest metropolitan regions of the world, they "accounted for nearly half of global output in 2014" (Parilla et al., 2014).

Urban Planner Richard Florida illustrates this global transformation of capital in a well-known Atlantic Magazine article entitled, "The World is Spiky: Globalization has changed the economic playing field, but it hasn't leveled it." Here Florida argues that economic activity is increasingly concentrated in just a few global urban centers. He writes (2005: 48), "In terms of both sheer economic horsepower and cutting-edge innovation, surprisingly few regions truly matter in today's global economy." Utilizing a number of metrics including population, light emissions, patents, and

scientific citations, Florida and his research team illustrate the incredible concentration of economic and intellectual activity that typifies the now dominant form of capital accumulation.

On the other hand, New York Times columnist Thomas Friedman argues that "The World is Flat." Friedman argues that globalization has flattened the barriers to entry making the world a far more competitive place. But, this flattening process has also expanded the reach of multi-national firms, which through advertising and expansion into emerging markets reshape unique local spaces into something much more mundane. Friedman references the remarkable similarities between individuals he met and observed in India to those in the U.S., going so far as to write, "I had actually found India and thought many of the people I met there were Americans. Some had actually taken American names, and others were doing great imitations of American accents at call centers and American business techniques at software labs" (Friedman, 2007: 5). This social and cultural flattening, he argues, is the result of the expansion of competition. Friedman (2007:8) writes, "It is now possible for more people than ever to collaborate and compete in real time with more other people on more different kinds of work from more different corners of the planet and on a more equal footing than at any previous time in the history of the world…." But, he quite optimistically connects this flattening with the spikiness argued by Sassen and Florida when he writes,

> But I was also excited personally, because what the flattening of the world means is that we are now connecting all the knowledge centers on the planet together in a single global network, which – if politics and terrorism do not get in the way – could usher in an amazing era of prosperity, innovation, and collaboration, by companies, communities, and individuals" (Friedman, 2007: 8).

Friedman was not and is not wrong in his depiction of the global economy. But Florida and Sassen are also correct. Combined, these three authors – and the many researchers that follow their paths – have illustrated the newly emerged global process of surplus production, accumulation, and distribution.

The class process in this increasingly global and increasingly urban form of capital is geographically uneven. Great amounts of wealth are accumulating in increasingly fewer and fewer

global centers like New York, London, Shanghai, and Tokyo. The social surplus accumulating in these spiky spaces is being produced in a flat world. In a flat world, where labor is everywhere and always accessible at low wages, workers compete against one another. In locales where workers organize and fight for greater access to the social surplus, larger multi-national firms can simply close the doors and move to more desperate and less organized spaces. Only large firms with great mobility can dispense with labor demands in this way. As a result, they are far more effective at generating larger shares of the social surplus. These firms also become monopsonists and can force local, less mobile firms, to compete for their business in a flat world. Accumulation is monopolistic; production is competitive; the world is spiky for the owners of capital but quite flat for all the rest.

Education is a tool to maintain organization within a society. It is a mechanism to transmit cultural preferences, knowledge, skills, and desired traits. Throughout its history, education has been a remarkably local process. However, the data above when stacked alongside the narrative of the changing nature of global capital suggest the development of a global system of education that can replicate the desired social relations to production of the global elite. Threads of this narrative can be seen in federal education policy in the United States. As will be discussed in more detail in subsequent chapters, the national education system has developed in the United States through fits and starts of federal organization, intervention, and re-organization of education policy. At each step in the process, the federal government has taken on an increasing role in determining appropriate educational outcomes. In doing so, it has increasingly erected structures that signify success in accordance with capital, legitimize specific forms of capital, and reinforce the dominant class positions of those with the greatest influence.

As the dominant form of capital accumulation takes on a more global process – wherein cites become machines for the extraction of surplus from producing regions to accumulating regions – national education policy appears to be changing in ways that support surplus generation in a flat production world. Federal policy, particularly under the stewardship of Education Secretary Arne Duncan, has pushed for the closing of poorly performing schools (those out of line with established

standards that support desired forms of capital), financially distressed school districts (those already burdened by access to the social surplus), and schools with lower enrollments to "turn them around." In their place, new charter schools emerge and students from closed schools are sent to higher performing schools. This imposes a benefit to those who are mobile and can acclimate to the climate of their new school. In addition to pushing for the closure of schools, federal and increasingly state policies are targeting "distance-learning" tools of on-line courses. This not only reduces costs for districts to hire teachers, it further introduces the student to communicating and competing in a flat world. These new structures are being erected through ideological narratives of efficiency, choice, and individual creativity. Yet, these very structures contain elements of signification, legitimation, and domination that, at present, are acting to hinder liberation for many within the American education system.

5.3 The Geography of School Closure: A Summary

The forces of global capital have dramatically altered the social and spatial organization of the United States since the late 1970s and early 1980s. Since the passage of the No Child Left Behind (NCLB) Act in 2001, the geographic landscape of school closure in the U.S. has illustrated a hollowing out of regular public schools in large and mid-sized urban centers, particularly in the Midwest and the Northeast, the so-called "rustbelt."[43] These regions have been some of the hardest hit in terms of the global restructuring of manufacturing from the United States to nations abroad. Increasingly, large cities and mid-sized suburbs are home to the nation's regular public schools. However, most of the nation's school closings are taking place within larger cities and in rural communities losing population. This suggests that as the urbanization process unfolds, political decisions are being made within large urban areas to re-distribute the real resource of public education from some neighborhoods to other neighborhoods.

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[43] The Every Student Succeeds Act (ESSA) was officially signed on December 10, 2015. This project will not address changes made in that bill. The period in question here is specific to the NCLB regime. Future work will seek to examine the ESSA and explore its potential impacts.

CHAPTER 6

AN ANALYSIS OF THE FACTORS CORRELATED WITH SCHOOL CLOSURE

This chapter evaluates the hypotheses generated by the application of Institutional Analysis and Design (IAD) framework. These hypotheses represent a number of different "pathways" to school closure in the United States. Each potential pathway is the result of multiple social structures that interact at the global and local levels. This chapter sets out to address three questions. First, are there differences between schools that are closed and those that are operating? Second, what are the factors most commonly associated with the closure of a regular public school? Finally, how important are school district factors compared to school-specific factors in deciding whether a school will close? The next section introduces the primary dataset for this project, including the data source. That is followed by a discussion regarding the characteristics of the primary data. The chapter then proceeds to address each question in order.

6.1 The Data

The data for this project come from the National Center for Education Statistics (NCES) - Common Core of Data files. The data are a compilation from five separate annual surveys administered by NCES[44]:

1. Public School Universe Survey
2. Local Education Agency (School District) Survey
3. State Aggregate Non-fiscal Data
4. State Aggregate Fiscal Data
5. School District Fiscal Data

The dataset used in this project combines information from the first, second, and fifth surveys above into a single six-year unbalanced panel from the 2007-2012 academic years. The panel contains over 500,000 individual school observations across the six-year period, each one being nested within a school district that itself is nested within a state. All data post 2001 are geo-referenced with global positioning system (GPS) coordinates.

[44] More information is available at www.nces.ed.gov/ccd/aboutCCD.asp

Table 6.1 provides the descriptions of the variables used in the analysis and its definition. The variables are organized according to the elements of the IAD framework, but the variables are also separated by school-specific factors and district-level variables. The majority of the hypotheses related to community attributes are school-specific factors. However, four school-specific explanatory factors address the biophysical world (specifically the urban form hypothesis) and rules-in-use. In contrast, district-level variables are dominated by hypotheses regarding rules-in-use. In large part, these factors are evaluating the structures in place at the school district and supra-district levels that are impacting district finances. However, three variables are included to account for the biophysical world. These factors attempt to account for the degree of competition between school districts as well as the health of the local economy.

Table 6.2 provides the descriptive statistics for each variable used in the analysis. Two points bear mentioning. First, there are large outliers in the revenue and expenditure variables. However, there is no systematic reason for this and consequently, no systematic method for culling them out. Relying on rules of thumb to eliminate districts of more than four standard deviations away suggests throwing out good information. I choose not to do this. The data set is restricted to observations from school districts with at least 30 students.[45] Second, this dataset is large but there are two sources of substantial information loss: the share of the school population that qualifies for free and reduced lunch and whether the school is
a charter school or not. Combined, these two factors force the model to drop more than 72,000 observations.

[45] Robinson (2004) utilizes a minimum threshold of 1,000 students. Although that would address the outlier problem, too many observations would be eliminated that are actually consistent with the rest overall dataset. I chose a threshold that dealt with the majority of extreme outliers that was as small as possible. In addition, when individual observations were identified that were still extreme outliers for specific variables, they were removed. This occurred for less than ten observations.

Table 6.1: Variable Descriptions

Variable	Definition	IAD Element
School Variables		
Hirschman Herfindhal Index (HHI)	The HHI measures the racial / ethnic concentration within each school building. It creates an index ranging from 10,000 to 0, where 10,000 is absolute homogeneity.	**Community**
Black	% of the school population that is Black.	**Community**
Hispanic	% of the school population that is Hispanic	**Community**
Free	% of the school population eligible for free and reduced lunch.	**Community**
City	Principle city with a population > 50,000	**Community**
Suburb	Population > 50,000 but outside of principle city	**Community**
Town	A residential community at least 10 miles from an urbanized area.	**Community**
Middle School	Binary variable = 1 if school serves primarily grades 6-8. Zero if otherwise	**Community**
High School	Binary variable = 1 if school serves primarily grades 9 – 12. Zero if otherwise.	**Community**
Mercantile Cities	City classified by Watkins as having matured by 1870.	**Biophysical**
Industrial Cities	City classified by Watkins as having matured by between 1880 and 1930.	**Biophysical**
Enrollment	The log of student enrollment per school building.	**Rules in Use**
Charter School	Binary variable = 1 if the school is a Charter school.	**Rules in Use**
Higher-level Variables		
Republican	Binary variable = 1 if state voted for Mitt Romney in the 2012 Presidential election	**Community**
Polycentric Competition	School districts per 1,000 pupils by ZIP code	**Biophysical**
Local	Share of district revenue from local sources	**Biophysical**
Local per pupil	Local revenue collected by the district divided by total students within the district.	**Biophysical**
Open Enrollment	Binary variable = 1 if the state requires school districts to participate in inter-district open enrollment.[46]	**Rules in Use**
Bureaucracy	Share of total district expenses on salaries and benefits of general administration.	**Rules in Use**
District Schools	Count of district schools per 1,000 students	**Rules in Use**
Student to teacher ratio (District)	The number of students per teachers district wide.	**Rules in Use**
ExpRev	The percentage of district total expenditures to total revenues.	**Rules in Use**
Debt service per pupil	Debt interest payments per pupil	**Rules in Use**
Title 1	Title 1 funds per pupil	**Rules in Use**
Federal	Share of district revenue from federal sources	**Rules in Use**
Federal per pupil	Federal dollars per pupil	**Rules in Use**
Teacher salaries per pupil	Teacher salaries per pupil	**Rules in Use**
Student transportation costs per pupil	Student transportation costs per pupil (includes salaries, benefits, and capital outlays).	**Rules in Use**
Building maintenance costs per pupil	Per pupil costs of building maintenance and repair by district	**Rules in Use**

[46] Data come from State Education Reforms (SER) division of NCES at https://nces.ed.gov/programs/statereform/tab4_2.asp.

Table 6.2 provides some stylized facts regarding community characteristics of American schools. On average, schools are quite diverse. The average school population is approximately 16 percent African American and 19 percent Hispanic. Somewhat surprisingly, on average, nearly half of all students are eligible for free and reduced lunch. Nearly two-thirds of all schools are located in cities and suburbs of urbanized areas, but this means approximately 30 percent of all the schools in the dataset are rural (or at least 10 miles away from any urbanized area).

The table also highlights the biophysical characteristics of schools in the U.S. The typical school is responsible for over 500 students each day. In addition, the average school district also faces a reasonably high degree of competition. For every 10,000 students within a U.S. postal ZIP code, there are approximately 64 school districts. The ideology of choice has made some headway in collective-choice decisions at the state level. Though only 5.3 percent of all schools in the panel are charter schools, nearly 60 percent of all schools are located in states that require mandatory participation for inter-district open enrollment. Finally, the typical school district relies on local funds for more than 40 percent of its total revenues.

The rules-in-use for the average school in the U.S. indicate that almost all schools spend more than they bring in through revenues. In fact, the typical school spends more than 100 percent more in total expenses than it brings in through revenues. However, a substantial portion of that is paid for by debt issuance. The typical school district also carries approximately $30 million in debt. Therefore, the typical level of debt service (interest on the debt) is almost $1.3 million per year, which accounts for nearly 2 percent of total revenue for the median school district. Table 6.2 also illustrates the small share of funding that stems directly from federal sources (recall much of state education funding is merely federal pass through dollars). This is consistent with the view that federal resources have been increasingly reduced. Finally, we see that by far the largest expense for school districts (out of the three included here to test the Lerman hypotheses) is teacher salaries.

Table 6.2: Descriptive Statistics

Variable	N	Mean (Open)	St. Dev	Min	Max
Hirschman Herfindhal Index (HHI)	511,507	6500.046	2177.53	0	10,000
Black	511,505	15.18	24.35	0	100
Hispanic	511,505	18.71	25.37	0	100
Free	498,220	48.92	27.10	0	99.91
City	517,309	.242	.428	0	1
Suburb	517,309	.291	.454	0	1
Town	517,309	.139	.346	0	1
Middle School	517,309	.186	.389	0	1
High School	517,309	.179	.384	0	1
Mercantile Cities	92,251	.072	.258	0	1
Industrial Cities	92,251	.205	.4040	0	1
Sunbelt Cities	92,251	.723	.447	0	1
Enrollment	511,617	550.84	436.62	1	12,944
Charter School	464,322	.052	.223	0	1
Open	511,415	.588	.492	0	1
Republican	511,415	.360	.480	0	1
Polycentric Competition	515,378	.666	1.933	.0005	80.925
Local (%)	517,295	42.33	19.68	0	100
Local_pp	516,985	5354.95	4405.16	0	499,355.6
Bureaucracy (%)	517,309	1.268	1.376	0	68.10
Schools per 1,000 students	516,985	16.21	21.43	.4635	600
Student to teacher ratio	510,591	15.97	13.29	.2813	2586.34
Expenditure to Revenue (%)	517,295	101.34	59.87	.0336	18538.89
Debt service per pupil	516,985	315.50	316.08	0	14057.14
Title 1 revenue per pupil	516,985	287.38	350.74	0	46013.33
Federal (%)	517,295	10.22	6.450	0	100
Federal_pp	516,985	1223.08	1430.05	0	190463
Teacher Salaries per pupil	516,985	2252.90	1443.07	0	55473.68
Student transportation per pupil	516,985	683.82	1033.17	0	345247.1
Building maintenance per pupil	516,985	1505.04	704.11	0	38075

Notes: The HHI is calculated by taking the share of the school's enrollment attributable to each of the six racial categories multiplied by 100. Each of these shares is squared and then are collectively summed. This provides an index of diversity for each specific school. The larger the index score, the more homogenous the school and vice versa.

With a basic understanding of the typical school and school district in this data set in hand, I now explore the differences between those schools that close and those that stay open. To assess their statistical difference, I conduct a difference of means test.

6.2 How are Closed Schools Different?

Table 6.3 explores the statistically significant differences between schools that close and those that stay open in a given school year. The differences are stark. The final column of Table 6.3 provides the statistical difference of means for the two groups.

Table 6.3 allows for an initial examination of four hypotheses outlined in Chapter 3. In fact, the evidence at present is supportive of each of the four. First, the table strongly indicates that school closure is a racial process. Schools that close are disproportionately African American; they have nearly twice the concentration of students of color than schools that remained open. Schools that close have lower HHI scores, indicating they are relatively more diverse than the schools remaining open; however, these same schools have a lower share, on average, of Hispanic students than schools remaining open. These three factors reinforce the notion that school closure occurs disproportionately on racial grounds.[47]

School closure is also a class-based process. On average, schools that close in a given year provide free and reduced lunch to more than 60 percent of their students. Operating schools provide this same service to 49 percent of their student body. Although this need is prevalent in both groups, closed schools provide this critical service to approximately 11 percent more of their student body than operating schools do. In addition to the direct impact on low-income students, school closure is also associated with a larger funding burden at the local level. Though the share of district income at the local level is slightly smaller for closed schools, these same schools are located in districts that spent over 15 percent more per pupil than schools remaining in operation. Hence, the financial burden appears to have fallen again on low-income communities of color.

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[47] As noted previously in footnote 14, these variables are likely to be highly collinear, particularly for schools located inside principal cities. I estimated the Pierson correlation coefficients in STATA 14 of the four variables HHI, Black, Hispanic, and Free for all schools located within principal cities. The share of enrollment of black students is negatively correlated with the share of the school's population that is Hispanic ($\rho = -0.47$). The share of enrollment per school that is black is also correlated with the share of the school's population that is eligible for free and reduced lunch ($\rho = 0.41$); however, the share of enrollment for Hispanic students has a weaker association with free and reduced lunch ($\rho = 0.26$).

Finally, school choice policies appear to be strongly correlated to school closure. Charter schools are particularly surprising. Charter schools make up only 5.2 percent of all operating schools in the data set. Yet remarkably, charter schools account for more than 12 percent of all school closures in the panel. In addition, mandatory inter-district open enrollment policies also appear to play a role inducing school closure, though certainly the magnitude of difference is small compared to that of charter schools. This conjecture is brought into question by the relationships between school closure and Republican leaning states.

Table 6.3: Difference between Closed and Open Schools

Variable	Mean (Closed)	Mean (Open)	Difference (Closed – Open)	Walsh t-statistic+
Hirschman Herfindhal Index (HHI)	6,497.16	6,717.47	-220.31	-8.04*
Black	28.12	15.03	13.10	28.44*
Hispanic	15.70	18.75	- 3.05	-9.91*
Free	60.30	48.79	11.51	31.08*
City	.334	.241	.093	16.21*
Suburb	.2153	.2925	-.0771	-15.43*
Town	.1460	.1386	.007	1.73*
Middle School	.1797	.1856	-.0058	1.25
High School	.1126	.1803	-.0676	-17.55*
Mercantile Cities	.1117	.0705	.0412	6.4597*
Industrial Cities	.3617	.2017	.1600	16.02*
Enrollment	260.51	554.29	- 293.78	-99.98*
Charter School	.1285	.0513	.077	18.34*
Open	.6194	.5871	.0323	5.47*
Republican	.2985	.3605	-.0620	-11.12*
Polycentric Competition	.7455	.6647	.0808	3.36*
Local (%)	39.45	42.36	-2.911	-12.82*
Local_pp	6162.66	5344.12	818.54	6.59*
Bureaucracy (%)	1.38	1.26	.123	5.39*
Student to school ratio	492.40	559.22	-66.82	-20.13*
Student to teacher ratio	15.95	15.96	-.0103	0.02
Expenditure to Revenue (%)	102.30	101.32	.9803	4.47*
Debt service per pupil	321.46	315.42	6.043	1.46
Title 1 revenue per pupil	412.90	285.69	127.20	22.91*
Federal (%)	11.66	10.20	1.46	17.23*
Federal_pp	1901.65	1213.99	687.66	13.02*
Teacher Salaries per pupil	2348.05	2251.61	96.44	5.32*
Student transportation per pupil	834.70	681.79	152.90	5.97*
Building maintenance	1710.59	1502.28	208.31	15.29*

Note: +All t-statistics are derived in STATA 13 using Welch's difference of means tests. Hence, the statistical significance of the differences is more conservatively estimated than if equal variances had been assumed. These are averages over the entire panel of schools that close. Once the school closes, the observation is removed from the analysis.

Typically, the school choice agenda is associated with the conservative political point of view. However, less than one-third of schools closed between 2007 and 2012 were located in states that

voted for Mitt Romney in 2012; this means that over 60 percent of all school closures have happened in so-called politically progressive states. Somewhat surprisingly, the degree of competition among school districts is not statistically different between schools that closed and schools remaining in operation.

These findings add support to the hypothesis that school closure disproportionately affects low-income minorities. However, Table 6.3 also provides strong support for the Lerman hypothesis for two clear reasons. First, there are dramatic differences in average enrollments. Schools that were closed, on average, were responsible for nearly 300 fewer students each day. Second, all of the expenditure variables indicate that the schools that closed spent a sizeable amount more on salaries, transportation, and building maintenance in particular. Taken together, these factors suggest that districts are rational agents acting to make the most cost effective decision possible. The efficiency variable to assess district-wide capacity supports this claim. Schools that closed had over 40 percent more school buildings than districts that closed. The counter argument to Lerman's rationality basis is bounded rationality and the factors associated with bureaucratic school districts. Here, the results seem to run against Robinson's findings that relatively more bureaucratic agencies are less prone to punctuated decision-making. Instead, this analysis finds that schools were more likely to be closed by districts that spent more dollars on central administration.

The third explanation of school closure revolves around the geographic location of schools. The results, again, largely support this narrative. School closure disproportionately impacts cities. Though cities make up nearly one quarter of all operating schools in the panel, they constitute over one-third of all closed schools. The opposite is true for suburban schools. Though they make up almost 30 percent of all operating schools, they account for fewer than 22 percent of all schools that have closed. Rural schools faired similarly (though they are not included in the table). Schools that closed were slightly less likely to be located in rural settings relative to schools that remained open.

Finally, Table 6.3 provides the first examination of the urban form/capital accumulation theory of school closure. This argument suggests that cities are shaped and reshaped by the dominant forms of

capital. Watkins (1981) classified the oldest cities in American into Mercantile cities, Industrial cities, and Sunbelt cities based on when these cities matured. I have reconstructed the Watkins dataset and applied it here. The results indicate substantive differences between schools closing in these communities and the schools remaining open. The oldest cities in the country, Mercantile cities, are home to less than seven percent of all operating schools. Yet, more than 12 percent of the schools that closed nationally where located in these socio-spatial formations. The same proportion holds for Industrial cities. They are home to more than 16 percent of operational schools but were home to 32 percent of all schools closed in the U.S. during this same time frame.

This analysis has shown several important differences between the schools that were closed between 2007 and 2012 and those that remained operational. In particular, the results are supportive of existing and new theories of school closure. However, these results must be interpreted with care. These difference of means tests do not control for other factors that may influence school closure, such as changes in enrollment. Therefore, the next step in uncovering the multiple pathways to school closure is to assess the association of these variables to school closure holding all other variables in the model constant. This will be accomplished by econometrically estimating the factors identified by the IAD framework in Chapter 4. The next section introduces the model. Then the model is estimated and the results are discussed in brief.

6.3 A Multi-level Analysis: The Model

It is possible to account for school district- and school - level factors in the analysis with multi-level modeling (MLM) techniques.[48] A multi-level model attempts to evaluate factors both at the individual and the group(s) level. In particular, most geo-referenced data exist within a hierarchical structure, (e.g. schools are located inside of counties). Failure to account for this structure ignores potentially important information for model estimation. Worse still, it fails to account for the likely

[48] For an excellent introduction/overview of the MLM approach, see Gelman and Hill (2007). For an application to education related to student achievement see Borman and Dowling (2010) or Raudenbusch and Bryk (1986).

interdependence of errors within hierarchical groupings. Specifically, the assumption of identical and independent (iid) error terms is violated. Failure to account for this violation generates standard errors that are too small (Finch et al, 2014). As a result, the probability of committing Type I error is underestimated leading to potentially erroneous conclusions about correlation. MLM techniques provide methods to address this problem.

The basic multilevel model is a variant of the linear regression model.

$$y_i = \beta_0 + \beta_1 X_i + \varepsilon_i \qquad [6.1]$$

Equation 6.1 is the basic linear regression model where a dependent variable (y) is measured for each individual (i). The model attempts to explain the behavior of y_i with a number of right-hand side explanatory variables (that are also specific to each individual). The multilevel model extends this framework by permitting the data to be nested. Equations 6.2 and 6.3 below illustrate the structure of the multilevel random intercept model.

$$y_{ij} = \beta_{0j} + \beta_{j1} X_{ij} + \varepsilon_{ij} \qquad [6.2]$$

$$\beta_{0j} = \gamma_{00} + v_{0j} \qquad [6.3]$$

Equation two makes clear that the dependent variable, y, for the ith individual is nested within the jth group. The model explains the nested dependent variable with a random intercept term, β_{0j}, and a vector of explanatory factors, X_{ij}. Equation 6.3 breaks down the random intercept component of the model. Here the random intercept is a function of the overall group mean, γ_{00}, and the jth group-specific deviation from that group mean, v_{0j}. The group-specific deviation is assumed to be a well-behaved residual with a mean of zero. The two equations are combined to illustrate the full model.

$$y_{ij} = \gamma_{00} + \beta_{j1} X_{ij} + v_{0j} + \varepsilon_{ij} \qquad [6.4]$$

This model will allow me to answer the final hypothesis developed within the IAD framework: Is it possible to account for idiosyncrasies of school districts? Equation 6.4 consists of the overall group mean (γ_{00}) along with the various covariates used (X) to explain the dependent variable. The nuance to the multilevel framework comes in the differentiation of the residual into an individual-level

residual and a group-level residual. However, equation 6.4 is specific to a linear multilevel model, but the dependent variable for this analysis has a Bernouli distribution. Consequently, we must modify the linear model to account for a multilevel logistic model. Equation 6.5 rewrites the combined model as a logit model and equation 6.7 illustrates how the model is interpreted.[49]

$$\log[\frac{p_{ij}}{1-p_{ij}}] = \gamma_{00} + \beta_{j1}X + v_{0j} + \varepsilon_{ij} \qquad [5]$$

$$e^{\log[\frac{p_{ij}}{1-p_{ij}}]} = e^{(\gamma_{00}+\beta_{j1}X+v_{0j}+\varepsilon_{ij})} \qquad [6]$$

$$\frac{p_{ij}}{1-p_{ij}} = e^{(\gamma_{00}+\beta_{j1}X+v_{0j}+\varepsilon_{ij})} \qquad [7]$$

Equation 6.7 specifies the relationship between the right-hand side variables and their ultimate impact on the odds of school closure.

The multilevel, or hierarchical, model allows me to address the idiosyncratic nature of individual school districts through the group-level portion of the variance via the Interclass Correlation Coefficient (ICC). The ICC estimates what portion of the total variation in the residual is attributable to group membership, i.e. specific to school districts.[50] For example, an ICC of 0.75 would suggest that the outcome is highly affected by group membership. Conversely, a low ICC of 0.05 would suggest that group membership is less relevant in explaining the dependent variable. The ICC can also be considered as a test of how well the model explains the process generating the dependent variable within its nested data structure. Higher ICC scores suggest that the model does not account for information from the group level. Consequently, group-specific variation is larger. However, as the model fit improves from the inclusion of previously omitted group-level covariates, the ICC score should fall.

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[49] This derivation is available in multiple sources. However, a straightforward exposition is available at http://www.ats.ucla.edu/stat/stata/faq/oratio.htm.

[50] The ICC statistic is $\rho_I = \frac{\tau^2}{\tau^2+\sigma^2}$, where τ is the total variation across all group members and σ is the total variation within groups.

6.4 A Multi-level Analysis: The Results

Table 6.4 presents the results of estimating equation 6.7 with the variables outlined in Table 6.1. The model was estimated in STATA 14 using the multilevel logistic function "melogit". All results are presented in odds ratios and are interpreted as impacts to the overall odds[51] of school closure. Coefficient values above one indicate a positive relationship with the odds of school closure. Coefficient values below one indicate a negative relationship with the odds of school closure.

The analysis utilized over 500,000 individual school observations across more than 13,000 districts over the six-years between the 2007 and 2012 academic years. The dependent variable is a dichotomous variable set equal to one if the school was closed in that school year and zero if it remained operational. The panel is unbalanced. Schools that close are no longer included in the analysis during subsequent years.

Table 6.4 provides the results of five hierarchical models. Model (1) provides the baseline analysis, often referred to as an "empty model." It estimates the dependent variable as a random intercept model without any explanatory factors. Its purpose is to evaluate the strength of the hierarchical nature of the data. Model (2) directly assesses the hypothesis that school closure is driven by race and class. Model (3) addresses the geographic explanation of school closure. It evaluates whether the geographic location along a spectrum of urbanization has any effect on the probability a given school will close. In addition, the model accounts for underlying trends in the frequency of school closure by incorporating time trend variables for five of the six years of the dataset. Model (4) incorporates the Lerman cost factors and several variables designed to assess the impact of several rules-in-use at varying levels of the hierarchy of public education. Finally, model (5) incorporates the urban classification system outlined in Chapter 3. It attempts to explore the role that urban form may have in shaping the allocation of schools.

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[51] The odds of closing are determined by taking the ratio of the probability a school will close divided by the probability it will not close based upon changes at the mean of each explanatory variable.

Model (1) asks whether a hierarchical model is necessary. By estimating the random intercept model without any explanatory factors, the Interclass Correlation Coefficient (ICC) can be used to estimate the extent of variation within school districts. The ICC is listed at the bottom of Table 6.4 and it indicates that given the structure of the data, over 36 percent of the residual is attributable to at the school district level. Snijders (2012) suggests a common ICC in social science research ranges from 5-25 percent. Therefore, the ICC suggests there is significant variation at the school district level in predicting whether a school might close.

Model (2) adds a series of school-level factors to the random intercept model. This model is primarily testing the hypothesis that school closure is an outcome that falls disproportionately on communities of color and relatively poorer neighborhoods. The results offer some support for this view. Schools with student populations that are increasingly homogenous, black, and poor have significantly higher odds of closing. School enrollments appear to be critical decision-making variables. For a school with average enrollment, a one percent increase (over the mean) in the school student population will decrease the log odds of school closure by nearly 70 percent. Finally, and perhaps surprisingly, charter schools have much higher odds of closing than non-charter schools. These results confirm the analysis in Table 6.3.

The school-level factors are relatively unchanged in Model (3). However, the geographic factors include in the analysis raise doubts about the research narrative focused on the inner-city nature of school closure. Relative to rural locations, the odds of a school in a principal city closing are less than the odds of a suburban school closing and only slightly higher than the odds of school located in a town. However, there is an absolutely higher risk of school closure associated with schools in or nearby urbanized areas. On average, a school located in an urbanized area (a population great than 50,000) is 50 percent more likely to close than a rural school. Though school closure is not necessarily a big city problem, it is quite clearly a predominantly urban process.

Model (3) also includes dummy variables for five of the six years in the panel, holding 2007 as the baseline for comparison. Overall, the time trends appear to be closely tied to the Great Recession. An average school in 2010 was over 60 percent more likely to close than it would have been in 2007.

Table 6.4: Factors affecting school closure in the U.S. (2007-2012)

Variables	(1)	(2)	(3)	(4)	(5)
Intercept	.0061* (0.0002)	.8137 (.093)	.5669* (.069)	1.232 (.223)	.3789* (.183)
HHI		1.000* (.000)	1.000* (.000)	1.000* (.000)	.9999 (.000)
Black		1.014* (.001)	1.012* (.001)	1.012* (.001)	1.016* (.002)
Hispanic		1.000 (.001)	.9986 (.001)	.9973* (.001)	1.005* (.002)
Free		1.014* (.001)	1.014* (.001)	1.018* (.001)	1.016* (.002)
Enrollment		.3315* (.006)	.3161* (.006)	.2626* (.006)	.2885* (.012)
Charter School		1.207* (.072)	1.176* (.073)	1.305* (.091)	1.172 (.135)
City			1.492* (.106)	1.239* (.095)	.7196 (.153)
Suburb			1.681* (.102)	1.274* (.085)	.8413 (.201)
Town			1.450* (.086)	1.344* (.085)	-
Middle School			1.433* (.056)	1.522* (.062)	1.758* (.150)
High School			.7307* (.037)	.7541* (.041)	1.654* (.153)
Open				1.079 (.063)	1.636* (.282)
Republican				.6794* (.044)	1.133 (.206)
Polycentric				.9413* (.012)	.8477 (.091)
Local (%)				.9974 (.002)	1.012 (.006)
Local_pp				.9999 (.000)	.9999 (.000)
Bureaucracy (%)				.9374* (.014)	.9785 (.023)
Students / Schools (District)				1.001* (.000)	.9997 (.000)
Student / Teacher				1.001 (.000)	1.008 (.005)
Expenditures / Revenue (%)				1.000 (.000)	1.002 (.001)
DebtServe_pp				1.000* (.000)	.9999 (.000)
Title1_pp				1.000* (.000)	.9999 (.000)
Federal (%)				.9789* (.005)	.9937 (.010)
Federal_pp				1.000 (.000)	1.0001* (.000)
TeacherSalary_pp				1.000* (.000)	1.0001* (.000)
StTrans_pp				1.000 (.000)	1.0003 (.000)
BldgMaint_pp				.9999 (.000)	1.0001 (.000)
Mercantile Cities					1.606 (.419)
Industrial Cities					1.887* (.366)
2008			1.480* (.079)	1.483* (.081)	1.487* (.172)
2009			1.543* (.083)	1.629* (.090)	1.248 (.151)
2010			1.626* (.088)	1.835* (.108)	1.875* (.230)
2011			1.284* (.073)	1.475* (.092)	1.642* (.217)
2012			1.406* (.079)	1.420* (.087)	1.740* (.225)
N	518,253	442,350	442,350	424,551	77,567
J (Groups)	15,773	13,713	13,713	12,952	1,299
Wald (chi^2)	.	4721.94	4,454	5074.33	1386.96
LR Test	3799.32*	2632.27	2483.77	2529.61	322.34
Variance (District)	1.902 (.082)	2.173 (.104)	2.118 (.102)	2.281 (.112)	1.515 (.240)
ICC	.3663	.3982	.3917	.4095	.3153

Notes: All coefficients are reported in odds ratios. Statistical significance is indicated by "*", which indicates an acceptable level of Type I risk equal to 5%.
+ was omitted by model

The time trend effects all indicate a substantially higher risk of closure relative to the 2007 school year. In fact, on average the odds of a typical school closing in the United States in the five years following 2007 were 47 percent higher. Further analysis will be necessary to fully understand the structures at work behind this outcome.

Model (4) addresses efficiency concerns, particularly through a number of factors related to the Lerman model of school closure. The first takeaway is that the school-level factor odds ratios are consistently of the same sign and relative magnitude. At the mean, a one percent increase in the school population that is black consistently increases the odds of that school closing by 1.2 – 1.4 percent. A similar story is true regarding poverty. As the share of a school's student body that is eligible for free and reduced lunch rises, the odds of that school closing also increase by 1.4 – 1.8 percent. However, the importance of enrollment and the school's status as a charter school are even more important. In fact, the odds of a charter school closing nearly doubled after controlling for a large number of district-level factors.

Analysis of the geography hypothesis also becomes more difficult. There is still a substantially higher risk of closure for urban schools relative to their rural counterparts. However, the effects on the odds ratio of principal city and suburban schools are drastically reduced. This reduction generates an odd result. Though the process of school closure is overwhelmingly an urban one, it now appears that the risks associated with school closure within urban areas gets smaller as urbanization increases. These results invert the traditional view of school closure.

The efficiency thesis put forward by Lerman is weakly supported by the model. The only cost factor to play a significant role in predicting school closure is teacher salaries per pupil. Though the factor is significant, its overall effect on any individual school's odds ratio is small, even when the teacher pay per pupil gets quite large. The amount of debt service owed by the district (on a per pupil basis) also tends to increase the risk that a district will close one of its schools. However, unlike teacher pay, this effect size is meaningful. For every $100 increase in debt service per pupil above the average carried per school district ($315 per pupil), the odds of any school within that district closing increase by more than 10 percent.

The results of Model (4) paint a somewhat complicated picture regarding school choice policies. First, the model finds that school districts that devote a larger share of their total expenses to central administration are less likely to close. This appears to lend support to Robinson's (2004) findings

that relatively more bureaucratic organizations are less prone to punctuated decision-making. Second, increased competition from by multiple school districts appears to substantially reduce the risk of school closure. Seemingly, this corroborates the Ostrom, Warren, and Tiebout (1961) thesis that polycentricity provides more efficient outcomes in the provision of public goods within a local public economy. Taken together – and including the result that charter schools are 30 percent more likely to close than non-charter schools – the model appears to see increasingly centralized bureaucratic districts competing against one another as reducing the overall risk of school closure. One slight variation on this interpretation is that districts spending more on centralized administration are more professionally managed. This interpretation suggests that better managed districts in more competitive environments will be less likely to close schools.

Finally, the results in Model (4) suggest that federal funding plays an important role in shaping the school closure process. Districts that have larger shares of their total revenue from federal sources are less likely to close a school. A one percent increase from the average federal share of school district revenue (10.22%) is associated with a two percent reduction in the odds of a school within that district being closed, on average. Conversely, Title 1 funding is correlated with higher odds of a school within that district closing; however, the effect is quite small.

Model (5) attempts to explore the role of urban form (or perhaps more accurately described as urban maturity) on the likelihood of school closure. The working hypothesis is that certain forms of urban development may be more cost effectively reconstructed to suit the needs of capital. The model clearly indicates that schools located within industrial cities (in the Watkins classification scheme) are far more likely to close than schools located in relatively newer cities, so-called "Sunbelt" cities.[52] This provides some support for the urban form hypothesis; however, as will be discussed below, there is more work to be done to improve upon the accuracy of this classification scheme.

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[52] Of course not all of these cities are located within the south west, which is typically considered the sun belt. For example, this category includes cities like Atlanta, GA.

School-specific factors remain consistent in magnitude and direction. In fact, seven of the statistically significant variables were school-specific. These findings suggest that schools with student populations that are disproportionately black and Hispanic,[53] poor, and facing lower enrollments will be more likely to close, particularly those schools located within industrial cities. Within this smaller subset of the overall panel, the charter school variable is not an important indicator of school closure. Instead, the state-level variable regarding the rules-in-use for open enrollment appears to be a strong contributor to the school closure process.

Model (5) indicates that federal funding and teacher salaries (both on a per pupil basis) are positively correlated to school closure. A $100 increase in federal funding per pupil or teacher salaries per pupil, at their means, increases the odds of school closure in that district by more than one percent. The average federal revenue per pupil per district is $1,223.08 but the median is just over $1,000. In fact, 75 percent of all districts receive $1,494 or less in federal dollars per pupil. Therefore, a district at the 75th percentile in federal revenue per pupil would be, on average, approximately two percent more likely to close a school than a district at the mean. In other words, though the variable is statistically significant the size of its effects quite small. The difference between the average district in teacher salaries and a district at the 75th percentile is meaningful. A school in a district at the 75th percentile in teacher pay would, on average, have approximately 10 percent higher odds of closing than a similar school in a district at the mean of teacher pay per pupil.

The specific factors associated with all but one of the hypotheses in Table 4.4 have been addressed. The remaining question is fundamental to the multi-level analysis performed above: ultimately, is the school or the school district the primary driver of school closure? As yet, there is no explicit answer; however, the ICC can be a guide here. Starting with the empty model, the multilevel model suggests substantial variation in school closure attributable to school districts. However, as more and more explanatory variables are included, the ICC actually gets larger. Higher values of the

[53] This result is not robust to model specification.

ICC suggest that more variation in school closure is attributable to membership in school districts (Finch et al, 2014). Consequently, the trend in the ICC suggests that the primary site of school closure in the U.S. is attributable to unobservable school district factors. This is true largely still in Model (5), which is primarily a model of school closure in urbanized areas. Here, the ICC indicates that individual school districts are responsible for more than 25 percent of the variation in school closure. Next, I discuss the key takeaways from this chapter and important limitations in the analysis.

6.5 Limitations and Conclusions

This chapter presents a comprehensive empirical analysis of school closure. It presents a global narrative that suggests the decision to close a school is a complex of local and district-level factors. Table 6.3 highlights the differences between regular schools in operation and schools that were closed. Four school specific factors stand out. The most prominent difference is in enrollment. Schools that closed, on average, enrolled 47 percent of schools that remained open. Second, closed schools have been disproportionately black. Schools that closed had, on average, 13 percent more students of color than schools that remained open. Third, schools that closed served a higher share of low-income students. Schools that closed served 12 percent more low-income students, on average, than schools remaining in operation. Finally, nearly 10 percent more schools that closed were located in principal cities; nearly the exact opposite of true of schools located in suburbs.

Three factors emerged from this analysis specific to the school districts themselves. The first is the overall capacity of the district. Schools that closed were in districts that enrolled, on average, 12 percent fewer students per school building than the parent districts of schools that stayed open. This measure of efficiency reinforces the thesis that districts close schools on rational grounds. The second differentiating factor is the amount of Title 1 funding per pupil received by the district. Here schools that closed were in districts that received substantially more Title 1 funding per pupil than the parent districts of schools that remained open. Finally, the risk of school closure is strongly influenced by unobservable school districts factors. The analysis finds that somewhere between one-

quarter and one-third of the unexplained variation within the model can be attributed to the school district level of the analysis.

Table 6.4 attempts to estimate the associated risk of school closure for specific school and school district factors. The most consistent findings regardless of the factors contained within the model were school-specific variables. They tell largely the same story as Table 6.3. Enrollment is one of the most important factors in the school closure process. Schools with higher enrollments rarely close.[54] However, schools that are homogenous, black, and poor have the highest odds of closing. This suggests that school closure is a race- and class-based process. But, it is also apparent that charter schools are more likely to close than non-charter schools. Even though they make up only 5.42 percent of all schools in the panel, the analysis in Table 6.3 indicates that charter schools account for more than 12 percent of all school closures.

The model also provides a more nuanced view of the role of geographic location. Unlike Table 6.3, the results in Models (3) and (4) indicate schools in principal cities have higher odds of closing than rural schools. But, suburban schools have higher odds of closing than schools in principal cities. This runs counter to the narrative that school closure is a disproportionately inner-city process. However, it strongly reinforces the urban nature of school closure in America.

The most substantial factor in predicting school closure in America is urban classification, according to Model (5). Schools that are located within industrial cities have almost 90 percent higher odds of closing than schools in so-called "Sunbelt" cities. Importantly, controlling for urban form in this way largely mutes school district factors that were significant in Model (4). In large part, this is due to the dramatic reduction of the sample, but the remaining sample is still has more than 77,000 observations. This provides some of the strongest evidence to date that urban form plays a meaningful role in structuring the distribution of public resources.

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[54] In the entire panel, schools in the 75th percentile close less than 0.9 percent of the time.

In total, the individual school-level factors and district-wide factors suggest that poverty is one of the primary pathways into school closure both locally and globally. It begins with residential segregation based on race, class, and the epoch of capital under which the city matured. Locally, households sort based primarily on income, but also on the availability and spatial distribution of housing. This sorting process then allocates school-aged children into geographically aligned schools. Schools that have relatively higher levels of minorities and low-income students reflect the socio-economic conditions of the neighborhoods they are in. Consequently, schools that close are likely to also be located in neighborhoods that are disproportionately black and poor. This is reinforced by the large differential in receipts of Title 1 funding per pupil. These funds are primarily distributed to districts based on the low-income status of their student population. More poor students beget more funding through Title 1.

This analysis though thorough is subject to several limitations. First, the analysis does not include any performance data for the schools or districts. Given that the turnaround efforts are largely tied to school-wide performance on standardized exams, this is an important weakness to the current analysis. The main issue here is that school performance data are primarily available at the state level and are inconsistently coded. Future work will seek to consolidate school performance data and evaluate its role in the school closure process. The second weakness is a complete lack of neighborhood level data. These data are available but are beyond the current focus of this study. Future work will seek to understand neighborhood effects in predicting school closure, but also attempt to estimate the potential feedbacks to neighborhoods from school closures. Third, the current specification of the model is subject to endogeneity, where right-hand-side variables are correlated with the error term. For example, it is possible that schools that close, on average, are more difficult to requite teachers to without higher wages. But, it may also be true that higher faculty wages place a larger financial burden on school district budgets. In this way, it is reasonable to assume a simultaneity bias here. Several variables in the analysis are susceptible to this specification problem.

Future work should utilize appropriate options for addressing these concerns.[55] Finally, the current approach utilizes classical econometric techniques that are well suited for large datasets like this. However, recent developments in methods and software capabilities are making it possible to apply Bayesian methods to this problem. These methods permit the application of more complex spatial models, such as space-time models to these large datasets using open source platforms

The factors with the strongest relationship to school closure were race and class at the school level and the urban classification for the city the school is located within. In short, school closure is an urban process that is significantly tied to race and class. However, this chapter has shown that a great deal of variation in the school closure process is directly attributable to the school districts themselves. However, the school district factors that were included in the model to account for this variation failed to do so. The next chapter explores one potential source of this unexplained variation: spatial dependence. It will address two questions. First, is there a global spatial relationship between school districts in proximity to one another? Put differently, is school closure contagious? Secondly, is it possible to identify those districts at higher risk of closure?

[55] Mostafa (2014) notes the difficulty endogeneity bias poses for multilevel modeling. Andrews, Duncombe, and Yinger (2002) provide a brief discussion of this challenge with respect to modeling economies of size in education both from the district and school perspective.

CHAPTER 7

MAPPING SCHOOL CLOSURE RISK – IS SCHOOL CLOSURE CONTAGIOUS?

This chapter evaluates the role of space and its impact on school closure in America. Specifically, this chapter addresses two questions. First, can one school district catch the school closure bug from its neighbor? Is school closure contagious globally? Second, is school closure a spatial process at the local or regional level? Answering these questions requires an additional tool. Specifically, this chapter incorporates Bayesian statistical tools to address the first question regarding spatial interdependence.

The next section introduces the concept of spatial dependence and the problems it poses for traditional ordinary least squares (OLS). Then it introduces the Bayesian Hierarchical model, specific to a Poisson distributed dependent variable. The data for this analysis are introduced briefly, followed by the results of the model. Finally, the chapter ends by mapping the residuals both from the multilevel analysis from Chapter 6 and the area random effects from the Bayesian model. It concludes with a discussion of the estimated model, the disease risk maps, and an examination of next steps.

7.1 Spatial Dependence

Geographers have long understood the power of proximity (see Tobler, 1970). However, until the latter half of the 20th century, econometricians had failed to incorporate this learning into their own work. "Spatial dependence" occurs when changes in one spatial unit (e.g. city block, county, state, etc.) impact neighboring spatial units and vice versa. Anselin (1988) introduced American econometricians to the concept of spatial dependence as well as its role in invalidating the use of ordinary least squares (OLS) techniques.[56] Anselin's book introduced a number of spatial econometric models that permitted the researcher to identify, test for, and account for spatial spillover

[56] Anselin (1988) illustrates that the use of OLS in the presence of spatial dependence (which requires a spatial lag model) will generate biased estimates that are not efficient. In the presence of spatial heterogeneity the estimates will remain unbiased but the estimates are no longer efficient.

effects. LeSage and Pace (2009) offer the foundational textbook in spatial econometrics today. Whereas Anselin (1988) focused on spatial lag and error models, LeSage and Pace focus particularly on spatial lag models, estimating the direct and indirect effects (via the spatial multiplier process) that generate spatial spillovers. Elhorst (2014) has offered the most recent venture into the problem of spatial econometrics, but has placed even more emphasis on emerging spatio-temporal autoregressive (STAR) models. Each of these authors seeks to understand the role proximity plays in shaping social processes.

Spatial dependence is a problem of geography. Social processes play out across space and at (and within) specific (but arbitrary) geographic locations. Consequently, the process of school closure also plays out across and within geographic space. Spatial econometric techniques are designed to estimate the strength of the mutual dependence between neighbors (network effects) and correct for it. However, implementing these spatial techniques is still a difficult venture fraught with challenges.

7.1.1 Spatial Challenges

There are a number of difficulties in estimating spatial econometric models. These problems are exacerbated when the number of spatial areal units is large and spans multiple years. The first problem to address is what is known as the Modifiable Areal Unit Problem (MAUP), [57] which occurs when spatial point processes are aggregated to areal units (spatial polygons). The problem, simply put, is that coefficient estimates are quite sensitive to the aggregation levels (city, county, state, etc.) chosen by the researcher. Anselin argues that to account for this problem, aggregation should take place at the level of geography that is pertinent to the process. This level of aggregation should be driven by theory and so depends on the question being addressed. This project is focused on the forces that cause school districts to close individual schools. Because school closure decisions are

[57] Gehlke and Biehl (1934) were the first to identify this difficulty of spatial analysis. One practice to assess the extent of the MAUP problem is to run it at multiple scales.

made by the school district, the school district is the relevant geography to use, rather than the characteristics of the individual schools per se.

The second significant challenge is computing power and models that can account for spatial dependence over a large number of spatial regions with very large numbers of observations. The National Center for Education Statistics (NCES) has "School Universe Data Files" that contain data on every individual public school in the United States from the 1985-1986 school year. However, latitude and longitude data are only associated with data beginning in the 2000-2001 school year. This project focuses on a six-year subset of this data. As a result, there are six years of data with approximately 100,000 observations per year. Traditional spatial econometric models can compute such large datasets, but recent innovations with Bayesian statistics and open source software have led to the development of more appropriate tools.

The third, and frankly more difficult problem, is the non-linear nature of the dependent variable. Two common ways to set up the non-linear dependent variables are: a binary 1 or 0 for each school district (or school) that closed (=1), as used in the previous chapter, or a count of closed schools per year within each school district, which is a count of "rare events." The former specification requires a logit or probit model. The latter specification calls for using Poisson and more recently Negative Binomial regression models.[58] Both specifications are highly complex and are made more so by attempting to account for spatial dependence. As a result, the estimation procedures can be time consuming. However, there have been recent developments in Bayesian estimation techniques with the development of conditional autoregressive (CAR) model priors[59] in the open source platform "R" that may help overcome this and other challenges.

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[58] Negative Binominal Regressions are built to overcome the challenge of overdispersion, which occurs when the variance of the dependent variable is larger than the mean.

[59] See Besag et al (1991) for an early discussion of CAR priors.

7.2 The Model

The Bayesian Hierarchical model begins with the dependent variable and then works backwards. Lee (2011) provides a simple formulation of the model.

$$y_i = Pois(\lambda_i, RR_i) \qquad [7.1]$$

$$\ln(RR_i) = \mu + X_i^t \beta + \theta_i \qquad [7.2]$$

Equation 7.1 shows that the estimated count (y_i) in areal unit i follows a Poisson distribution with a mean of lambda (λ_i) times the area specific relative risk rate (RR_i). Equation 7.2 then shows how the relative risk rate is estimated. This is often referred to as the log-link function. The relative risk rate is estimated from an overall group mean (μ), a set of explanatory factors (X_i^t), and a set of area-specific random effects (θ_i). However, in Bayesian analysis additional assumptions are made by the researcher by applying parent distributions to the group-level parameters (μ, β). If the researcher has relative confidence of the underlying structure of the parent distribution, a so-called "informative prior" is applied to these higher-level parameters, but this not necessary in all cases. A "noninformative prior" can generally be applied; in this case, the model estimates the parameters from relatively weak starting positions. The models are then estimated using a "sampler", which effectively uncovers the underlying distribution of each parameter. These are said to be "posterior" distributions.[60]

To address the question of spatial dependence between school districts, I follow Lee (2011, 2012, 2013) by incorporating a Conditional Autoregressive (CAR) prior distribution on the random effect term (θ_i) in equation 7.2 above. A complete description of a distribution requires the mean and variance of the parameter distribution. Lee (2011) evaluates four common structures for the CAR prior, and using a simulation determines the so-called Leroux CAR is the preferred form. Formally, the Leroux CAR prior distribution can be described in the following way:

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[60] For a general introduction to Bayesian analysis see Kruschke (2014). The code to generate the distributions in Appendix A-2 is provided by Kruschke.

$$\theta_i | \, \theta_{-i}, W, \tau^2, \rho, \mu \sim N\left(\frac{\rho \sum \theta_j + (1-\rho)\mu}{n_i \rho + 1 - \rho}, \frac{\tau^2}{n_i \rho + 1 - \rho} \right) \qquad [7.3]$$

This distribution states that the random effect term used to estimate the relative risk for each specific areal unit is conditional upon the "neighbors" of areal unit i, the weights matrix (W), the precision term (τ^2), the spatial correlation coefficient (ρ), and the group-level mean of the random effect (μ). Lee (2011: 81) states that equation 7.3 is, "a weighted average of the random effects in neighboring areas and the overall mean μ." There are three important elements to highlight in 7.3. First, the precision of the parameter distributions improves as the number of neighbors (n_i) increases, particularly if the spatial correlation coefficient (ρ) is large. As ρ approaches one, the denominator in 7.3 approaches the number of neighbors (n_i). However, the grand mean (μ) in the numerator of the distribution's conditional mean plays less and less of an influential role. The majority of the random effect is estimated with information from the observation's neighbors. If, on the other hand, ρ begins to approach zero the number of neighbors becomes far less important. The grand mean plays a much stronger role in shaping the area-specific random effect and the precision of the parameter distribution grows much larger. Second, the Leroux CAR is a means of evaluating spatial dependence globally; it is not a tool to evaluate local spatial processes. The spatial correlation coefficient is estimated over the entire spatial matrix. If there is a strong global spatial relationship, the spatial correlation coefficient (ρ) will approach one. If there is effectively no spatial relation, then ρ will approach zero. Finally, the CAR prior helps to account for overdispersion (where the variance within the dependent variable is greater than the mean of the dependent variable).[61]

This simple Bayesian model addresses all three of the concerns noted in the previous section. First, the model is hierarchical. The group-level parameters are assumed to come from their own parent distribution. Second, the model explicitly accounts for the count nature of the dependent variable. Finally, the model is easily estimated in R using the CARBayes package (Lee 2012). The

[61] Additionally, the utility of the CARBayes package is improved as it seems to easily allow for zero-inflation. Comparison of the CARBayes estimates to a spatial Zero-inflated Poisson (ZIP) model yielded nearly identical results on a different but similar dataset.

next section briefly outlines the data used to assess the global power of spatial dependence within the school closure process, followed by a brief discussion of the results.

7.3 The Data and Results

The dependent variable is the count of schools closed within a school district in the 2010-2011 academic year. This year was selected for two reasons. First, this particular school year had the highest risk of closure over the entire panel. Second, my own limitations prevent me from utilizing the entire dataset at this time. Future work will utilize time-space models to better understand the global spatial process at play.

The explanatory factors are taken from the school district level of the multilevel model presented in Chapter 6, but only for the 2010 academic school year. Two variables are added to account for the scale of school district administration. This cross sectional analysis is intended to be conservative in its estimation of the role of space globally.

Table 7.1: Variable Descriptions

Variable	Definition
Black	% of the school district student population that is Black.
Hispanic	% of the school district student population that is Hispanic
District Enrollment	Total student population by District
Student to teacher ratio	Log of the number of students per teachers district wide.
Deficit	The percentage of district total expenditures to total revenues.
Federal (%)	Share of district revenue from federal sources
Federal_pp	Federal revenue dollars per pupil
Local (%)	Share of district revenue from local sources
Local_pp	Local revenue dollars per pupil
Teacher Salaries per pupil	Teacher salaries per pupil
Student transportation per pupil	Student transportation costs per pupil (includes salaries, benefits, and capital outlays).
Building maintenance	Per pupil costs of building maintenance and repair by district

Table 7.1 presents the key variables used in the analysis. Table 7.2 provides the descriptive statistics. The model was estimated using Markov Chain Monte Carlo (MCMC) methods, using a hybrid Metropolis-Hastings and Gibbs sampler. Three separate chains are estimated from different,

uninformed, starting positions. The chains are combined in the R package Coda and evaluated for convergence, autocorrelation within the sampler, and model complexity. I perform the analysis on approximately 5,700 school districts within the Midwest and a large portion of the so-called Rustbelt.[62] The Gelman-Rubin diagnostic was 1.04, well below the 1.2 threshold typically used to assess convergence (Gelman and Rubin, 1992). Autocorrelation was addressed by thinning every 10th sample. Each chain was estimated for 50,000 iterations to ensure convergence. The density distributions are provided in Appendix A-2.

Table 7.2: Descriptive Statistics

Variable	N	Mean (Open)	St. Dev	Min	Max
Black	5,153	5.4270	13.35	0	100
Hispanic	5,153	5.330	9.31	0	95.73
District Enrollment	5,153	2,441	7,133.9	0	405,600
Local (%)	5,153	45.18	19.23	0	99.05
Local_pp	5,153	6,567	6,196.19	0	280,200
Student to teacher ratio	5,153	14.47	3.45	0	63
Deficit	5,153	99.58	18.58	0	364.90
Federal (%)	5,153	9.974	5.89	0	57.730
Federal_pp	5,153	1,258	1,090.73	0	55,760
Teacher Salaries per pupil	5,153	2,312	2,111.45	0	55,410
Student transportation per pupil	5,153	935	1,191.83	0	64,290
Building maintenance	5,153	1,590	906.79	0	43,120

Table 7.3 provides the results of the model estimation.[63] According to the model, as the average number of students per teacher increases by one, the odds of that district closing a school increase by 10.6 percent, on average. The second strongest correlation to school closure is the share of the district's student population that is black. At the mean, a one percent increase in the share of district enrollment that is black will increase the odds of that district closing a school by, on average, 2.8

[62] The use of this spatial subset of the U.S. has the advantage of substantially reducing the amount of computing time required to estimate the model. It is at the same time large enough to assess potential spatial dependence at the global level. However, this spatial subset potentially introduces selection bias into the model due to states that border the shapefile. As indicated below in equation 7.4, the number of neighbors each observation has plays an important role in understanding the flow of information between areal units.

[63] This cross-sectional analysis suffers from problems of endogeneity. Future work needs to improve model specification to better account for this issue.

percent. The third most meaningful contributor to a district's odds of closing a school is the share of district revenue generated locally. As the local share of the district revenue increases by one percent, at the mean, the odds of that district closing a school rises roughly two percent on average. However, as the district's per pupil share of local funding goes up, the risk to the district of closing a school declines. Two additional factors were significantly associated with district school closure counts. District enrollment was significant but its effect is small. To be meaningful, district enrollment would have to increase substantially. Teacher pay, however, can have some modest impact on the estimated count of school closure. A $100 increase in teacher pay per pupil across the district, at the mean, increases the odds of that district closing a school by roughly 3.3 percent.

Table 7.3: Model Results

Variable	Avg. log odds	Odds Ratio	SD	2.5%	50%	97.5%
Intercept	**-6.592***	0.0013713	.7385	-8.045	-6.579	-5.156
Black	**.02762***	**1.0280050**	.004077	.01966	.02760	.03557
Hispanic	.0001516	1.0001516	.007752	-.01545	.0003426	.01477
District Enrollment	**.00002388***	**1.0000239**	.000004071	.00001569	.00002338	.0000317
Student to teacher ratio	**.1007***	**1.1059448**	.02341	.05592	.1006	.1468
Building maintenance	.0002513	1.0002513	.0001642	-.0000734	.0002503	.0005656
Teacher Salaries per pupil	**.0003286***	**1.0003287**	.00005888	.0002169	.0003274	.0004453
Student transportation per pupil	.00009996	1.0001000	.0001586	-.0001975	.00009742	.0004109
Federal (%)	-.02505	0.9752611	.02366	-.07090	-.02522	.02220
Federal per pupil	.0002066	1.0002066	.0001188	-.0000469	.0002137	.0004217
Local (%)	**.01934***	**1.0195282**	.009948	.0007539	.01906	.03974
Local per pupil	**-.0002109***	**0.9997891**	.00006114	-.0003383	-.0002077	-.0000996
Deficit	-.001150	0.9988507	.004452	-.01007	-.001089	.007361

Note: Coefficients in bold indicate the mean is substantially different from zero.

Generally, the results of this model reinforce the more detailed analysis in Chapter 6. The purpose of this brief analysis; however, was not to re-evaluate these factors. Rather, it was intended to assess the degree to which school districts influence each other. Is school closure spatially contagious?

7.3.1 Is School Closure a Spatial Phenomenon?

The model finds effectively no evidence for spatial dependence at the global level. This can be seen in Figure 7.1, a trace and density plot of the spatial correlation coefficient. Examination of the density plot (right) shows the mode of the pdf is effectively zero. Referring back to the specification for the random effects term in [7.3], as ρ approaches zero the random effects term converges to:

$$\theta_i \mid \theta_{-i}, W, \tau^2, \rho, \mu \sim N\left(\frac{\mu}{1}, \frac{\tau^2}{1}\right) \qquad [7.4]$$

As a result, the random effects terms are dominated by the grand mean and the precision is estimated without the added benefit of sharing information across neighbors. We can therefore conclude that spatial dependence is not present at the global level.[64]

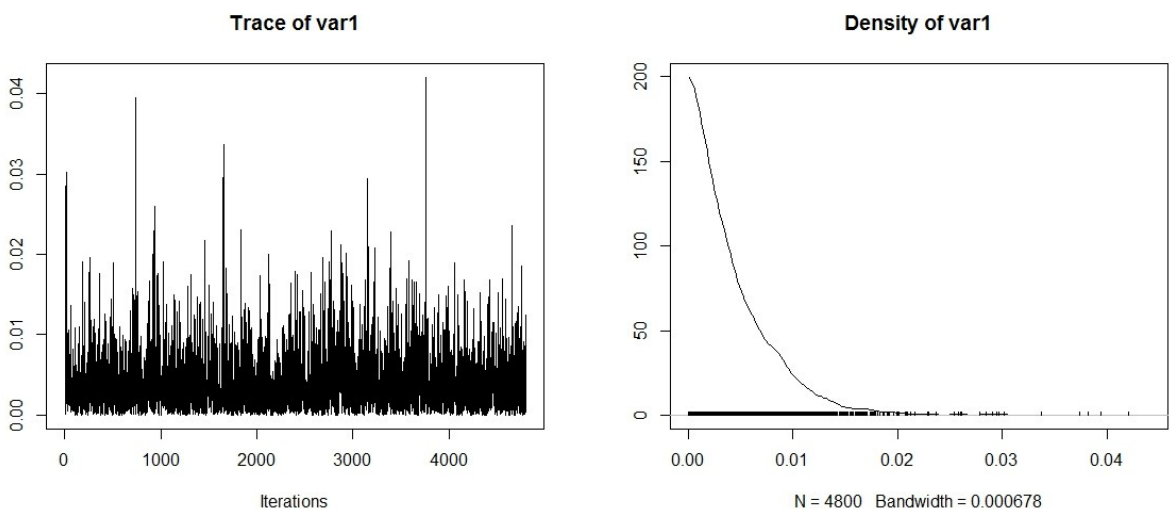

Figure 7.1: Trace and Density plot of $\boldsymbol{\rho}$

7.4 Global vs Local

There is no meaningful spatial force at play globally with respect to school closure. But, we have yet to test for local spatial autocorrelation. This section uses two methods to evaluate the local forces

[64] To verify, I also estimated global spatial autocorrelation using the Moran's *I* statistic. It is statistically significant but small, at 0.05. This confirms the result illustrated in Figure 7.2.

of spatial autocorrelation: Getis-Ord Gi* and Luc Anselin's Local Indicators of Spatial Association (LISA) method (Anselin, 1995; Getis & Ord, 1992). The first method provides a means of identifying "hot spots" of unusual behavior. The LISA method finds similar clusters but, importantly, it also identifies areas/regions of dissimilar but adjacent behavior. We find that indeed school closure is a strong but local spatial process.

The Getis-Ord Gi* statistics was originally constructed to find local spatial activity that is not present at the global level (Anselin, 1995:97). The Gi* is, in general terms, a spatial location quotient. Regions whose behavior is multiple standard deviations away from the global level behavior are deemed a hot spot of activity. The statistic is a z-score that evaluates the sum of the event in question in the ith areal unit plus the sum of events in the ith unit's neighbors. That sum is compared to the sum of all events globally. If the area sum is large enough relative to the global sum to be statistically significant, then that area is deemed a hot spot. The reverse is true for areas with unusually low sums.

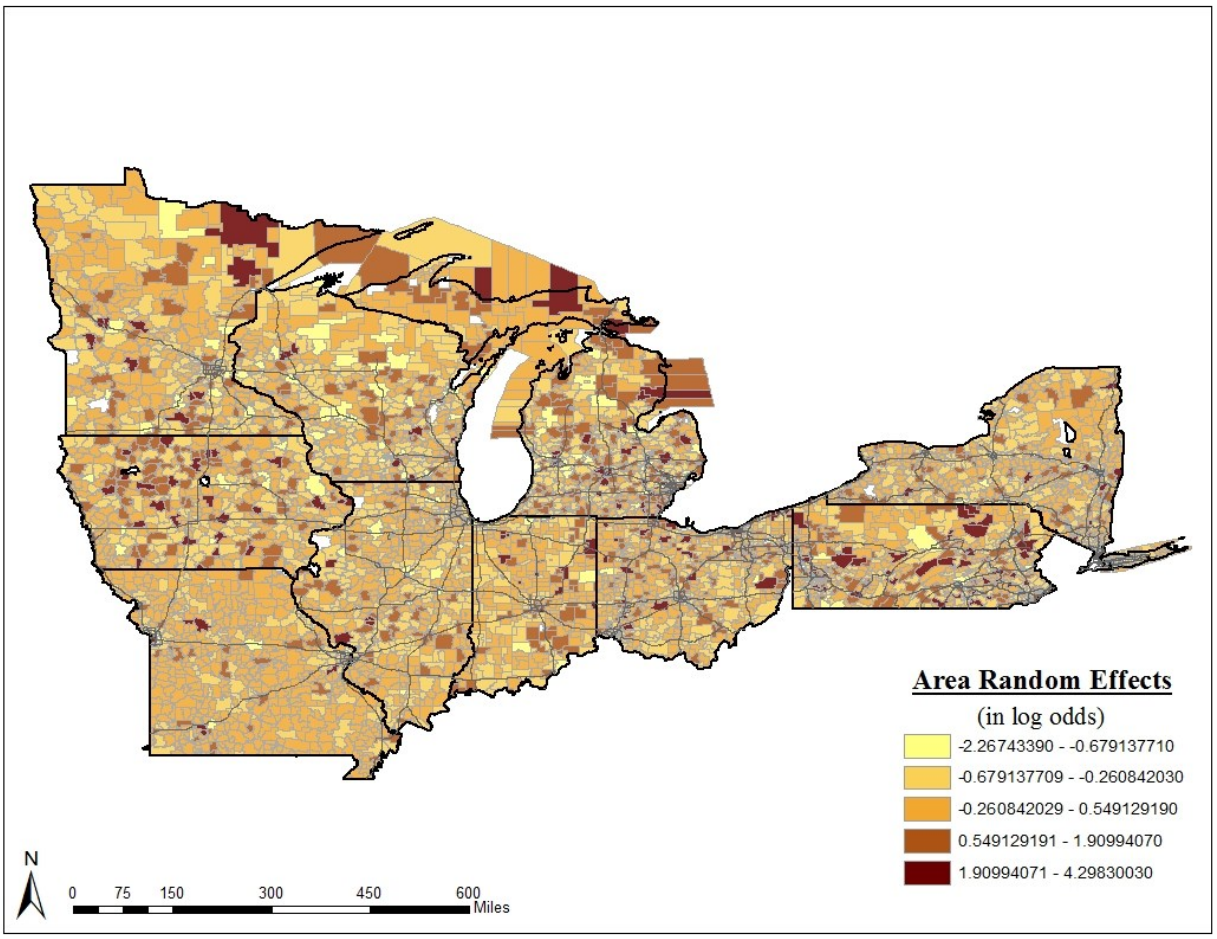

Figure 7.2: School District Residuals

The Gi* is developed by first mapping the residuals from the multilevel model estimated in Chapter 6. To ease the mapping process, the residuals are mapped for approximately 5,700 school districts in the Midwest and portions of the so-called Rustbelt. Figure 7.2 illustrates the school district specific residuals from the Model (4) in Table 6.4. There is not an explicit pattern in the residuals. However, as noted above, the Getis-Ord Gi* was developed for the purpose of identifying local spatial relationships when there is little to no global spatial association.

Figure 7.3 maps the estimated Getis-Ord Gi* values to create a "hot-spot" analysis of school closure in America between 2007-2012.[65] Recall that the random effect area residuals are representative of the predictive power of the model. They indicate how far above or below the area specific residual is for the overall school district intercept in equation 6.4. Consequently, the areas of hot-spot activity represent clusters of school districts where the area specific residual (v_{0j}) is greater than the overall school district average (γ_{00}). Therefore, areas of low activity are areas where the model over predicted likely behavior. In simplistic terms, hot spots are unusually "bad" at closing schools and low spots are unusually "good".

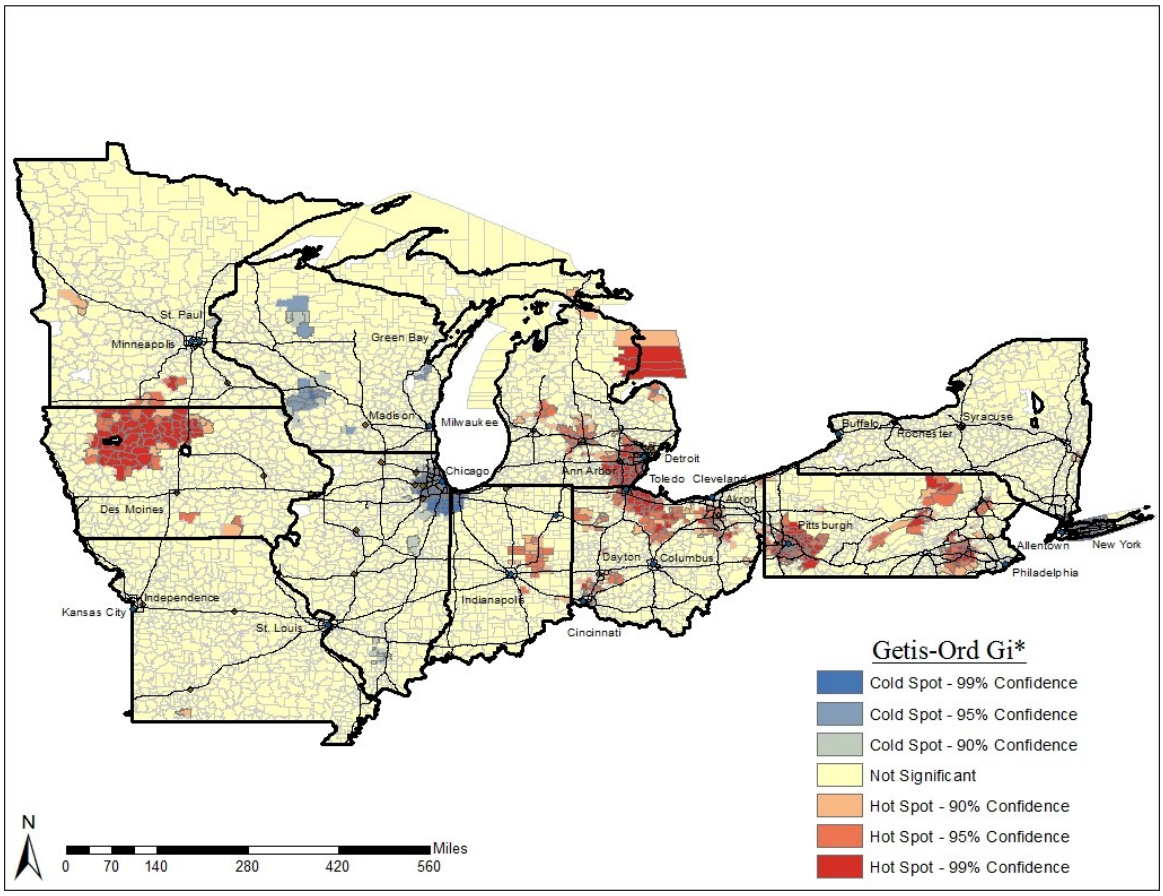

Figure 7.3: Getis-Ord Gi* Optimized Hot Spot Analysis

[65] This figure utilized ESRI's "Optimized Hot Spot Analysis" tool. This corrects the traditional Getis-Ord Gi* for the multiple tests that take place. It is a much more accurate tool

The figure illustrates three distinct areas. Looking only at hot spots, it appears two different processes are playing themselves out. The hot spot in north-central Iowa illustrates a substantial cluster of school and school district consolidation. However, the other significant hot spots appear centralized on or near the cities of Indianapolis, Detroit, Toledo, Cleveland, Pittsburgh, and Harrisburg/Reading, and Scranton. The third spatial cluster is a large cool spot surrounding Chicago that moves somewhat into western Wisconsin. On the surface, this may seem somewhat odd. Chicago Public Schools closed a large number of schools in the 2010-2011 school year. However, all this means is that the model is predicting much higher numbers of school closures than are actually being observed. This is an important result. It suggests that something at the state level of Illinois and Wisconsin that are acting to restrict the actual numbers of schools that can be closed. Future work should seek to uncover these structural forces.

Figure 7.3 demonstrates a clear spatial relationship between school closures; however, it appears that the spatial effects dissipate quickly over space. Given the geographical focus of the closure activity, it appears more likely that the spatial association more closely adheres to the notion of *spatial heterogeneity*. This form of spatial dependence (the other being spatial autocorrelation) is more akin to differences in unobserved regional or local institutional factors. In some cases, a properly specified set of indicator variables can account for this heterogeneity.

The second method used to evaluate local spatial association is Anselin's Local Indicator of Spatial Association (LISA) statistic. This approach though similar to the Gi* statistic focuses on pairwise behavior (high-low; low-high; low-low; and high-high). It establishes both hot and cold spots, which should correspond to the Gi* z-score, and differences in school closure behavior between neighbors. This helps researchers identify outliers within a particular spatial regime.

Figure 7.4 below maps out the LISA analysis. The local Moran's *I* reinforces the statewide structural differences, but it also paints a more complete picture. Within the rustbelt region of Michigan, Indiana, Ohio, and Pennsylvania the large swath of hot spots in Figure 7.3 are primarily districts with relatively high random effects next to one another (high-high clusters). But, Figure 7.4

makes clear that in actuality this region is dominated by a mixture of high-high pairs and pairs where districts with low random effects neighbor districts with high random effects. However, something altogether different appears to be happening in the states of Wisconsin, Illinois, and Missouri. Here a number of low-low pairs are neighbors to districts with higher risk levels.

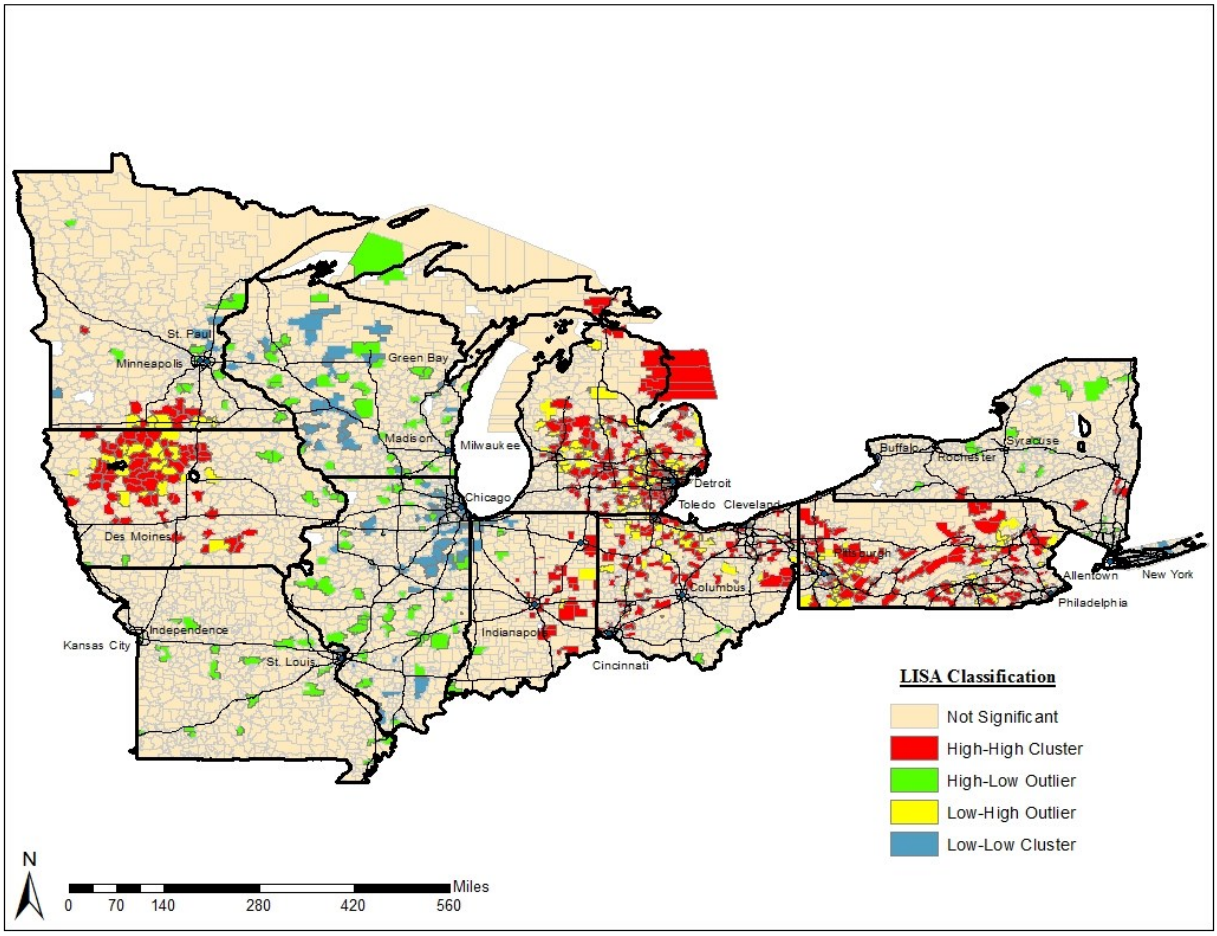

Figure 7.4: LISA

7.5 Conclusion

This chapter examined the role of space and geography in the process of school closure. The data strongly reject the hypothesis that school closure is a spatial phenomenon at the global level. Instead, it is a strong but locally spatial phenomenon. These regional spatial clusters are both highly focused but also contained almost entirely within specific states. School closure does not appear to be

contagious. Rather, these local clusters suggest that (unobserved) institutional factors are shaping the school closure process.

The cross-sectional analysis indicates a process wherein school districts that are more dependent on local sources of revenue may struggle to maintain service levels. The size of the school district appears to pose a significant burden for district managers. As the student to teacher ratio rises from the mean, the risk of closing a school within that district increases substantially. This suggests that as districts seek economies of scale through enrollment growth, their own actions toward consolidation incentivize the closure of older schools. The process also affects districts that have relatively higher shares of African American students.

This chapter has identified the importance of local unobserved factors shaping the spatial allocation of regular public schools. The next chapter attempts to synthesize the findings thus far into a coherent story of school closure in America. This theory is then tested by attempting to account for the spatial heterogeneity seen in the local clustering of school closure behavior. Ultimately, it seeks to address the primary question of this project: Is school closure socially just or is it a process wherein capital accumulation reinforces unequal access to the social provisioning process?

CHAPTER 8

HOW ARE NEW SCHOOLS DIFFERENT FROM CLOSED SCHOOLS?

The social surplus accumulates in the hands of the owners of the means of production via the *fundamental class process* of capitalist commodity production.[66] Then, the accumulated surplus is redistributed to those class positions that help to reproduce the desired conditions for accumulation. Participants of these *subsumed processes* include schools, local governments, not-for-profits, and federal and state government agencies to name only a few. In this view, payments to participants in subsumed processes work to direct public, not-for-profit, and charitable activities toward investments that ultimately help to reproduce the desired social relations to production.

Schools are essential mechanisms for the preparation of young human beings for a future of what Marx called, "free labor." Consequently, a political decision to close a school and/or build a new school sends a clear message about those spaces and the people that inhabit them. One space is better at producing human beings that operate in-line with the dominant form of capital accumulation; the other is considered a "failed school" in need of a "turnaround." If this is the process playing out, clear differences should be visible between schools that close and schools that are newly opened.

The purpose of this chapter is to assess the key differences between closed schools and new schools in three ways. The chapter begins by assessing the differences between the two school types over a range of factors. This helps to explain the differences in levels of factors that are potential criteria for school board decision-making. Finally, the chapter evaluates the spatial distribution of new school production and compares that to school closure. The chapter concludes with a discussion of these results and next steps.

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[66] As noted previously, the "fundamental class process" is a phrase utilized by Resnick and Wolffe (1987) to describe the primary means of capital accumulation during the contemporary capital epoch.

8.1 Are New Schools and Old Schools Different?

Table 8.1 analyzes the statistical differences in means over a range of factors between closed schools and new schools. This analysis will help to understand the differences between the process of closing a school compared to constructing new one. Six factors stand out. First, African American students are absolutely worse off. The schools that close are disproportionately black; new schools are substantially less black, yet they do have higher shares of Hispanic students, and generally are more diverse. Second, poorer students are also absolutely worse off. Schools that close have much higher proportions of students on free and reduced lunch. Third, schools that close enroll 29 percent fewer students, on average, than new schools.

Table 8.1: Difference between Closed and New Schools

Variable	Mean (Closed)	Mean (New)	Difference (Closed – New)	Welch t-statistic+
Hirschman Herfindhal Index (HHI)	6715.939	6211.797	504.1427	13.103*
Black	28.114	20.9882	7.126	12.125*
Hispanic	15.708	23.18395	-7.476	-15.793*
Free	60.305	48.032	12.273	22.627*
City	.3338	.3060	.0278	3.433*
Suburb	.2153	.2541	-.0388	-5.276*
Town	.1459	.1097	.0362	6.274*
Middle School	.1798	.2067	-.0269	-3.921*
High School	.1125	.1416	-.0290	-5.019*
Mercantile Cities	.1117	.0478	.0637	6.6889*
Industrial Cities	.3617	.1958	.1659	10.521*
Enrollment	260.32	365.79	-105.47	-21.30*
Charter School	.1293	.2563	-.1270	-18.03*
Open	.6198	.6570	-.0372	-4.458*
Republican	.2989	.4030	-.1040	-12.58*
Polycentric Competition	.7455	.3149	.4307	12.95*
Local (%)	39.42	40.48	- 1.054	-3.167*
Local_pp	6157.45	4974.50	1182.95	8.539*
Bureaucracy (%)	1.387	.9926	.3949	12.44*
Student to school ratio	492.40	608.77	-116.36	- 24.19*
Student to teacher ratio	16.14	20.76	- 4.616	-8.965*
Expenditure to Revenue (%)	102.31	108.58	-6.271	-6.638*
Debt service per pupil	321.18	369.62	-48.435	- 8.112*
Title 1 revenue per pupil	412.67	325.14	87.54	9.836*
Federal (%)	11.66	11.32	.3491	2.395*
Federal_pp	1901.09	1419.81	481.28	7.297*
Teacher Salaries per pupil	2347.21	2026.34	320.87	13.37*
Student transportation per pupil	834.10	589.50	244.61	9.379*
Building maintenance	1710.67	1379.11	331.57	20.795

Note: +All t-statistics are derived in STATA 13 using Welch's difference of means tests. Hence, the statistical significance of the differences is more conservatively estimated than if equal variances had been assumed.

Fourth, over one quarter of all new schools are charter schools. Fifth, the average student to school ratio for districts that close schools is much smaller than the same ratio for districts that open new schools. Finally, districts that close schools spend considerably more on building maintenance and teacher salaries.[67]

These key differences provide strong support for the Lerman thesis. These data suggest that new schools are intended to capture economies of scale. The buildings operate at a higher capacity: they require far less local support per pupil, pay their teachers less, and spend far less on maintenance and repairs. However, these data strongly indicate that the process of new school construction is falls largely along lines of income and race. New schools serve 12 percent fewer low-income students than schools that close and seven percent fewer African Americans.

8.2 The Spatial Distribution of New Schools

Figure 8.1 below illustrates the Getis-Ord Gi* optimized residual map based on the odds a specific district will construct a new school. It is generated from the district-specific residuals. The model largely under predicts new school construction in several large metropolitan areas (e.g. Des Moines, Kansas City, Minneapolis/St. Paul, Maddison, Harrisburg, Reading, and Albany), which generates so-called "hot spots". But, it substantially over-predicts new school production in the Chicagoland area and somewhat on the periphery of the St. Paul, MN metropolitan region – the "cold spots". The districts with the highest risk of new school construction appear to be those on the fringe of the metro-region, with the exception of Des Moines and Kansas City. The results strongly indicate a spatial process is also at work determining the distribution of public services.

[67] This provides additional evidence of an issue of endogeneity in the school closure model.

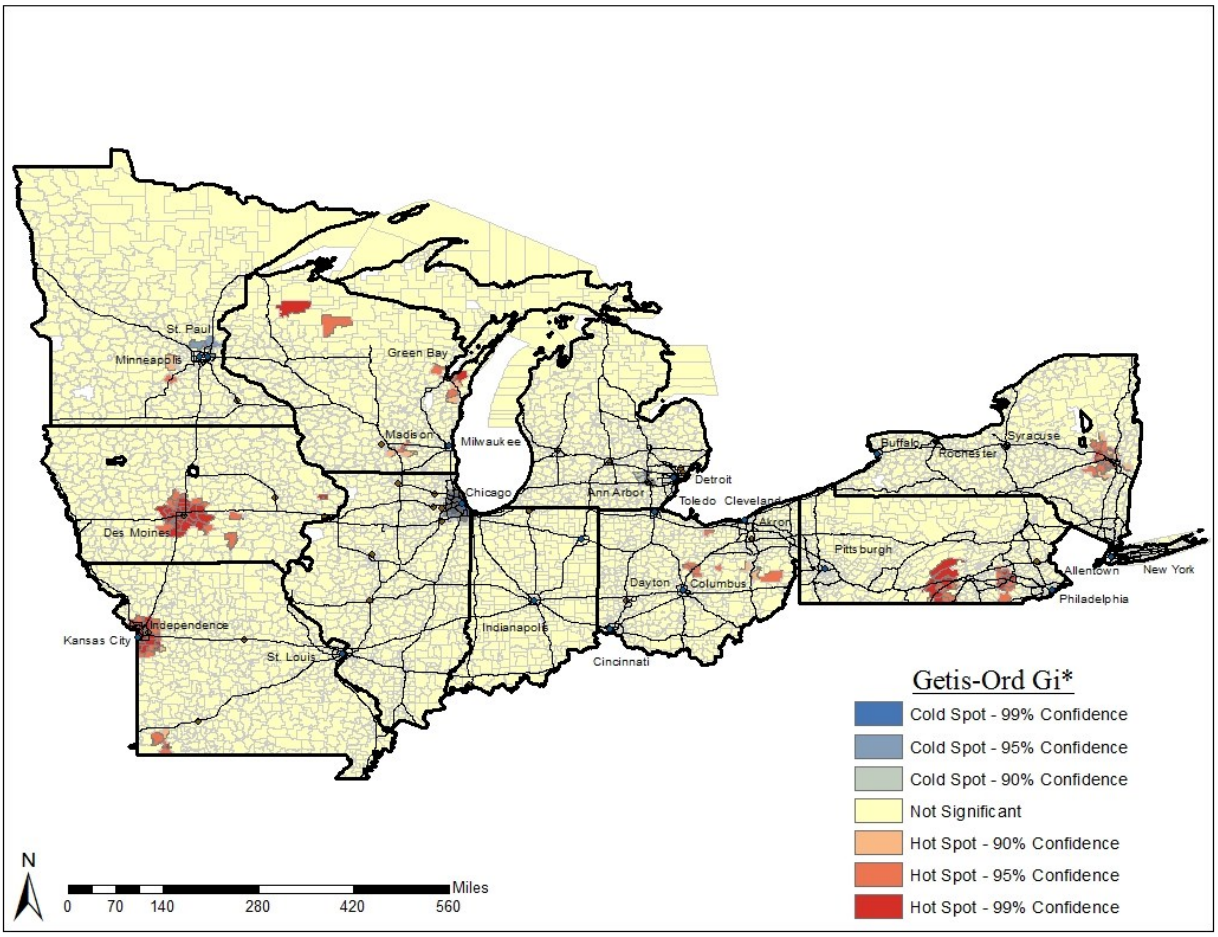

Figure 8.1: Getis-Ord* Optimized Hot-spot Map

Compared to Figure 7.4, a very different picture emerges from the model attempting to predict new school construction. First, the school closure hot-spot analysis includes a mix of rural and urban spaces. Second, the school closure model under predicts a much wider regional area than is the case in the new school model. This indicates that potentially, school closure is either more contagious at the local/regional level or, more likely, that the process of school closure is being shaped by structures at scales different from the set of structures shaping new school production. New school production appears heavily concentrated within metropolitan areas.

Figure 8.2 and Figure 8.3 illustrate the significant difference in behavior that both processes exhibit across the United States. These maps are both generated from the empty models for closed

schools and new schools. Figure 8.3 was missing data for a number of states. However, the geographic concentration of new schools relative to closed schools is still apparent, with the extraordinary exception of Florida.[68]

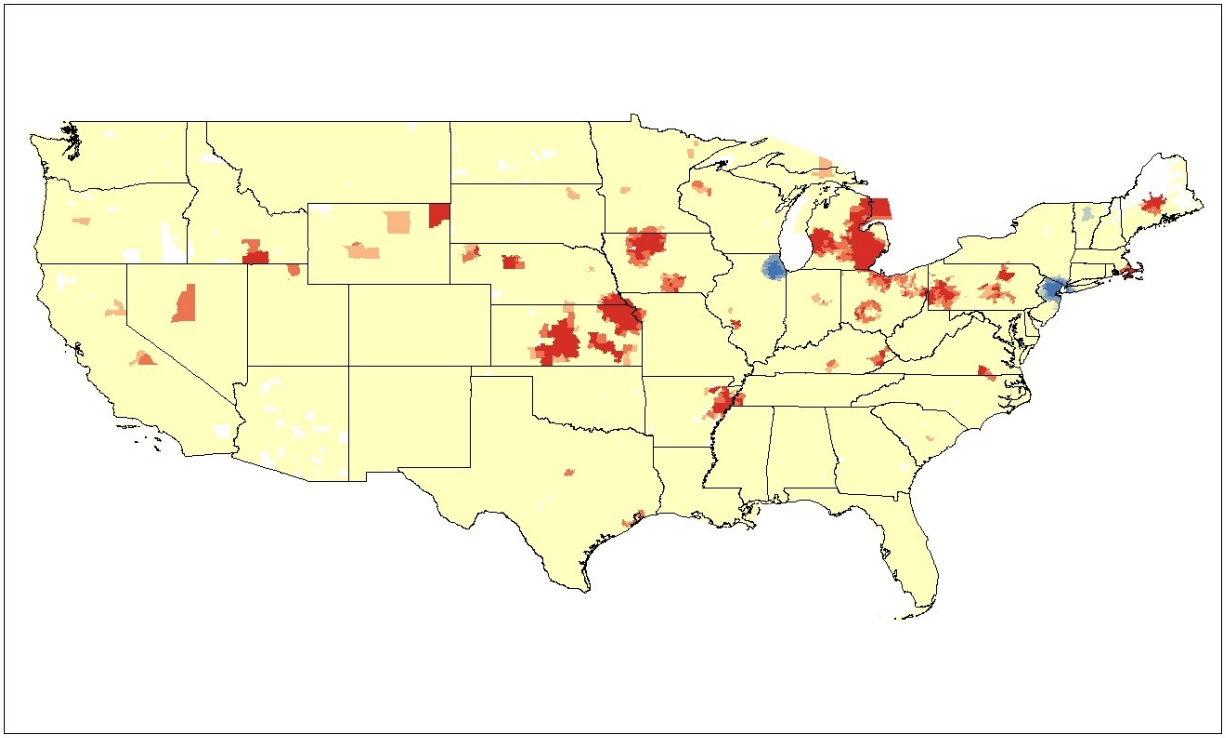

Figure 8.2: School Closure Map of Getis-Ord Gi* (Empty Model)

[68] The curious case of Florida represents another clear avenue for further research. One potential source for this substantially different behavior is that most (if not all) school districts in Florida are consolidated in individual counties.

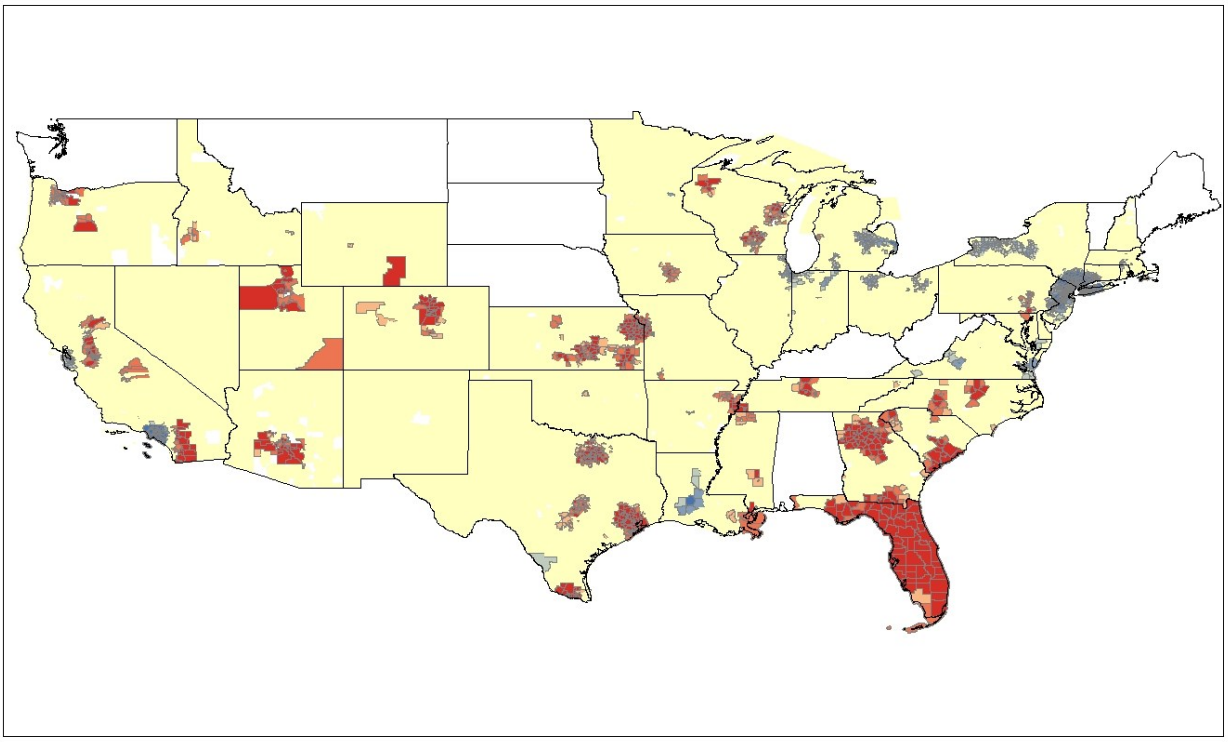

Figure 8.3: New School Map of Getis-Ord Gi* (Empty Model)

8.3 Circulation of Access

This chapter has examined the differences between schools that close and schools that are new. The analysis has attempted to clarify the differences between them across a range of factors, including their spatial distributions. Clear and substantial differences have been identified. The results suggest a story that is consistent with David Harvey's (1983) "spatial fix," which he has since written was, "to describe capitalism's insatiable drive to resolve the inner crisis tendencies by geographical expansion and geographical restructuring" (Harvey, 2001).

School closure disproportionately impacts low-income and minority students of color. The school closure process is primarily, if not ultimately, an urban process, and it has been accelerating since 2007. Schools in closer proximity to the metropolitan principle cities are increasingly likely to close. Of those urban schools, they tend to disproportionately be charter schools with low

enrollments. However, the process has been somewhat diffuse locally; it appears to be somewhat contagious in concentrated regions of the country.

New schools, on average, are not placed in the same geographic area as the school they are replacing. Instead, these schools are located in urbanized areas seeking to achieve economies of scale. In this pursuit of economies of scale (and simply following the structures of global capital) these new schools help far fewer low-income students. In addition, new schools are predominantly located in school districts that do not face significant competition, are overwhelmingly charter schools, and have slightly higher enrollments on average. Finally, the spatial distribution of new schools is dramatically different from the distribution of closed schools. New schools are highly concentrated in population centers, whereas schools that close are located in a more diffuse pattern.

Overall, these findings paint a revised school closure narrative. Schools in poor income neighborhoods are removed for the benefit of spaces (and people) that are more congruent with the dominant form of capital. The next chapter attempts to weave together the various strands of this narrative developed thus far in this project.

CHAPTER 9

ANSWERING THREE QUESTIONS, ASKING MANY MORE

This dissertation set out to answer three questions about the social dilemma of public school closure in America between 2007 and 2012. First, what are the most important socio-economic factors associated with school closure? Second, are school districts influenced by their neighbors in making school closure decisions? And third, does the spatial organization of cities play a role in shaping school closure outcomes? The remainder of this chapter answers each questions, addresses a few others, and finishes with a discussion of limitations and next steps.

9.1 Factors Associated with School Closure

School closure is a complex process. Model (6.4) provides the full estimation of the model developed using the IAD framework. The full set of hypotheses is seen below in Table 9.1 along with an indication of the model's support for the hypothesis. Using the results from Tables 6.4, I can now address the model's support for each of the first three explanations for school closure: race and class, efficiency/rationality, and geography.

This project finds strong support for the explanation that school closure is a race- and class-based process. The single most consistent factors across model specification are that a one percent increase from the average of a school's share of its population that is Black or low-income will increase that school's probability of closing by approximately 1.5 percent. In addition, the hypothesis is further supported by the impact of an increase in the overall degree of homogeneity within a school. As the HHI rises (suggesting increased homogeneity within the school), the probability of that school closing also increases. Finally, both of these results are reinforced in Table 6.3. Schools that close have statistically significantly higher proportions of both students of color and students that are low-income when compared to schools that remain open.

Overall, the efficiency hypothesis finds mixed support here. It is clear that enrollment plays a major role in the school closure decisions. Low enrollments substantially increase the odds a school will close.

Table 9.1: Summary of IAD Hypotheses

Hypothesis Number	Hypothesis	Model (4) Results
H_1	School districts generating more local revenue per pupil will be less likely to close schools.	No support
H_2	School districts operating in ZIP codes with relatively higher counts of school districts (i.e. competitors) will be more likely to close a school.	Opposite effect
H_3	Schools located in Mercantile and Industrial cities will be more likely to close than schools in Corporate cities.	Industrial cities only (Model 5)
H_4	Schools with higher shares of African American students and/or Latino/Hispanic students will be more likely to close.	Black students only
H_5	Racial/Ethnic heterogeneity within a school will decrease its probability of closing.	Supported
H_6	Schools with higher rates of free and reduced lunch will be more likely to close.	Supported
H_7	Schools located in large central cities have a higher probability of closing.	Partial support
H_8	School Districts that receive higher shares of Title I funding will be more likely to close a given school.	Support
H_9	School districts where federal funds constitute a relatively higher share of overall district revenue will be more likely to close a given school.	Opposite effect
H_{10}	Schools that witness large declines in enrollment over time are more likely to be closed by a School District.	Support
H_{11}	School districts in states that permit open enrollment will be more likely to close schools than districts in non-open enrollment states.	No support but Republican is significant.
H_{12}	School districts that have relatively higher expenses on student transportation, building maintenance, capital investments, and instructional staff are more likely to face higher financial burdens and will be more likely to close schools.	Support for Teacher salaries per pupil
H_{13}	School districts that are relatively less bureaucratic will be more likely to close schools than districts that are more bureaucratic.	Support
H_{14}	School district idiosyncrasies are important factors shaping the school closure process and must be accounted for.	Support. The ICC is nearly 41 percent.

However, the efficiency measures are largely targeted at the school district level. Of the three Lerman factors, only teacher pay per pupil was positively correlated to school closure. In a similar vein, as districts increase their debt service levels, the odds of that district closing a school increases. However, a number of factors that would typically be associated with efficiency/rationality concerns

generate unexpected outcomes. Districts that are more bureaucratic are less likely to close schools, which is consistent with the Robinson thesis but runs counter to conventional wisdom. One plausible interpretation here is that these districts are more competently managed. Also surprising, as the average enrollment per building rises, districts are more likely to close a school. This again though may be interpreted somewhat differently. If average capacity is increasingly high, that means some schools on are overcrowded while others are under capacity. Such districts may seek to consolidate schools to take advantage of economies of scale and/or more efficiently use facilities that are under capacity. Finally, another somewhat confusing result is that districts in ZIP codes with more school districts are less likely to close schools. This factor explores the concept of polycentricity proposed by Ostrom, Tiebout, and Warren (1961). In fact, this finding supports their claim. If it is assumed that closing schools is a less efficient outcome, then more competition appears to be more efficient. The efficiency hypothesis actually finds great support when predicting new school production. Here, the evidence is somewhat stronger that districts build new schools to achieve economies of scale. Districts that build new schools actually spend significantly less per pupil on student transportation and building maintenance.

The last explanation focuses on the role of geographic location on the school closure decision. In general, the view is that school closure is a process that disproportionately affects inner-cities (Lipman, 2015). In general, the results suggest unambiguously that school closure is an urban process. Schools in higher population areas such as towns, suburbs, and cities are nearly 30 percent more likely to close, on average, than their rural counterparts. However, this general support belies a surprise. Within urbanized areas, the risk of school closing actually runs away from central cities. The highest odds of school closure are associated with towns, followed by suburban locations, and finally principal cities. Consequently, the geographic narrative is somewhat more nuanced. Research projects focusing on case studies of large-scale central city school closings seemingly overstate the generality of this outcome.

This analysis also clearly identified an important geographic pattern in schooling across America. Schools are closing in urban areas but are being built up in the urban periphery. Here, these schools are larger, more racially and ethnically diverse, but they unambiguously serve fewer low-income students. This geographical analysis reinforces the narrative that school closure is a class-based process.

The factors with the strongest association to school closure decisions suggest multiple paths to school closure (Fitzpatrick, 2005). Socioeconomic status plays an important role. Low enrollment, low-income, and schools with higher shares of students of color are more likely to close. Districts that are more professionally managed and face greater competition tend to close fewer schools. However, districts that pay teachers more per pupil have higher odds of closing. Within this vein, charter schools play a particularly interesting role. Individual charter schools are substantially more likely to close than non-charter schools, on average (the odds ratios range from 17-30 percent). However, new schools are over three times more likely to be charter schools than non-charter schools. This represents an apparent disconnect between policy and the outcomes being generated. It merits further exploration. Finally, urban schools are more likely to close than rural schools, but schools on the urban periphery are more likely to close than schools in the urban core. School districts themselves play a major role.

9.2 Is School Closure Contagious?

This project sought to understand what role, if any, spatial proximity plays in shaping school district decisions to close schools. To answer the question, the district-specific residuals were mapped and evaluated for two types of spatial association: global and local dependence. If school districts do influence one another, then school closure decisions should be clustered in space. First, I tested for global spatial dependence using a Bayesian Hierarchical Poisson model with a Conditional Autoregressive (CAR) prior. The results were clear; school closure is not a globally spatial process. It does not spread throughout the entire geography in question. Rather, its impacts dissipate quickly

over space. Then, I utilized disease mapping techniques from epidemiology to evaluate the role of local spatial dependence. Here, using Geographic Information Systems (GIS) tools I estimated the Getis-Ord Gi* (optimized). The results demonstrate that school closure is a locally spatial process. Adjacent school districts do behave similarly to one another. This raises several important questions regarding the local networks (economic, social, and spatial) that structure local public service provision.

Changes to service networks in neighboring geographies can adversely affect one another, either physically or through social networks. The ICA literature provides an important future connection. Local spatial dependence implies that school closure is a collective action dilemma. In fact, figures 7.4 and Appendix A-3 illustrate that these spatial relations are largely structured at the metropolitan level. Existing governance institutions may prove useful coordinating mechanisms for this collective challenge.

9.3 Does Spatial Organization of Cities Matter?

This project emphasizes the role of socially produced space in structuring the school closure outcomes under exploration. Its thesis is that cities are spatially organized to meet the needs of a specific type of capital accumulation. However, over time a city's urban form becomes out-of-sync with current forms of wealth generation. As capital seeks out new spaces to shape to its needs, older cities become potential targets for redevelopment, assuming their conditions for redevelopment also meet the needs of capital accumulation a la Harvey (1983).

Model (6.5) finds that schools located in cities that were classified as Industrial had almost 90 percent higher odds, on average, of closing than cities coming of age between 1940 and 1970; however, the relation between the classification system used and the actual infrastructure within those cities is tenuous. The classification scheme developed by Watkins (1981) relies solely on population growth rates. It does not take into account the actual organization of space within those cities.

Hence, interpretation of the industrial cities variable must be done with caution. However, this result does provide enough evidence to suggest this is an important area of future research.

9.4 Discussion and Next Steps

This project has made several contributions to the study of school closure in America. Importantly, it provides a future research agenda with a substantial and expanding data set. However, there are three contributions that I would like to address specifically.

The first contribution involves the hypothesis that urban form is structuring the school closure process. Cities classified as industrial were particularly hard-hit by school closure. The objective of the Watkins classification system is to argue that urban form specifically plays a role in the process of school closure. This finding makes an important connection between the production and reproduction of social space and school board decision-making. In particular, it suggests future work needs to focus on understanding the local structures that govern the land development process (e.g. zoning codes, building codes, infrastructure design standards, etc.). Although the results are consistent with the theory outlined in this chapter, the classification system is not specific enough to offer such a certain interpretation. Future work should update the Watkins classification system to address the potential for cities themselves to have been remade under forms of capital post 1970. An additional effort in this vein should develop an improved classification scheme that truly takes a city's layout into effect. GIS offers a potential tool to help construct and ultimately implement such a process. In addition to the significance and magnitude of the urban classification scheme, additional work needs to take place regarding the adjacent action situation of housing and the local structures that shape housing decisions. As Figure 4.2 indicates, there are important interactions here that need to be considered. It also suggests an important opportunity to discuss coordination between cities and school districts.

The second contribution outlines a spatial pattern in the closure of schools and the reallocation of that resource away from core urbanized areas to metropolitan suburban districts. Moreover, it

introduces researchers in this field to disease mapping techniques developed by epidemiologists. These methods can be extremely helpful in identifying "sick" regions (e.g. hot spots) or areas that are just behaving strangely (e.g. cold spots). This method also helps to further the institutional research related to this project, which brings me to the final contribution.

The last contribution I will discuss here is the application of the IAD framework as a tool to further applied heterodox economic theory. In particular, there appear to be strong potential and useful connections between the IAD framework and the Social Fabric Matrix developed by Prof. Gregory Hayden.[69] Future efforts should seek to develop a bridge between these two elements.

Many important questions remain unaddressed and many more questions emerged from this analysis generally. There are two important directions that I am most eager to pursue. Recent work on spatio-temporal models has advanced them substantially to the point they are now more widely available to applied researchers. Specifically, the R package INLA (Integrated Nested Laplace Approximation) offers a viable method to further assess the local influence of districts on one another in space and through time. For example, one hypothesis may be that school closures in one district feedback on the resource base of another district, but this feedback may occur in a temporal autoregressive fashion. Second, there is increasing work being done to integrate social network analysis and spatial methods. These two approaches utilize similar research structures to evaluate levels of influence. One question that arose during background qualitative discussions was the role of superintendents in this process. Being boundedly rational, school district boards focus primarily on what staff identify as a policy issue. Consequently, superintendents may have significant power in framing the school closure process and subsequent outcomes. A secondary, but perhaps even more important question is to assess the level of cooperation between school districts and the communities they serve. In states like Iowa, school districts and local governments are separate but equal levels of government. Hence, one does not require authorization from the other to make decisions. This too

[69] In particular, there seems to be a likely connection in Ostrom's notion of hierarchal rules-in-use and Hayden's notion of information deliveries between actors.

can create coordination problems as indicated in Figure 4.2. Examining the level of cooperation between these two local governments and its role in the school closure process would further the school closure narrative in substantive and meaningful ways.

School closing is a disruption to the social fabric of impacted neighborhoods, schools, and parents, and students. I experienced this first-hand in 2011 as the Cedar Rapids Community School District closed a local elementary school, displacing more than 240 students. The school was located in one of the poorest and most racially diverse neighborhoods in the city. Over 60-percent of students were from racial or ethnic minorities, with 40-percent being black.[70] Enrollments in the school had actually been growing. But, the student population was relatively poor. Over 88-percent of students at the school were eligible for free and reduced lunch, compared to a statewide average of 34-percent. The public purpose behind this action was, according to the District Superintendent, to save $1 million per year out of a $211 million operating budget, less than 0.05-percent of the District's operating budget.[71]

The framing of the school closure decision was grounded in the goal of efficiency. Capacity utilization was the bell weather. The District even engaged in a thorough review of enrollments and trends beginning in 2008. That review, however, took place in isolation from the local government. In my view, this social dilemma stems from the lack of coordination between school districts and the local governments they operate within. It is entirely possible for these organizations to coordinate through a formal mechanism that ensures adequate and early information regarding enrollments and resource needs within school catchment areas. Local government actors are also boundedly rational. They are largely attention driven. Consequently, there needs to be a mechanism that requires their attention when necessary. A formal process of regular review between local government and local school districts can provide that function. Declining enrollments would not only be an indication to

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[70] Polk Elementary was a regular public school within the Cedar Rapids Community School District. The data pertaining to it are taken from: http://www.publicschoolreview.com/polk-elementary-school-profile/52402.

[71] http://www.kwwl.com/story/17134655/cedar-rapids-school-board-to-vote-on-possible-school-closure, accessed Nov. 14, 2016.

the District that extra attention was required. Local governments may also see declining enrollments as a call for renewed attention for the school's neighborhood. Focusing city staff's attention on the area could result in renewed public investment in the community, neighborhood planning efforts, zoning policies, and generally, increased community building efforts. These are low-cost efforts through a low-cost formal process of monitoring and coordination between two of the largest land-holders in every city in America. The benefits of this practice could greatly reduce the number of school closings, and for those that do eventually close, a coordination mechanism could ensure that affected families and students were aware of the situation well in advance. Potentially, it could make the wrenching experience of school closure less frequent and more bearable. All in all, it would be a welcome result.

This project represents a small step forward into a very complicated social world. Through a better understanding of the role of social space in our daily lives – and the structures that govern its use – it is my hope that well-intentioned acting organizations can begin to coordinate effectively to change the primary structures governing school closure at the local level.

APPENDIX A

SCHOOL DISTRICT EXPENDITURE DISTRIBUTIONS

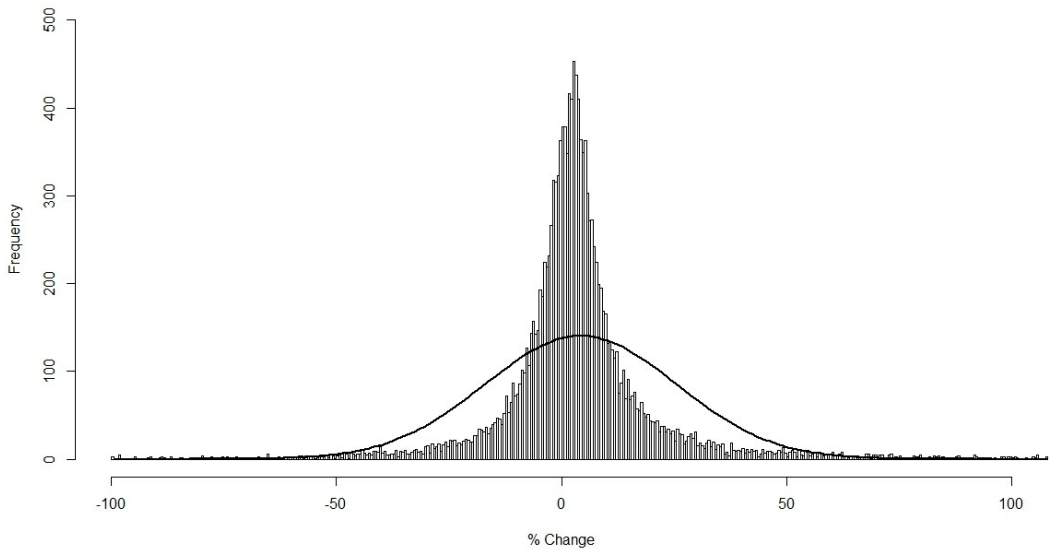


Figure A1: Changes in District Expenditures (2008-2009)

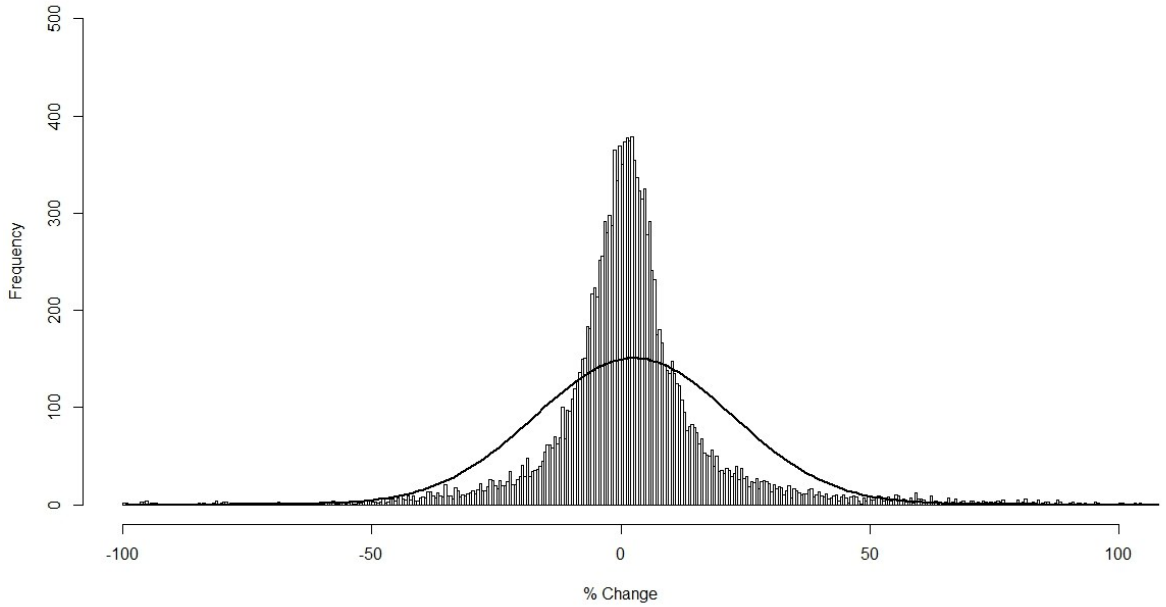


Figure A2: Changes in District Expenditures (2009-2010)

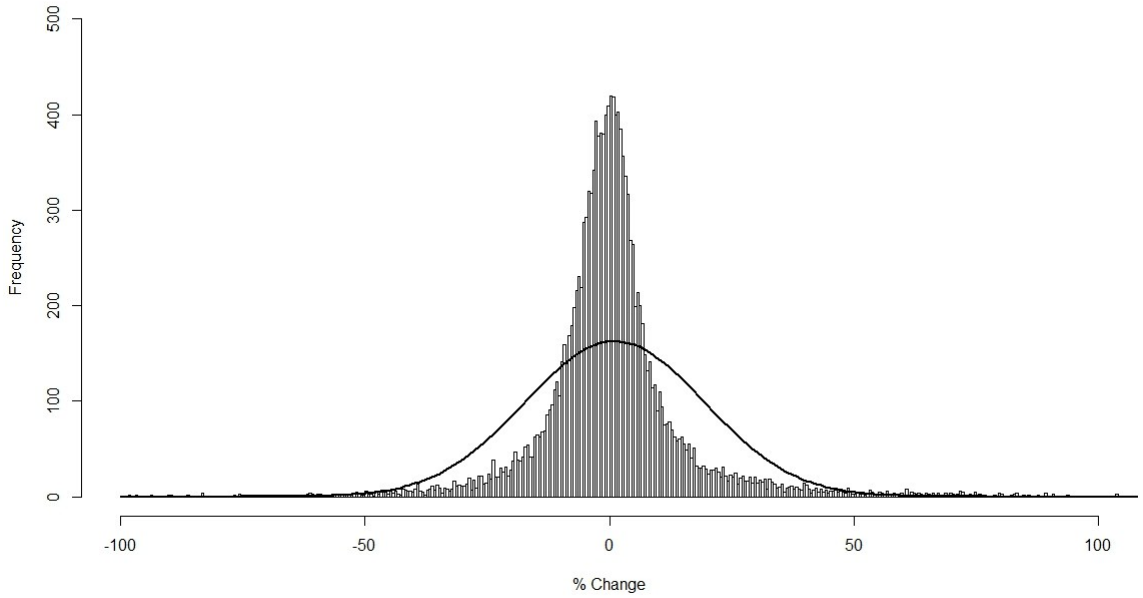


Figure A1.3: Changes in District Expenditures (2010-2011)

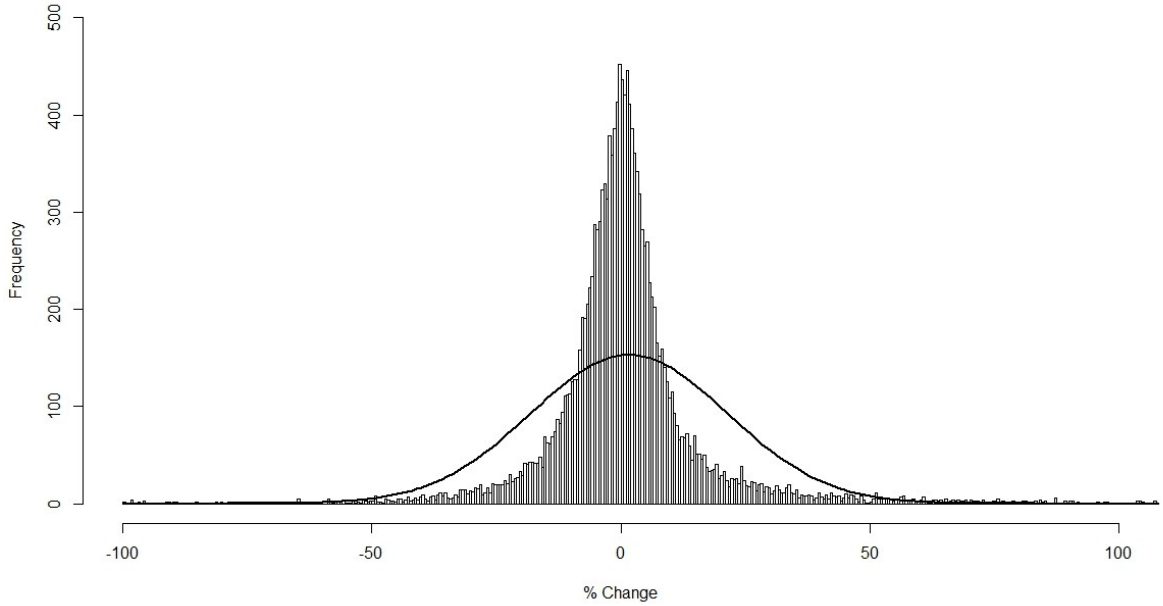
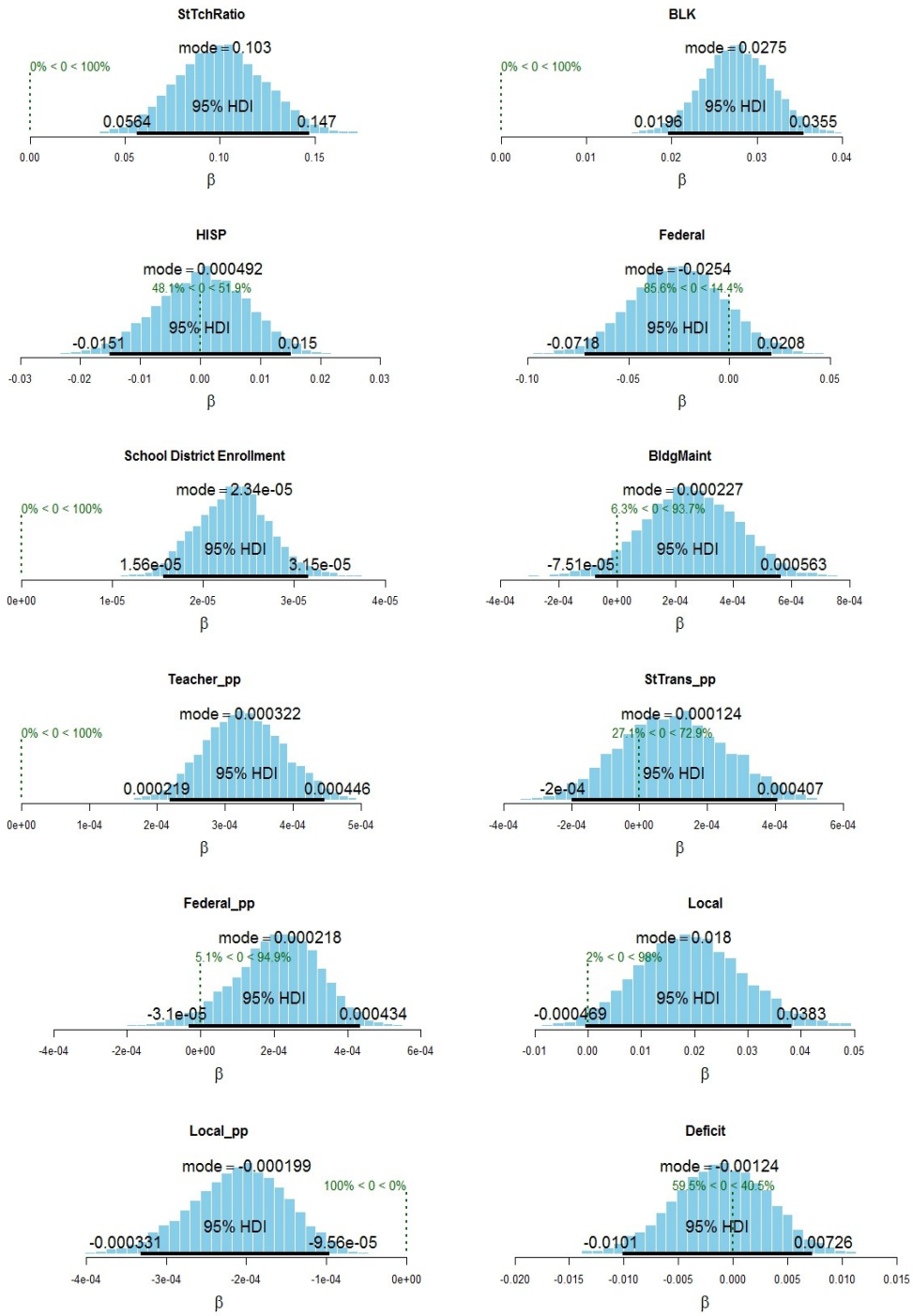


Figure A4: Changes in District Expenditures (2011-2012)

APPENDIX B

POSTERIOR DISTRIBUTIONS



APPENDIX C

MODEL COMPARISON

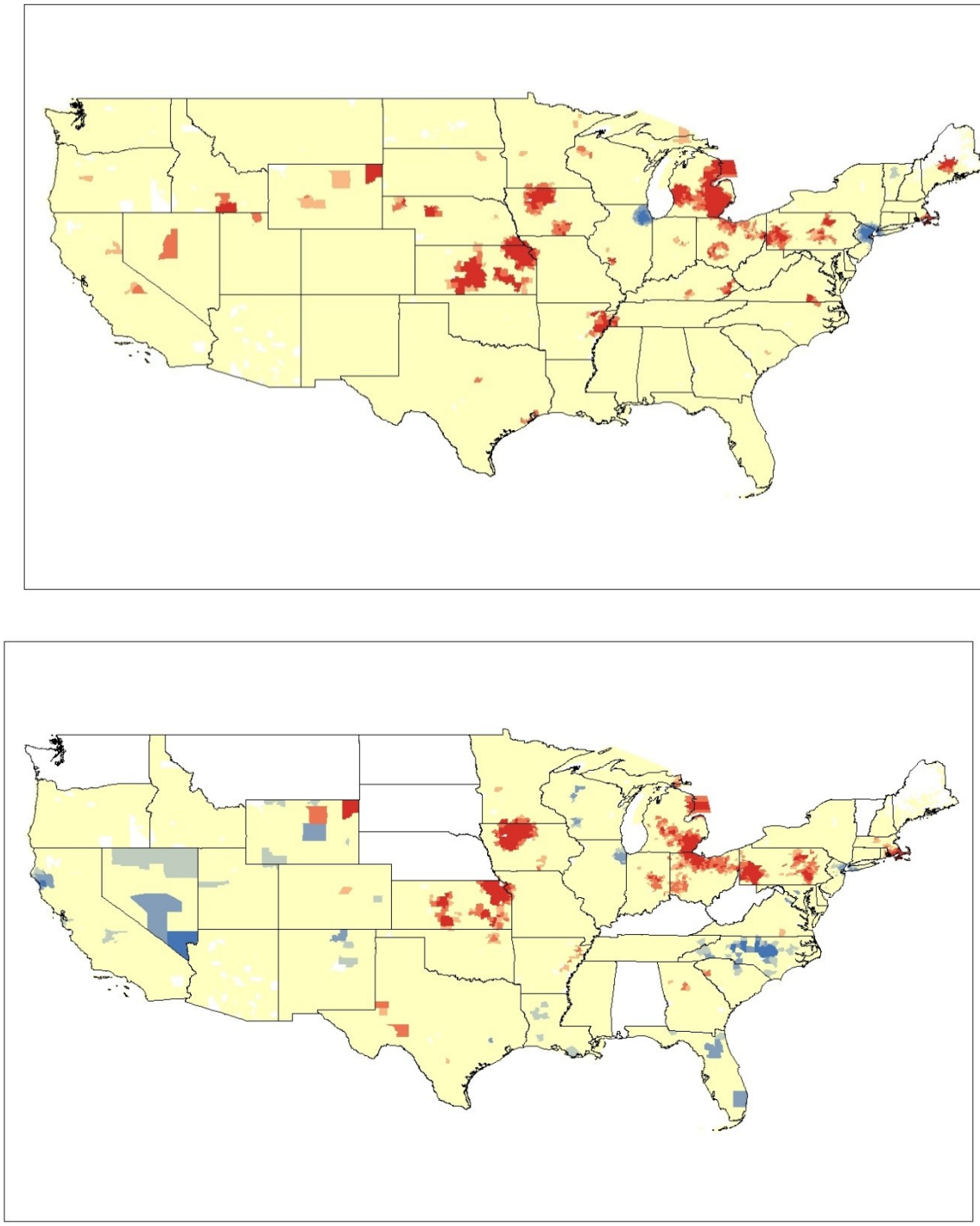


Figure C1: Closed School "Risk"

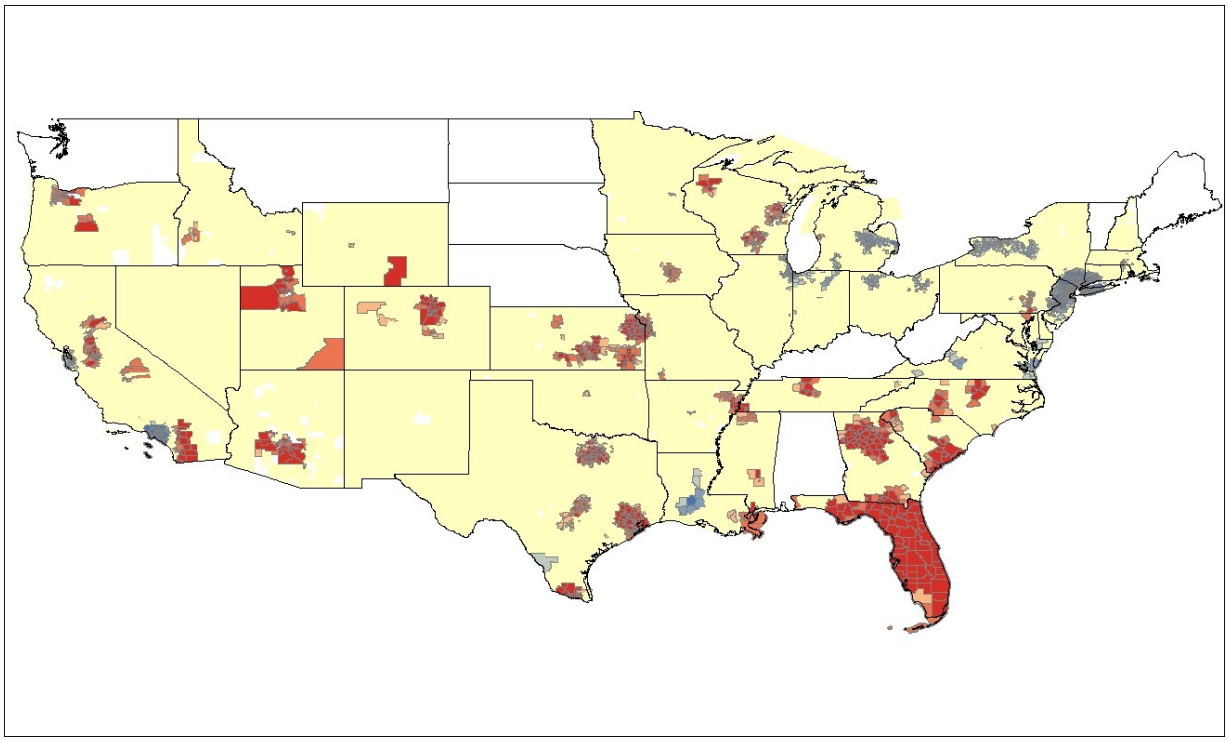


Figure C2: New School "Risk"

This map illustrates the likelihood that a school district will construct a new school over the six-year period. It is the equivalent of estimating model 6.1 on new school production. If a district is shaded red, it suggests the number of new schools produced in the district was higher than was expected by the model. Areas in blue indicate districts that produced fewer new schools than the model predicted.

BIBLIOGRAPHY

Althusser, L., Balibar, E., Establet, R. Macherey, P., & Ranciere, J. (1965[2015]). *Reading capital: The complete edition*. New York: Verso.

Andrews, M., Duncombe, W., & Yinger, J. (2002). Revisiting economies of size in American education: Are we any closer to a consensus? *Economics of Education Review, 21*(3), 245-262.

Andrews, R. L. (1974). *The environmental impact of school closures.* University of Washington. Education & Welfare National Institute of Education. (ED112521)

Anselin, L. (1988). Spatial econometrics: Methods and models. Dordrecht: Springer Science+Business Media Dordrecht

Anselin, L. (1995). Local indicators of spatial association - LISA. *Geographical Analysis, 27*(2), 93-115.

Archer, M. (1995). *Realist social theory: The morphogenetic approach.* Cambridge: CUP.

Archer, M. (1996). *Culture and agency: The place of culture in social theory.* New York: Cambridge University Press.

Arsen, D., & Ni, Y. (2012). The effects of charter school competition on school district resource allocation. *Educational Administration Quarterly, 48*(1), 3-38.

Arsen, D., Plank, D. N., & Sykes, G. (2002). School choice policies: How have they affected Michigan's education system? *Working Paper*, 1-39. The Education Policy Center at Michigan State University.

Arvanitidis, P. A. (2006). A framework of socioeconomic organisation: Redefining original institutional economics along crtical realist philosophical lines. *Discussion Paper Series, 12*(6), 101-128.

Arvanitidis, P. A. (2015). *The economics of urban property markets.* New York: Routledge.

Ayala, J., & Galletta, A. (2012). Documenting disappearing spaces: Erasure and rememberance in two high school closures. *Peace and Conflict: Journal of Peace Psychology, 18*(2), 149-155.

Bali, V. A., & Alvarez, R. M. (2004). The race gap in student achievement scores: Longitudinal evidence from a racially diverse school district. *The Policy Studies Journal, 32*(3), 393-415.

Basu, R. (2004). A Flyvbjergian perspective on public elementary school closures in Toronto: A question of `rationality' or `power'? *Environment and Planning C: Government and Policy, 22*(3), 423-451.

Basu, R. (2007). Negotiating acts of citizenship in an era of neoliberal reform: The game of school closures. *International Journal of Urban and Regional Research*, 31(1), 109-127.

Besag, J., York, J., & Mollie, A. (1991). Bayesian image restoration with two applications in spatial statistics. *The Annals of the Institute of Statistics and Mathematics, 43*(1), 1-59.

Bhaskar, R. (1978). *A realist theory of science.* Hemel Hempstead: Harvestor Press (1st Edition Leeds 1975).

Bhaskar, R. (1989). *Reclaiming reality.* London: Verso.

Bifulco, R., & Reback, R. (2011). *Fiscal impacts of charter schools: Lessons from New York.* New York State Education Department. Albany: The Education Finance Research Consortium.

Billger, S. M. (2010). Demographics, fiscal health, and school quality: Shedding light on school closure decisions. *IZA Discussion Papers, No. 4739*, 1-27.

Billger, S. M., & Beck, F. D. (2009). The determinants of high school closures: Lessons from longitudinal data throughout Illinois. *IZA Discussion Papers, No. 4641*, 1-21.

Bogart, W. T., & Cromwell, B. A. (2000). How much is a neighborhood school worth? *Journal of Urban Economics, 47*(2), 280-305.

Bohtke, J. (2001). School bureaucracy and student performance at the local level. *Public Administration Review, 61*(1), 92-99.

Bondi, L. (1987). School closures and local politics: the negotiation of primary school rationalization in Manchester. *Political Geography Quarterly, 6*(3), 203-224.

Bondi, L. (1988). Political participation and school closures: An investigation of the bias in local authority decision making. *Policy and Politics, 16*(1), 41-54.

Bondi, L. (1989). Selecting schools for closure: Theory and practice in 'rational' planning. *Journal of Education Policy, 4*(2), 85-102.

Borman, G. D., & Dowling, M. (2010). Schools and inequality: A multilevel analysis of Coleman's equity of educational opportunity data. *Teachers College Record, 112*(5), 1201-1246.

Bowles, S., & Gintis, H. (2011). *Schooling in capitalist America: Educational reform and the contradictions of economic life.* Chicago: IL: Haymarket Books.

Boyd, W. L., & Wheaton, D. (1983). Conflict management in declining school districts. *Peabody Journal of Education, 60*(2), 25-36.

Brummet, Q. (2012). The effect of school closings on student achievement. Michigan State University Buchanan, J. (1965). An economic theory of clubs. *Economica, 32*(125), 1-14.

Busemeyer, M. R. (2007). Determinants of public education spending in 21 OECD democracies, 1980-2001. *Journal of European Public Policy, 14*(4), 582-610.

Bushouse, B. (1999). *The mixed economy of child care: An institutional analysis of nonprofit, for-profit, and public enterprises.* Unpublished dissertation. Bloomington: Indiana University

Bushouse, B. (2011). Governance structures: Using IAD to understand variation in service delivery for club goods with information asymmetry. *Policy Studies Journal, 39*(1), 105-119.

Bushrod, G. M. (1999). *School closure and its impact on community.* Unpublished dissertation. Ann Arbor, MI: University of Michigan.

Campbell, D. E., West, M. R., & Peterson, P. E. (2005). Participation in a national, means-tested school voucher program. *Journal of Policy Analysis and Management, 24*(3), 523-541.

Castells, M. (1979). *The urban question: A Marxist approach.* Cambridge: M.I.T. Press.

Chubb, J. E., & Moe, T. M. (1990). *Politics, markets, and America's schools.* Washington, DC: The Brookings Institution.

Churchill, R., & Carrington, V. (2000). Moving out and moving on: School closure and transition experiences of students, parents, and teachers. (pp. 1-19). Paper presented at the Annual Conference of the Australian Association for Research in Education, Sydney, 2-7 December.

Commons, J. R. (1931). Institutional economics. *The American Economic Review, 21*(4), 648-657.

Cuban, L. (1979). Shrinking enrolment and consolidation. *Education and Urban Society, 11*(3), 367-395.

Darity, W. J. (1992). A model of "Original Sin": Rise of the west and lag of the rest. *The American Economic Review, 82*(2), 162-167.

de la Torre, M., & Gwynne, J. (2009). *When schools close: Effects on displaced students in Chicago public schools.* Chicago: Consortium on Chicago School Research at the University of Chicago.

de la Torre, M., Allensworth, E., Jagesic, S., Sebastian, J., Salmonowicz, M., & Meyers, C. (2012). *Changes in student populations and teacher workforce in low-performing Chicago schools targeted for reform.* Chicago: Regional Educational Laboratory.

de la Torre, M., Gordon, M. F., Moore, P., & Cowhy, J. (2015). *School closings in Chicago: Understanding families' choices and constraints for new school enrollment.* Chicago, IL: The University of Chicago Consortium on Chicago School Research.

De Witte, K., & Van Klavermen, C. (2014). The influence of closing poor performing primary schools on the educational attainment of students. *Educational Research and Evaluation: An International Journal on Theory and Practice, 20*(4), 290-307.

Deeds, V., & Pattillo, M. (2015). Organizational "failure" and institutional pluralism: A case study of an urban school closure. *Urban Education,* 50(4), 474-504.

Doern, G. B., & Prince, M. J. (1989). The political administration of school closures: Administrators, trustees and community groups. *Canadian Public Policy, 15*(4), 450-469.

Dowdall, E. (2011). *Closing public schools in Philadelphia: Lessons from six urban districts.* Philadelphia: The PEW Charitable Trusts.

Downs, A. (1981). *Neighborhoods and urban development.* Washington, D.C.: Brookings Institution.

Duncombe, W., & Yinger, J. (2005, November). *Does school district consolidation cut costs?* Syracuse University. Syracuse, NY: Center for Policy Research.

Edel, M. (2013 [1992]). *Urban and regional economics: Marxist perspectives.* Philadelphia: Harwood Academic Publishers.

Elacqua, G., Martinez, M., Santos, H., & Urbina, D. (2012). School closures in Chile: Access to quality alternatives in a school choice system. *Estudios de Economia, 39*(2), 179-202.

Elhorst, J. P. (2014). *Spatial econometrics: From cross-sectional data to spatial panels.* Heidelberg, New York, Dordrecht, London: Springer.

Engberg, J., Gill, B., Zamarro, G., & Zimmer, R. (2012). Closing schools in a shrinking district: Do student outcomes depend on which schools are closed? *Journal of Urban Economics, 71*(2), 189-203.

Enomoto, E. K. (1977). Schools as nested communities: Sergiovanni's metaphor extended. *Urban Education, 32*(4), 512-531.

Feiock, R. C. (2013). The institutional collective action framework. *Policy Studies Journal*, 41(3), 397-425.

Finch, W. H., Bolin, J. E., & Kelley, K. (2014). *Multilevel modeling in R.* Boca Raton: CRC Press, Taylor & Francis Group.

Finnigan, K. S., & Lavner, M. (2012). A political analysis of community infuence over school closure. *Urban Revolution, 44*, 133-151.

Fitzpatrick, S. (2005). Explaining homelessness: A critical realist perspective. *Housing, Theory and Society, 22*(1), 1-17.

Florida, R. (2005, October). The world is spiky: Globalization has changed the economic playing filed but hasn't leveled it. *The Atlantic Monthly*, pp. 48-51.

Friedman, T. (2007). *The world is flat: A brief history of the 21st Century.* New York: Picador.

Gehlke, C. E., & Biehl, K. (1934). Certain effects of grouping upon the size of the correlation coefficient in census tract material. *Journal of the American Statistical Association, 29*(185A), 169-170.

Gelman, A., & Hill, J. (2007). *Data analysis using regression and multilevel/hierarchical models.* New York : Cambridge University Press.

Gelman, A., & Rubin, D. B. (1992). Inference from iterative simulation using multiple sequences. *Statistical Science*, 7(4), 457-472.

Getis, A., & Ord, K. (1992). The analysis of spatial association by use of distance statistics. *Geographical Analysis,* 24(3), 189-206.

Giddens, A. (1984). *The constitution of society.* Cambridge: Polity Press.

Gordon, D. M. (1977). Class struggle and the stages of American urban development. In D. C. Perry & A.J. Watkins (Eds.), *The rise of the sunbelt cities.* (pp. 55-82). Beverly Hills, CA: Sage Publications.

Gorski, P. S. (2013). What is critical realism? And why should you care? *Contemporary Sociology, 42*(5), 658-670.

Gotham, K. F. (2002). *Race, real estate, and uneven development: The Kansas City experience, 1900-2000.* Albany, NY: State University of New York.

Greene, A. M. (2008). An examination of Tiebout sorting and residential segregation through a racialized lens. *Conneticut Public Interest Law Journal, 8*(1), 135-170.

Gruchy, A. (1987). *The reconstruction of economics: An analysis of the fundamentals of institutional economics.* New York: Greenwood Press.

Harvey, D. (1982). *The limits to capital.* New York, NY: Verso.

Harvey, D. (2001). Globalization and the "spatial fix". In B. Belina (Ed.), *Marxism in Geography* (pp. 23-30). Potsdam.

Harvey, D. (2009). *Social justice and the city: A revised edition.* Athens, GA: University of Athens Press.

Harvey, D. (2015). *Seventeen contradictions and the end of capitalism.* London: Profile Books Ltd.

Hays, S. P. (1964). The politics of reform in municipal government in the progressive era. *The Pacific Northwest Quarterly, 55*(4), 157-169.

Hooghe, L., & Marks, G. (2003). Unraveling the central state, but how? Types of multi-level governance. *American Political Science Review, 97*(2), 233-243.

Hursh, D. W. (2015). *The end of public schools: The corporate reform agenda to privatize education* . New York: Routledge.

Jack, J., & Sludden, J. (2013). School closings in Philadelphia. *The University of Pennsylvania Graduate School of Education's Online Urban Education Journal, 10*(1), 1-7.

Jessop, B. (2008). *State power: A strategic-relational approach.* Cambridge: Polity Press.

Johnson, H. M. (1978). School closure: How much impact on the community. *Phi Delta Kappan, 58*(5), 357-359.

Jones, B. D. (1999). Bounded rationality. *Annual Review of Political Science, 2*, 297-321.

Jones, B. D. (2003). Bounded rationality and political science: Lessons from public administration and public policy. *Journal of Public Administration Research and Theory, 13*(4), 395-412.

Jones, B. D., & Baumgartner, F. R. (2005). A model of choice for public policy. *Journal of Public Administration Research and Theory, 15*(3), 325-351.

Jones, B. D., Baumgartner, F. R., & True, J. L. (1998). Policy punctuations: U.S. budget authority, 1947-1995. *The Journal of Politics, 60*(1), 1-33.

Jones, B. D., Sulkin, T., & Larsen, H. A. (2002). *Policy punctuations in American political institutions.* University of Washington, Department of Political Science. Seattle, WA: Center for American Politics and Public Policy.

Katznelson, I. (1994). *Marxism and the city (Marxist introductions).* New York: Oxford University Press.

Kearns, R. A., Lewis, N., McCreanor, T., & Witten, K. (2009). 'The status quo is not an option': Community impacts of school closure in South Taranaki, New Zealand. *Journal of Rural Studies, 25*, 131-140.

Kirshner, B., & Pozzoboni, K. (2011). Student interpretations of school closure: Implications for student voice in equity-based school reform. *Teachers College Record, 113*(8), 1633-1667.

Kirshner, B., Gaertner, M., & Pozzoboni, K. (2010). Tracing transitions: The effect of high school closure on displaced students. *Educational Evaluation and Policy Analysis, 32*(3), 407-429.

Kiser, L. L., & Ostrom, E. (2000). The three worlds of action: A metatheoretical synthesis of institutional approaches. In M. D. McGinnis (Ed.), *Polycentric games and instiutions: Readings from the workshop in political theory and policy analysis* (pp. 56 - 89). Ann Arbor: The University of Michigan Press.

Knoke, D. (1982). The spread of municipal reform: Temporal, spatial, and social dynamics. *American Journal of Sociology, 87*(6), 1314-1339.

Kruschke, J. K. (2014). *Doing Bayesian data analysis, second edition: A tutorial with R, JAGS, and Stan.* Waltham, MA: Academic Press, an imprint of Elsevier.

Lawson, T. (2003). *Reorienting economics.* New York, NY: Routledge.

Lee, D. (2011). A comparison of conditional autoregressive models used in Bayesian disease mapping. *Spatial and Spatio-temporal Epidemiology, 2*, 79-89.

Lee, D. (2013, November). CARBayes: An R package for Bayesian spatial modeling with conditional autoregressive priors. *Journal of Statistical Software, 55*(13), 1-24.

Lee, D., & Mitchell, R. (2012). Boundary detection in disease mapping studies. *Biostatistics, 13*, 415-426.

Lee, D., Rushworth, A., & Sahu, S. K. (2014). A Bayesian localized conditional autoregressive model for estimating the health effects of air pollution. *Biometrics, 70*, 419-429.

Lefebvre, H. (1970). *The urban revolution.* (R. Bononno, Trans.) Minneapolis, MN: University of Minnesota Press.

Lefebvre, H. (1974). *The production of space.* Cambridge, MA: Basil Blackwell Inc.

Lens, M. C., & Monkkonen, P. (2016). Do strict land use regulations make metropolitan areas more segregated by income? *Journal of the American Planning Association, 82*(1), 6-21.

Lerman, D. L. (1984). The economics of public school closings. *Journal of Urban Economics, 16*(3), 241-258.

LeSage, J., & Pace, R. K. (2009). *Introduction to spatial econometrics.* Boca Raton, FL: Taylor & Francis Group .

Lipman, P. (2011). *The new political economy of urban education: Neoliberalism, race, and the right to the city.* New York, NY: Routledge.

Lucas, B. G. (1982). A rural perspective, school closure and community protest. *McGill Journal 01 Education, 17*(3), 251-262.

Lyson, T. A. (2002). What does a school mean to a community? Assessing the social and economic benefits of schools to rural villages in New York. *Journal of Research in Rural Education, 17*(3), 131-137. (ED464777)

Massey, D. S., & Denton, N. A. (1993). *American appartheid: Segregation and the making of the underclass.* Cambridge, MA: Harvard University Press.

Meyer, J., Scott, R. W., & Strang, D. (1987). Centralization, fragmentation, and school district complexity. *Administrative Science Quarterly, 32*(2), 186-201.

Molotch, H. (1976). The city as a growth machine: Toward a political economy of place. *American Journal of Sociology, 82*(2), 309-332.

Moos, A., & Dear, M. J. (1986). Structuration theory in urban analysis: Theoretical exegesis. *Environment and Planning A, 18*(2), 231-252.

Morton, R. J. (2009). *School closures: Through the eyes of teachers. Dissertation.* Wichita, KS: Witchita State University.

Oncescu, J., & Giles, A. (2014). Rebuilding a sense of community through reconnection: The impact of a rural school's closure on individuals without school-aged children. *The Journal of Rural and Community Development, 9*(3), 295-318.

Ostrom, E. (1986). An agenda for the study of institutions. *Public Choice, 48*(1), 3-25.

Ostrom, E. (2010). Beyond markets and states: Polycentric governance of complex systems. *American Economic Review, 100*(3), 641-672.

Ostrom, E. (2011). Background on the institutional analysis and development framework. *Policy Studies Journal, 39*(1), 7-27.

Ostrom, V. (1999). Polycentricity. In M. D. McGinnis (Eds.), *Polycentricity and local public economies* (pp. 52-74). Ann Arbor: University of Michigan Press.

Ostrom, V., Tiebout, C. M., & Warren, R. (1961). The organization of government in metropolitan areas: A theoretical inquiry. *Political Science Review, 55*, 831-842.

Peirce, C. S. (1878 [1992]). How to make our ideas clear. In N. Houser, & C. Kloesel (Eds.), *The Essential Peirce* (Vol. 1, pp. 124-141). Bloomington, IN: Indiana University Press.

Pentland, A. (2014). *Social physics: How good ideas spread - the lessons from a new science.* New York, NY: The Penguin Press.

Phipps, A. G. (1993). An institutional analysis of school closures in Saskatoon and Windsor. *Environment and Planning A, 25*, 1607-1626.

Polski, M. M., & Ostrom, E. (1999). *An institutional framework for policy analysis and design.* Bloomington, IN: Workshop in Political Theory and Policy Analysis.

Porter, E. (2012). *Closures and consolidation: Schools, farms, and population decline in rural Illinois.* Unpublished thesis. Illinois State University.

Post, D., & Stambach, A. (1999). District consolidation and rural school closure: E pluribus unum? *Journal ofResearch in Rural Education, 15*(2), 106-117.

Powell, W. W., & Snellman, K. (2004). The knowledge economy. *Annual Review of Sociology, 30*, 199-220.

Raudenbusch, S., & Bryk, A. S. (1986). A hierarchical model for studying school effects. *Sociology of Education, 59*(1), 1-17.

Redding, S., & Rhim, L. M. (2014). Evolution of school turnaround. In S. Redding, & L. M. Rhim (Eds.), *The state role in school turnaround: Emerging best practices* (pp. 19-28). San Francisco, CA: WestEd. Retrieved from http://centeronschoolturnaround.org/wp-content/uploads/2013/12/Evolution_of_School_Turnaround1.pdf .

Resnick, S., & Wolff, R. (1987). *Knowledge and class.* Chicago: University of Chicago Press.

Resnick, S., & Wolff, R. (2004). Dialectics and class in Marxian economics: David Harvey and beyond. *The New School Economic Review, 1*(1), 91-114.

Rhode, P. W., & Strumpf, C. S. (2003). Assessing the importance of Tiebout sorting: Local heterogeneity from 1850 to 1990. *American Economic Review, 93*(5), 1648-1677.

Rothwell, J. T., & Massey, D. S. (2010). Density zoning and class segregation in U.S. metropolitan areas. *Social Science Quarterly, 91*(5), 1123–1143.

Samuelson, P. A. (1954). The pure theory of public expenditure. *The Review of Economics and Statistics, 36*(4), 387-389.

Santos, M. (1975). Underdevelopment, growth poles, and social justice. *Civilizations, 25, 18-30.*

Santos, M. (1977 [1985]). Spatial dialectics: The two circuits of urban economy in underdeveloped countries. *Antipode, 17*(2-3), 127-135.

Santos, M. (1977). Society and space: Social formation as theory and method. *Antipode, 9*(1), 3-13.

Sassen, S. (2000). *Cities in a world economy.* Sage Publications Ltd.

Sharkey, P. (2013). *Stuck in place: Urban neighborhoods and the end of progress toward racial equality.* Chicago: The Univeristy of Chicago Press.

Simon, H. A. (1945). *Administrative behavior.* New York: The Free Press.

Smith, N. (1984). *Uneven development: Nature, capital, and the production of space.* Oxford: Basil Blackwell.

Smith, N. (1996). *The new urban frontier.* New York: Routledge.

Soja, E. W. (1989). *Postmodern geographies: The reassertion of space in critical social theory.* New York: Verso.

Soja, E. W. (2010). *Seeking spatial justice*. Minneapolis, MN: University of Minnesota Press

Stone, R. (2001). Refusing the realism-structuration divide. *European Journal of Social Theory, 4*(2), 177-197.

Strang, D. (1987). The administrative transformation of American education: School district consolidation, 1938-1980. *Administrative Science Quarterly, 32*(3).

Tiebout, C. M. (1956). A pure theory of local expenditures. *The Journal of Political Economy, 64*(5), 416-424.

Tobler, W. R. (1970). A computer movie simulating urban growth in the Detroit region. *Economic Geography, 46*, 234-240.

Urquiola, M. (2005). Does school choice lead to sorting? Evidence from Tiebout variation. *American Economic Review, 95*(4), 1310-1326.

Valencia, R. (1984). *School closures and policy issues. Policy Paper No.84-C3.* Standford, CA: Stanford University, California Institute for Research on Educational Finance and Governance.

Valencia, R. (1985). Public school closures and policy issues: Financial and social implications. *Public Budgeting & Finance*(Spring), 43-53.

Veblen, T. B. (1899). *The theory of the leisure class.* New York, NY: MacMillan.

Watkins, A. J. (1980). *The practice of urban economics.* Beverly Hills, CA: Sage Publications.

Weatherly, R., Narver, B. J., & Elmore, R. (1983). Managing the politics of decline: School closures in Seattle. *Peabody Journal of Education, 60*(2), 10-24.

Wilson, W. (1887). The study of administration. *Political Science Quarterly, 2*(2), 197-222.

Wilson, W. J. (1987). *The truly disadvantaged: The inner city, the underclass, and public policy.* Chicago, IL: The University of Chicago Press.

Wilson, W. J. (2009). *More than just race: Being black and poor in the inner city.* New York, NY: W. W. Norton & Company.

VITA

Drew Evan Westberg was born on May 8th, 1983 in Marshalltown, Iowa. He attended Marshalltown Area Catholic Schools through sixth grade, after which he attended public schools for grades 7-12. He graduated from Marshalltown High School in the spring of 2001.

Dr. Westberg was admitted to Coe College in the fall of 2001. He graduated Magna cum Laude from Coe College in 2005 majoring in economics with a classical studies minor. From 2005 to 2007, Dr. Westberg was earning his Master's Degree from the University of Iowa in Urban and Regional Planning. During the second year of the program, he interned with the City of Iowa City working for Robert Miklo, the Senior Planner. This experience was transformational. Following graduation, Dr. Westberg started working for the City of Cedar Rapids as a Long-range Transportation Planner. For nine glorious months, Dr. Westberg was an urban planner. Then, on June 13th, 2008 the city was flooded; everything changed.

For the next four and one-half years, Dr. Westberg worked on flood recovery program administration. This gave him a front-row seat to the devastation wrought by this disaster, both in its wake and the long doldrums of flood recovery. This singular event changed the course of his life. During his time with the City, Dr. Westberg moved into public administration where served as the Special Assistant to the City Manager. This provided him with more exposure to the workings of local government. In the fall of 2011, Dr. Westberg applied for and was admitted into the PhD program at UMKC. He joined the program in the fall of 2012 and defended his dissertation four years later in May of 2016.

In the fall of 2014, Dr. Westberg joined Coe College as a Visiting Scholar in Economics. In 2015, he was hired for the full-time tenure track position. At Coe, he teaches a wide variety of courses ranging from the introductory Macroeconomics course to upper-level applied microeconomics courses. He also maintains an active research agenda. Dr. Westberg has two co-authored publications forthcoming in 2017 in Economic Development Quarterly and Nonprofit Policy Forum.

Dr. Westberg is married to Teale Burford, who teaches high school choir. They have a daughter, June, who was born April 10th, 2016.