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State-Led Housing Planning:
Rule Complexity and Implementation Trade-offs

DISSERTATION

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DOCTOR OF PHILOSOPHY

in Urban and Environmental Planning and Policy

by

Huixin Zheng

Dissertation Committee:
Associate Professor Nicholas J. Marantz, Chair
Professor Victoria Basolo
Associate Professor Jae Hong Kim

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Vita

Huixin Zheng

Education

2021 University of California, Irvine, School of Social Ecology
Doctor of Philosophy in Urban and Environmental Planning and Policy

2015 University of California, Los Angeles, Luskin School of Public Affairs
Master of Public Policy

2013 Sun Yat-sen University, Guangzhou, China, International School of Business and Finance
Bachelor of Business Administration

Publications

Zheng, H., Marantz, N. J., Kim, J.H., & Houston, D. (2021). Accessibility, Affordability, and the Allocation of Housing Targets to California's Local Governments. *University of California Institute of Transportation Studies Reports*.

Marantz, N. J., & Zheng, H. (2020). State Affordable Housing Appeals Systems and Access to Opportunity: Evidence from the Northeastern United States. *Housing Policy Debate*, *30*(3), 370–395.

Marantz, N. J., & Zheng, H. (2018). Exclusionary Zoning and the Limits of Judicial Impact. *Journal of Planning Education and Research*, 1–14.

Conference Presentations

Zheng, H. (2020, October). The Allocation of Housing Targets to California's Local Governments: Implications for Accessibility and Rulemaking. Paper presentation at the *Annual Conference of the Association of Collegiate Schools of Planning* (Virtual).

Marantz, N. J., & Zheng, H. (2018, October). Exclusionary Zoning and the Limits of Judicial Impact. Paper presentation at the *Annual Conference of the Association of Collegiate Schools of Planning*, Buffalo, NY.

Marantz, N. J., & Zheng, H. (2018, April). The Efficacy of Judicial Intervention in Local Land Use Regulation. Paper presentation at the *Annual Conference of the Urban Affairs Association*, Toronto, Canada.

Teaching Experience

2020 Instructor, University of California, Irvine, Statistics Bootcamp (graduate course)

2017-2019 Teaching Assistant, University of California, Irvine
Quantitative Analysis for Planners (graduate course)
Environmental Analysis and Design (undergraduate course, weekly discussions held)
Principal Economics for Planners (undergraduate course)
Research Design (undergraduate course)
Introduction to Urban Studies (undergraduate course)
Environmental Law & Policy (undergraduate course)
Sustainability I & II (undergraduate course)

Abstract of the Dissertation

State-Led Housing Planning: Rule Complexity and Implementation Trade-offs

By

Huixin Zheng

Doctor of Philosophy in Urban and Environmental Planning and Policy

University of California, Irvine, 2021

Associate Professor Nicholas Marantz, Chair

California's housing planning system seeks to address housing shortages and promote housing development in areas accessible to transit, jobs, and socioeconomic opportunities. Since 2017, the state Legislature has enacted a set of laws seeking to strengthen the housing planning system through a complex array of standards, requirements, and procedures. California's current housing planning system is comprised of a complex housing target allocation mechanism and enforcement mechanisms to ensure that local governments effectively accommodate the development of the allocated housing units. However, the complexity of the rules will likely lead to numerous implementation challenges.

This dissertation, consisting of three studies, examines the implementation of California's current housing planning system at different levels of government and highlights the trade-offs related to the complexity of the system. The first essay draws on interview data and observations of public events and underscores the ways in which the complexity of the state's planning rules has posed implementation challenges related to administrative efficiency, inclusive decision-making, flexibility, legal uncertainty, and legitimacy perceived by different stakeholders. The second essay compares the mechanism that the Southern California Association of Governments

(SCAG) uses to allocate housing units to local governments with two simpler alternatives. Through the assessment of different allocation scenarios in the SCAG region, this essay finds evidence that a simpler allocation mechanism could potentially guide housing development to transit- or jobs- rich areas more equitably and with lower administrative burdens. The third essay turns to planning implementation at the local level and examines the trade-offs involved in directing new housing opportunities, especially subsidized housing, away from relatively poor neighborhoods. Focusing on the City of Los Angeles, this essay finds evidence that newly subsidized housing would alleviate residential crowding in single-family neighborhoods but not in relatively crowded, high poverty neighborhoods. The empirical results, however, may be driven by the growing demands for affordable housing units with the appropriate size in these neighborhoods.

This dissertation reveals implementation trade-offs that are at least in part due to the complexity of the planning processes and techniques that are required by state law or promoted by government agencies. Current complex rules in place may not necessarily achieve the goal of promoting housing development equitably. Possible directions for improving state-led housing planning efforts involve simplifying the system in a way that reduces the use of administratively complex procedures and the reliance on overly technical approaches. Decision-makers should be aware of the potential trade-offs among different policy objectives and, in some cases, need to recognize that important objectives may conflict.

Chapter 1. Introduction

Background

In areas where demand for housing is strong – including many expensive coastal regions in the West and Northeast – local regulatory barriers to housing are recognized as a leading cause of the lack of new housing supply and rising housing costs (Glaeser and Gyourko 2018). Extensive scholarly research indicates that high housing costs have contributed to a host of problems including residential overcrowding, homelessness, and reduced social mobility (Acolin and Wachter 2017; Clark, Deurloo, and Dieleman 2000; Ganong and Shoag 2017; Hanratty 2017). Several high-cost West Coast and Northeastern states have exercised their legal power to adopt a *state housing planning system*, which seeks to overcome local regulatory barriers to housing and address the state's existing and future housing needs. A few other states – such as Oregon – also seek to pursue a stronger leadership role in coordinating statewide land use and housing planning activities (Oregon Department of Land Conservation and Development n.d.).

Established in state law, a state housing planning system sets forth processes for allocating numerical housing targets to local governments (e.g., cities and counties), specifies how the housing targets should be accommodated, and provides enforcement mechanisms to monitor compliance and ensure that local governments effectively accommodate the development of the allocated housing units. The efficacy of a state housing planning system will, in part, depend on the ways in which allocation and enforcement mechanisms are structured (Zheng et al. 2021).

In California, recent changes to the state's housing planning legislation, including the Housing Element law and other housing-related laws, have introduced an array of standards, requirements, and procedures. California's current housing planning system is comprised of a complex housing allocation mechanism, referred to as the Regional Housing Needs Assessment (RHNA) process, and enforcement mechanisms that empower the lead state housing agency and private entities (e.g., non-governmental organizations and housing developers) to take a stronger leadership role in overseeing local planning processes. Specifically, upon receiving the housing allocations, each local government must update the housing element of its general plan and identify sites with the capacity to accommodate the development of the allocated housing units. The California Department of Housing and Community Development (HCD) reviews all local housing elements and determines whether they are in compliance with state law. Enforcement also depends on the efforts of non-governmental organizations and housing developers to ensure that local land use and zoning policies accommodate the housing allocations. Some commentators suggest that these new rules could enable state housing administrators, housing advocates, and city officials to better leverage state planning standards and requirements to spur housing development in California (Elmendorf et al. 2020a; 2020b). However, the complexity of the rules, coupled with intense political conflicts over land use planning, will likely lead to numerous implementation challenges that involve various types of trade-offs. This dissertation, consisting of three essays, investigates the trade-offs in the implementation of California's housing planning system and highlights the implications for improving state-led housing planning processes.

Organization of the Dissertation

The first essay (Chapter 2) explores how complex rules may influence the implementation of California's housing planning system with respect to various aspects of implementation performance. This study contributes to a better understanding of the performance trade-offs in the implementation process. The complexity of the rules that structure California's housing planning system arises from two main sources: (1) the need to empower HCD to provide stronger leadership in overseeing and coordinating local planning processes; and (2) the needs to tailor housing targets and planning rules to regional and local context and to enable inclusive planning processes. However, there may be negative trade-offs for implementation performance. In this study, the conceptualization of performance trade-offs builds upon the distinction of two institutional dimensions: (1) mechanisms of coordination, which characterize HCD's leadership, and (2) the complexity of the rules. I extensively review contextual data from multiple sources and collect data through semi-structured interviews with key informants and observations of public events that took place between September 2020 and April 2021, including city council and planning commission meetings, public engagement meetings, and housing advocacy workshops. The data reveal implementation challenges related to administrative efficiency, inclusive decision-making, flexibility, legal uncertainty, and legitimacy perceived by different stakeholders, which constitute various types of performance trade-offs. Most notably, many of the current complex rules have placed significant administrative burdens on HCD and regional planning bodies. Implementation actors at the local level wrestle with uncertainty about how to appropriately perform the planning tasks. Furthermore, the need to meet complex, rigid top-down requirements will likely hamper engagement efforts and inclusive planning processes.

The second essay (Chapter 3) focuses on the implementation of intraregional housing allocations and assesses the trade-offs involved in using a complex, multi-criteria allocation method to allocate housing targets to local governments. As required by state law, regional councils of governments (COGs) must incorporate numerous criteria into the allocation methods in order to achieve the state's goals of promoting housing development in areas accessible to transit, jobs, and socioeconomic opportunities. The trade-offs of a multi-criteria allocation method, however, may be increased administrative burdens and susceptibility to technical difficulties and political wrangling. This study asks the question of whether a simpler allocation method could achieve the state's policy objectives. I answer this question by comparing the mechanism that the Southern California Association of Governments (SCAG) uses to allocate housing units to local governments with two simpler alternatives. A Bayesian model averaging method is used to assess the extent to which allocation outcomes, under each allocation method, align with the goal of promoting housing development in places with high social mobility and places near transit and jobs. This study finds evidence that SCAG's multi-criteria method may be unnecessarily complex and may raise concerns about inequitable development patterns. A simpler allocation method could potentially guide housing development to transit- or jobs- rich areas more equitably and with lower administrative burdens.

The third essay (Chapter 4) turns to the implementation of housing planning at the local level. Policy-makers and planners have sought to use complex, technical modeling and mapping tools to direct new housing development to areas deemed high-opportunity and well-resourced and, in some cases, limit new housing opportunities in relatively poor, low-resourced locations. Specifically, to promote the statutory objective of affirmatively furthering fair housing, local governments should avoid the concentration of sites to accommodate the development of below-

market-rate units in neighborhoods deemed low-resourced and segregated (Kirkeby 2020). Such housing strategies could create trade-offs between addressing housing needs in relatively poor neighborhoods and promoting more integrated residential patterns. This study focuses on the need for adequate dwelling space, which has been found largely unmet among low income, minority households, and examines whether residential crowding among renters is alleviated in neighborhoods close to newly subsidized housing in the City of Los Angeles. For households with limited economic resources, new subsidized housing opportunities should facilitate households' switch to dwelling units that better accommodate their housing needs, all else equal. Contrary to expectation, I find that the number of crowded units is *less* likely to decrease in relatively crowded, high poverty neighborhoods that are close to newly subsidized housing. Therefore, this study does not provide direct evidence that subsidized housing has alleviated residential crowding in these neighborhoods. The empirical results, however, may reflect the situation that the supply of subsidized housing is lagging behind the growing demands for housing units with the appropriate size and at affordable prices in crowded, high-poverty neighborhoods. This study highlights the need for future research on residential location patterns in response to new subsidized housing opportunities to better inform ongoing policy debates related to the way housing subsidies are allocated.

Together, the three essays provide a better understanding of the various types of trade-offs in the implementation of California's housing planning system. These trade-offs are at least in part due to the complexity of the planning processes and techniques that are required by state law or promoted by government agencies. As detailed in each of the three essays, these complex rules may seek to empower HCD to take a stronger leadership role in overseeing local planning processes, enable inclusive stakeholder engagement and better tailoring of planning targets and

standards, or to facilitate more intentional and methodical planning processes to achieve the state's policy goals. Challenges and trade-offs involved in deploying and carrying out these complex rules manifest in the implementation of the planning system at different levels of government. Overall, I find the rules that structure the system are overly complex and may not necessarily achieve the goal of promoting housing development equitably. This dissertation extends the recent discussion of the concept of using simple rules for urban development (Moroni et al. 2018) and contributes to the planning and policy implementation literature by assessing the implications of complex institutional arrangements for achieving the state's goals in the context of housing planning. There are lessons from California's experience for other state governments seeking to have greater influence on local land use planning decisions. This dissertation suggests that possible directions for improving state-led housing planning efforts involve simplifying the system in a way that reduces the use of administratively complex procedures and the reliance on overly technical approaches. More broadly, decisions-makers are often faced with reconciling trade-offs among different objectives and, in some cases, need to recognize where important objectives may conflict or may not be realistically achievable. Implementation of state housing policy will also benefit from better data collection for evaluating the effectiveness of the adopted housing programs and strategies.

Chapter 2. The Complexity of State-Led Housing Planning: Lessons from Implementation in Southern California

Introduction

The lack of affordable and quality housing has long been a topic of concern in many economically vibrant regions in the United States. Restrictive local land use regulations over decades have contributed to a host of issues including rising housing costs, exacerbated income segregation, and reduced social mobility (Acolin and Wachter 2017; Ganong and Shoag 2017; Gyourko and Molloy 2015; Lens and Monkkonen 2016). Many states have exercised their legal power to adopt planning statutes that require local jurisdictions (e.g., cities and counties) to address the housing needs of all income groups, especially for people of low and moderate income (Meck 2002; Ramsey-Musolf 2017). The implementation of state-led land use planning and development regulation, however, remains subject to political controversy and persistent opposition at the local level (Fischel 1992; 2001; Infranca 2019; Ihlanfeldt 2004).

This study focuses on the implementation of California's housing planning system, which seeks to mitigate the state's overall housing costs and achieve multiple policy objectives such as improving intraregional jobs-housing balance, reducing excessive commuting and greenhouse gas emissions, and advancing socioeconomic equity. Since 2017, the state Legislature has enacted a set of laws seeking to strengthen the housing planning system through a complex array of standards, requirements, and procedures. Current state law establishes a Regional Housing Needs Assessment (RHNA) process for assessing and allocating numerical housing targets to local governments, which must then update the housing elements of their general plans and demonstrate adequate land use capacity and strategies for accommodating the housing targets.

State law also provides enforcement mechanisms to ensure that local plans and policies are in compliance with statutory requirements. Major housing planning activities and decisions are coordinated primarily by the lead state housing agency – the California Department of Housing and Community Development (HCD) – with regional councils of governments (COGs) coordinating some activities related to housing target allocations within their respective regions. The processes of arriving at the housing targets and updating local housing elements must engage stakeholders such as local governments and the public.

The complexity of California's system is in part attributable to the political salience of land use planning. Over time, there have been piecemeal statutory changes that layered new provisions on top of old ones (Lewis 2003; May 2005). Under California's current housing planning system, the complexity of the rules arises from two important sources: (1) the need to empower HCD to provide stronger leadership in overseeing and coordinating local planning processes; and (2) the needs to tailor housing targets and planning rules to regional and local context and to enable inclusive planning processes. As a result, California's current system consists of a large number of rules prescribing housing target allocation mechanisms, planning standards, enforcement provisions, and procedures to enable inclusive engagement.

This study asks how complex rules influence the implementation of California's housing planning system. Of interest are several aspects of implementation performance identified in the literature, such as administrative efficiency, inclusive engagement, stability and legal certainty, flexibility, and policy legitimacy (Buitelaar and Sorel 2010; Ha et al. 2020; Leyden et al. 2017; May and Jochim 2013; Moulton and Sandfort 2017). The complexity of the system may create negative trade-offs for implementation performance. The conceptualization of performance trade-offs builds upon the distinction of two institutional dimensions: (1) mechanism of

coordination, which characterizes the leadership of HCD, and (2) the complexity of the rules. Prior research posits that a coordination mechanism with strong leadership of the lead agency generally benefits from administrative efficiency, stability, and legitimacy perceived by the general public (Provan and Kenis 2008). While using many complex rules may undermine some of these performance aspects, the complexity in rules may be conducive to better tailoring to different regional and local context and may facilitate more intentional, methodical, and inclusive planning processes. This study assesses how complex rules promote or undermine varying aspects of implementation performance.

I extensively review contextual data from multiple sources and collect data through semi-structured interviews with key informants and observations of public events that took place between September 2020 and April 2021, including city council and planning commission meetings, public engagement meetings, and housing advocacy workshops. Interviewees include state housing administrators, regional planners, housing advocates, and local planners. The data collection focuses on local communities in the counties of Los Angeles and Orange. These communities are of particular interest because they generally have good access to jobs and transit, and many of them will likely have to make substantial changes to their local plans and policies due to the high housing targets allocated to them. These local jurisdictions received their draft housing targets in March 2020 and must update and submit their housing elements for state review and certification by October 2021. Therefore, while they are still in the early phase of implementing the state planning mandate at the time of this study, observing and understanding how they perceive, discuss, and respond to the many complex rules provide insights into how various aspects of implementation performance are achieved or undermined.

The interviews and observations of local public events reveal some positive, but mostly challenging experiences. Scholars and housing advocates generally support HCD's strengthened leadership role in implementing and enforcing state requirements. However, the data suggests that the numerous complex rules have placed significant administrative burdens on HCD and COGs. Moreover, for regional and local governments, the needs to meet complex, rigid top-down requirements will likely hamper engagement efforts and inclusive planning processes. Implementation actors within the housing planning system also expressed concerns and uncertainty about potential disputes and further changes to the system.

The rest of the chapter is organized as follows. I first review the theories and conceptualizations regarding coordination mechanisms and rule complexity. I extend the theories to discuss how various aspects of implementation performance may be collectively shaped by the coordination mechanisms and the rules in place, focusing on the trade-offs between different performance aspects. Next, I describe the research approach of the study, followed by an overview of the coordination mechanisms and rules in California's housing planning system. I then present the results and identify different aspects of implementation performance that are promoted or undermined by some of the currently adopted complex rules. I conclude by highlighting the policy and research implications.

Theoretical Framework

This section reviews the conceptual framing of coordination mechanisms and theories of rule complexity from a wide range of disciplines. Central to this study are that there are trade-offs involved in utilizing each coordination mechanism and in devising complex rules.

Furthermore, conflicts may arise within the system if the presumed strengths of the coordination mechanism utilized are undermined by unduly complex rules.

Mechanisms of Coordination

Two mechanisms of coordination are of relevance to a state housing planning system (Provan and Kenis 2008).[1] The first form is a *lead organization mechanism*, under which statewide housing planning activities and key decisions are coordinated by a lead organization, which is typically a state housing agency. Housing planning activities can also be regionally coordinated by a metropolitan planning organization (MPO) or a COG. In the context of state-led housing planning, a *regionally coordinated mechanism* is typically established by the Legislature and, in some cases, it supplements a lead organization mechanism. A supplemental regionally coordinated mechanism may facilitate a planning process that is better tailored to regional context and more inclusive of local stakeholders. Specifically, an MPO/COG can serve as a negotiator between its member jurisdictions and the lead state housing agency, linking state policy goals to locally controlled land use and development regulations.

Coordinating local planning activities to accommodate regional and statewide housing needs calls for a lead organization mechanism because local governments are generally not willing to collaborate on issues involving local land use and housing development. Such resistance is largely due to jurisdiction-centered economic interests and individualistic preference for local autonomy (D'Apolito 2012; Fischel 1992; 2001; Ihlanfeldt 2004; Reynolds 2003). While

[1] The conceptual framing of coordination mechanisms is based on the typology of network governance developed in Provan and Kenis (2008), in which network is viewed as a mechanism of coordination. The third mechanism of coordination, which is not discussed in this study, is called *shared governance*. Under shared governance, there is no distinct, formal governance entity, and members of the network interact and coordinate with each other to manage group-level activities and decision-making. Shared governance is rarely viable for coordinating local land use issues.

there may be little agreement about how to plan for future growth in each community, a lead state housing agency can assume major strategic and operational decisions and work with local governments to resolve possible conflicts (Provan and Kenis 2008).[2] In addition, a regionally coordinated mechanism, if adopted, generally provides increased capacity for performing complex tasks at the regional level. MPOs/COGs have long been charged with developing long-range transportation plans for their regions (Barbour et al. 2011). However, because regional planning agencies do not directly regulate land use, a regionally coordinated mechanism will likely have limited effectiveness in promoting equitable housing development in the absence of state leadership (Loh and Sami 2013; Provo 2008).[3]

In choosing a particular coordination mechanism, decision-makers are faced with trade-offs, such as those between: (1) administrative efficiency and inclusive decision-making (e.g., high levels of involvement from local communities), (2) flexibility and stability, and (3) internal and external legitimacy, which largely depend on the extent to which local governments and the general public view coordinating efforts as beneficial and legitimate (Provan and Kenis 2008). As shown in Figure 1, in principle, a lead organization mechanism generally promotes administrative efficiency, stability, and external legitimacy over inclusive decision-making, flexibility, internal legitimacy. In the context of state-led planning, by having a formal structure that centralizes key operations and decisions, a state housing agency could provide greater administrative efficiency and stability compared to a more decentralized structure, but the trade-

[2] The authors also note that while the lead organization can maintain its focus on broader system-level decisions that are not widely agreed upon, this situation may hurt long-term sustainability of the system.
[3] For instance, in Minnesota, the housing-planning system is established in state law for the Twin Cities region and is administered by the Metropolitan Council. Some commentators suggest that the Metropolitan Council has retreated from the commitment to promoting socioeconomic and racial integration and guided affordable housing away from suburban communities (Goetz et al. 2003; Hamilton 2018).

offs may be reduced commitment from local governments and lower levels of flexibility and responsiveness to changing circumstances. A lead state housing agency also helps build external legitimacy through focusing on the broader goals of the state housing planning system, but not necessarily the needs of each individual local community. In this case, internal legitimacy will be hurt if local governments do not view interactions and coordinated efforts as beneficial.

If a regionally coordinated mechanism is used as a supplemental approach, it may better balance the trade-offs among conflicting aspects of implementation performance through its representative structure; however, the balance is generally tilted toward administrative efficiency and stability (Provan and Kenis 2008). While a regionally coordinated mechanism may better account for the needs from different stakeholders, as placed at the midpoint regarding "Trade-off 3" in Figure 1, it will be practically difficult to maintain internal and external legitimacy simultaneously when conflicting values are at play. As detailed below, the complexity in rules also impacts how these trade-offs are made.

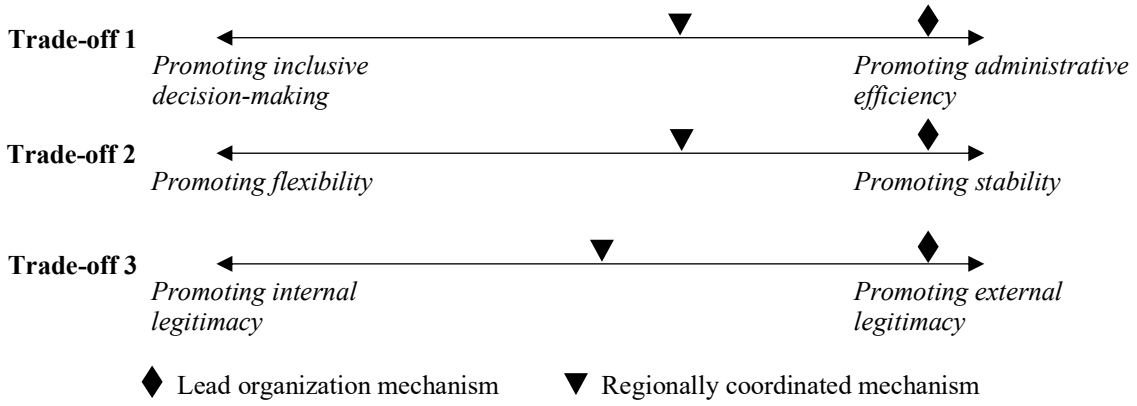

Figure 1. Trade-offs under different coordination mechanisms.
Note: Illustrated by the author.

Rule Complexity

Complex rules and their implications thereof are studied by scholars from many disciplines including policy implementation, public administration, and law and economics (Abeler and Jäger 2015; Ha et al. 2020; Hatch et al. 2020; Kleven and Kopczuk 2011; Mazmanian and Sabatier 1983; Oprea 2020; Schuck 1992). Complexity is a multi-dimensional concept. Schuck (1992) defines rules as complex to the extent that the following four features are presented: density, technicality, institutional differentiation, and indeterminacy. Complex rules are *dense*, often characterized by their sheer volume and specificity, and seek to control many different implementation activities and processes (Mahoney and Sanchirico 2005). Unlike general rules that apply to a broad range of situations, specific rules may attempt to anticipate and prescribe how to carry out each step in an implementation process and establish requirements for different scenarios and procedures. Complex rules are often *technical*, requiring expertise to understand and implement. One common source of technical rules is the attempt to differentiate circumstances and pursue rules tailored to specific context, demanding tasks such as intensive data collection and analysis (Kaplow 1995; Mahoney and Sanchirico 2005). Complex rules also tend to be *indeterminate* (i.e., difficult to apply unambiguously) and thus create uncertainty in the implementation process. Finally, complex rules can be *institutionally differentiated*. Schuck (1992, 4) define that such rules "draw upon different sources of legitimacy, possess different kinds of organizational intelligence, and employ different decision processes for creating, elaborating, and applying the rules."

There are trade-offs involved in choosing the degree of complexity in rules.[4] In studies examining optimal tax incentives and targeting efficiency in need-based aid programs, complexity arises from the need to improve the precision of rules, such as in measuring taxpayers' ability to pay and in targeting groups that are truly in need (Abeler and Jäger 2015; Dynarski and Scott–Clayton 2006; Kleven and Kopczuk 2011). Analogously, in the context of regulation, complexity arises from the need to precisely tailor the standards and requirements to varying circumstances of regulated entities. The costs of the added degree of complexity in rules have been discussed in different strands of literature. In the optimal tax research, the cost of complexity is often understood as decreased compliance rates and increased administrative burdens (Abeler and Jäger 2015). Studies of public assistance programs find that the use of detailed eligibility criteria and rigorous documentation often leads to complexity and administrative hassles that may reduce program participation among intended recipients (Dynarski and Scott–Clayton 2006; Kleven and Kopczuk 2011). In the context of land use planning and development regulation, complex rules and processes often result in delay and disruption in the housing development process (Luger and Temkin 2000; May 2005). Drawing upon the literature on computer science, psychology, and economics, Oprea (2020) contends that, all else equal, decision-makers prefer implementing rules that are less complex.

Interplay of Coordination Mechanisms and Rules

Drawing on the theories and concepts reviewed above, this study considers the trade-offs in devising complex rules in tandem with the trade-offs in choosing between different

[4] Following Kleven and Kopczuk (2011), this study treats rule complexity as a parameter that can be chosen in policy design.

coordination mechanisms. As detailed below and illustrated in Figure 2, a clear trade-off exists between inclusive decision-making and the efficient operations of a lead agency when using complex rules. In general, complex rules are posited to promote inclusive decision-making over administrative efficiency (Trade-off 1 in Figure 2). This is because a higher level of complexity is necessary when decision-makers seek to consider existing competing interests and tailor the rules to varying circumstances of regulated entities. However, rule complexity per se is at best a necessary but not a sufficient condition for promoting inclusive decision-making. For example, when rules are so complex that they become unintelligible, they will likely undermine inclusive decision-making.

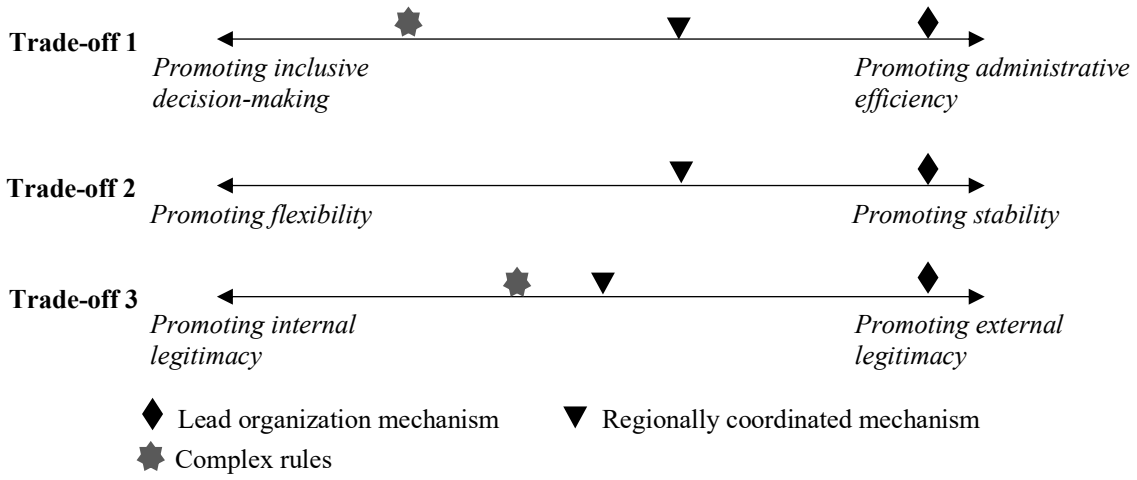

Figure 2. Trade-offs under different coordination mechanisms and degrees of rule complexity. *Note*: Illustrated by the author. Complex rules are not placed on the flexibility/stability spectrum because they are posited to promote neither of these needs.

The degree of complexity in rules is less of a dominant factor influencing the extent to which the rules promote flexibility or stability. Stability is important for reducing uncertainty and developing consistent responses to stakeholders, while flexibility requires adaptability and quick responses to different or changing circumstances. Binding rules that allow little deviation from the prescribed standards and requirements should promote legal certainty. Binding simple rules

are posited to balance the needs between stability and flexibility because simple rules typically apply to a broad range of situations (i.e., less differentiated) and provide legal certainty through clear, simple terms. On the other hand, it may be difficult to achieve flexibility under complex rules due to the specificity and prescriptiveness of the rules. Neither would complex rules promote stability if the numerous indeterminate standards and requirements give rise to legal uncertainty (Buitelaar and Sorel 2010). To the extent that the needs for inclusive decision-making are promoted under complex rules, the trade-offs may be increased administrative burdens, legal uncertainty, and less flexibility (Moroni et al. 2018). Simple rules, on the other hand, are easier for the target group to understand and comply with and for those charged with enforcement to detect violations (Epstein 1995; Schuck 1992; Sutter 1998). Such simplicity reduces uncertainty with respect to implementation processes (Buitelaar and Sorel 2010; Christiansen and Keber 2006). Therefore, simple rules may enhance the strengths of a lead organization mechanism such as administrative efficiency and stability.

In an ideal case where inclusive decision-making is adequately promoted and where the rules are appropriately tailored to various circumstances of regulated entities, complex rules can satisfy both internal and external legitimacy. However, such ideal conditions are practically difficult to achieve. Complex rules will more likely undermine external legitimacy due to a wide range of issues. One of such issues is that public engagement and participation can be undermined by the intricacy of the rules. Moreover, disputes tend to occur under indeterminate, complex rules and may need to be resolved in court (Liebwald 2015). The general public may view such coordinated efforts as less legitimate if the lead agency's decisions are frequently disputed. Internal legitimacy is also undermined if the issues of rule intricacy and indeterminacy are perceived by implementation actors within the system. However, internal legitimacy may be

undermined to a lesser extent than external legitimacy because implementation actors are likely to have a better understanding of the rules than the public and because some may view such complexity as necessary for accounting for existing different interests. Given the discussions here, complex rules are posited to slightly promote internal legitimacy over external legitimacy, as illustrated in Figure 2 (Trade-off 3).

Prior research cautions the attempt to compensate for limited inclusive decision-making through adopting complex rules under a multi-tier hierarchy structure (Zywicki 1998). Such rules tend to be ill-fitting for two reasons. First, the distance between the top of the hierarchy (e.g., the legislature, the lead state agency, etc.) and rule implementers prevents the rules from being devised truly based on complete information and context at the operational level. Second, amending such rules is likely to be cumbersome because of the hierarchical structure. More broadly, legal scholars have long contended there is not always a perfect rule solution to every single problem. If rules are devised to accommodate all interests and solve as many problems as possible, they become unduly complex (Driesen 2015; Moroni et al. 2018).

In summary, the theories and concepts reviewed above inform the conceptualization of potential trade-offs in implementation performance. For example, complex rules seeking to enable inclusive planning processes will likely reduce administrative efficiency and may undermine the leadership role of the lead agency. The present analysis, as detailed below, assesses the performance trade-offs associated with complex rules used in California's housing planning system.

Research Approach

This study has two objectives: to characterize California's housing planning system with respect to the coordination mechanisms and rules adopted, and to understand how these institutional arrangements influence the implementation of the housing planning system. Data were collected and analyzed in three research stages. In the initial stage, I collected and extensively reviewed contextual data from multiple sources, including the California State Legislature website, scholarly studies and reports, and public agency documents (e.g., memoranda, letters, technical assistance materials, etc.). This research stage provides an initial synopsis of the coordination mechanisms and the complexity of the rules adopted in California's housing planning system. This research stage also reveals variation in the institutional arrangements across the state. For example, in counties that are not within the jurisdiction of any COG, planning activities are simply coordinated by HCD. This study focuses on a more complex scenario in which COGs are involved in the planning process. For example, in the six-county Southern California Association of Governments (SCAG) region,[5] a regionally coordinated mechanism is utilized to supplement the lead organization mechanism, and a complex multi-criteria methodology has been adopted to allocate housing targets to local governments within the region.

The SCAG region is of particular interest because many jobs-rich, transit-rich communities in the region have received high housing targets and will likely confront significant challenges in planning for their targets. Specifically, HCD has assigned the region over 1.34 million units for the upcoming 2021-2029 planning period – a regional target more than three

[5] The SCAG region covers the counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura.

times the one previously assigned. Moreover, as compared with SCAG's prior housing allocation practice, the newly adopted allocation methodology will allocate much higher housing targets to jobs-rich, transit-rich communities in the region's coastal counties such as Los Angeles and Orange.[6] Facilitating housing development in these communities is critical to meeting the state's objectives of promoting efficient development patterns and socioeconomic equity. A better understanding is needed of the implementation experience in these communities.

For the reasons described above, the second and third research stages focus on the SCAG region. The second stage seeks to understand how the coordination mechanisms and the complex planning rules in place influence the implementation process. I conducted fifteen semi-structured interviews between September 2020 and January 2021 with a range of key informants, including state housing agency staff, regional government staff, local government staff, and housing advocates. Interviewees were selected for their deep knowledge of and extensive involvement in the implementation of the state planning mandate. In the case of local government staff, interviewees are planning professionals working in local governments in the counties of Los Angeles and Orange – two coastal counties in the SCAG region that provide good access to jobs and transit. The interviews took place while the local jurisdictions were in the process of updating their housing elements, which must be submitted to HCD for review and certification by October 15, 2021.[7] I asked interviewees questions pertaining to their understanding and thoughts about the allocation methodology and how they think the new state requirements would affect the implementation process within their jurisdiction (or advocacy strategies in the case of

[6] In the past, SCAG allocated the lion's share of housing targets to communities in inland counties with relatively limited access to jobs and transit.
[7] Local jurisdictions in the SCAG region received their draft housing allocations in March 2020 and the final allocations in March 2021.

housing advocates) (see Appendix A for interview questions). Interviews lasted anywhere between 45 to 120 minutes and were recorded with permission.

Local government participants were recruited if their jurisdictions had begun the housing element update process at the time when the recruitment took place (August – December 2020) and if they expressed interest in participation. Local governments were searched for through several processes: searching for information on the internet about general plan/housing element update in local jurisdictions in the counties of Los Angeles and Orange, signing up for local governments' listservs to receive news related to their general plan/housing element update, and following event calendars put together by housing advocacy groups. Given the modes of recruitment, the experience described by the interviewees participated in the present study may not be generalizable to local jurisdictions that begun the housing element update relatively late. Moreover, local jurisdictions that were interviewed were mostly in the early phase of implementing the state planning mandate.[8] Therefore, the interviews reflect the early discussions about many of the new state planning requirements and people's anticipation of the challenges and opportunities in the long run. It is the author's intention to re-interview local public agency staff and expand the sample in two or three years to assess local implementation practice throughout the entire housing element update process and in the post-certification period.

Besides the interviews, supplemental data were collected via observations of public events such as city council and planning commission meetings and housing advocacy workshops. In the third research stage (January – April 2021), I attended all hearings on the fifty-

[8] Some denied the interview requests citing that they would be able to provide more input once their housing elements are certified.

two appeals filed to SCAG challenging the allocation methodology and the allocated housing targets. As more local jurisdictions begun their housing element update processes, I routinely joined relevant city council and planning commission meetings, public engagement workshops, and housing advocacy meetings.[9] Data collected from observations of public events capture a range of perspectives and experiences such as those of elected officials, residents and workers, and housing advocates.

Data drawn from all sources were reviewed through an iterative process (Denzin and Lincoln 2011). Contextual data collected in the first research stage were coded along the dimensions of coordination mechanisms and rule complexity, as detailed in the following section. Data collected from interviews and observations of public events were first coded along general categories such as the perceived rationales for the new allocation methods and state requirements, the current and anticipated challenges and opportunities, and the tasks and strategies deployed and underway. In later iterative reviews of the data, the coding was guided by the different types of trade-offs described in the conceptual framework (e.g., administrative efficiency vs. inclusive decision-making), linking specific experiences and perspectives to themes of how various aspects of implementation performance are promoted or undermined.

Coordination Mechanisms and Rules in California's Housing Planning System

In regions where a COG is formed, California's current housing planning system is characterized by a lead organization mechanism (as the primary approach), a regionally coordinated mechanism (as the supplemental approach), and many complex planning rules (e.g.,

[9] The primacy source of information is the Fair Housing Elements Calendar put together by the Campaign for Fair Housing Elements, which is a statewide coalition of housing advocates and grassroot activists.

requirements and standards). This section focuses on the strengthened leadership role of HCD and on the major complex rules adopted under current state law.[10]

Strengthened Lead Organization Mechanism

Key actors involved in California's housing planning process include the lead state housing agency (i.e., HCD), regional COGs, and local governments (i.e., cities and counties).[11] The implementation of California's housing planning system is primarily coordinated by HCD, with COGs coordinating some activities related to housing target allocations within their respective regions. Historically, HCD mostly issued advisory guidelines on how to accommodate the housing targets (Elmendorf et al. 2020a). Recently enacted legislation has strengthened HCD's ability to implement and enforce the state planning mandate. Specifically, housing targets at the regional level are primarily determined by HCD, with input provided by COGs. While each COG develops its own methodology to allocate the regional targets among its member jurisdictions, the methodology must be reviewed by HCD.[12] Local governments must then update the housing elements in their general plans to demonstrate land use capacity and strategies for accommodating the allocated targets over a statutorily specified planning period. Local housing elements must be reviewed and certified by HCD for compliance with state law. A

[10] See Elmendorf et al. (2020a) for a detailed description of California's current planning processes and requirements.

[11] This study focuses on these three chief categories of implementation actors. There are other entities that participate in the housing planning process, but the extent of involvement is either much lower or not required by state law. For example, the California Department of Finance (DOF) provides relevant data such as population projections to HCD. Non-governmental organizations and housing developers play an active role in monitoring the implementation of state housing planning laws. These private entities can influence the planning process, but their involvement is not mandatory.

[12] If HCD determines that a COG's methodology does not further the statutory objectives, the COG must either revise the methodology or adopt the methodology without revisions and provide written findings explaining why the COG believes that the methodology furthers the statutory objectives. The COG's reasoning must be supported by substantial evidence (Cal. Gov. Code, § 65584.04(i)).

jurisdiction without a certified housing element faces several potentially significant consequences, such as the risk of litigation from housing advocacy groups and housing developers and a loss of eligibility for critical state and federal funding for infrastructure improvements and public amenities. Courts can impose financial penalties and a moratorium on all development and on local land use authority until the housing element is brought into compliance.

HCD must engage in continuous monitoring of the implementation of the policies and programs described in local housing elements. To do this, HCD promulgates "standards, forms, and definitions" that local governments must follow in preparing their annual progress reports on the implementation of the housing elements (Cal. Gov. Code, §65400). HCD has the authority to decertify a housing element during the planning period if it finds that the local government fails to implement any program actions included in its housing element, such as rezoning on schedule. Recent legislation also expands HCD's enforcement authority to refer non-compliant jurisdictions to the State Attorney General's Office for litigation. Scholars and housing advocates suggest that, with stronger state leadership and strengthened enforcement mechanisms, state housing administrators, housing advocates, and city officials could better leverage state planning standards and requirements to spur housing development (Elmendorf et al. 2020a; 2020b).

Complex Rules for Target Allocation and Local Planning

The complexity of the rules stems from two main sources: (1) the needs to tailor the rules to regional and local context and to enable inclusive planning processes; and (2) the need to ensure that local governments plan and zone for the housing targets appropriately. These needs are most notably marked by the convoluted housing target allocation mechanisms and the numerous detailed and prescriptive requirements related to the update of local housing elements.

Each COG undertakes a series of complex, technical tasks in order to allocate housing targets to local governments within its jurisdiction. As required by state law, each COG must develop an allocation methodology that accounts for a dozen factors such as projected household growth, local jobs-housing relationships, and opportunities to increase the use of public transit (Cal. Gov. Code, §65584.04(e)). The incorporation of these factors is intended to promote a number of statutory objectives such as advancing efficient development patterns and affirmatively furthering fair housing (Cal. Gov. Code, §65584(d)). Methodologies for allocating the housing targets and the complexity thereof vary by region. COGs generally incorporate multiple criteria in distributing their housing targets to better tailor the targets to local conditions. Nevertheless, the allocation methodologies have been under heated discussion in some of the regions. In the SCAG region, upon receiving the draft allocations, about one-fourths of the region's local jurisdictions have filed formal appeals to SCAG challenging the methodology and requesting changes (mostly reductions) in their targets. Four cities in San Diego County have filed a legal challenge to the allocation plan adopted by the San Diego Association of Governments (SANDAG), arguing that the weighted voting system in SANDAG is punitive to smaller jurisdictions in the region (*Coronado Times* 2020).

Throughout the housing element revision process, local governments must "make a diligent effort to achieve public participation of all economic segments of the community" (Cal. Gov. Code, §65583(c)(7)). While the housing elements are prepared and adopted by local governments, the components of a housing element are largely prescribed by state law. A housing element is a technical document comprised of detailed analyses of a range of topics related to housing, such as local demographic and socioeconomic characteristics, existing and future housing needs, constraints to housing preservation and development, and policies and

programs in place and to be introduced. The most complex and technical portion is the identification of an inventory of sites that could accommodate new housing and demonstrate adequate capacity to meet the allocated housing targets. To determine whether a site can be included in the inventory, local planners must go beyond examining zoned capacity, infrastructure availability, and environmental constraints, but further differentiate different types of sites (e.g., vacant vs. non-vacant sites, residentially zoned vs. non-residentially zoned sites, etc.), to which different criteria will be applied (Kirkeby 2020).

Because local jurisdictions are mostly on the hook of planning for, but not building, the housing targets, many steps are needed for converting the allocated housing targets into actual production (Elmendorf et al. 2020a). Moreover, challenges facing implementation actors at different levels of government may undermine the efficacy of the housing planning system. Some scholars have argued for simple rules for allocating housing targets on the basis of administrative simplicity (Graddy and Bostic 2010; Monkkonen, Manville, and Friedman 2019). This study considers both the coordination mechanisms and the complexity of rules in place. As detailed below, the current institutional arrangements of the system are attempting to satisfy many needs at once, and some of these needs will likely conflict with one another.

Findings and Discussion

Interviews with key informants and observations of public events reveal implementation challenges related to administrative efficiency, inclusive decision-making, flexibility, legal uncertainty, and legitimacy perceived by different stakeholders. These challenges are expressed as current and ongoing implementation experiences as well as concerns and uncertainty about further changes to the system. These challenges are also reflected in the discussions and debates

taking place in different types of public events such as public hearings, city council and planning commission meetings, and housing advocacy meetings.

Administrative Burdens on HCD and COGs

The literature suggests that by having a formal structure that centralizes key operations and decisions, a lead organization mechanism can benefit from administrative efficiency. On the other hand, if the lead organization is charged with implementing many complex rules, it will likely suffer a great deal from administrative burdens, and efficient operations will be compromised. Such predicament is reflected in the data.

The increased administrative burdens due to complex requirements in state law are clearly reflected in two responsibilities of HCD: (1) evaluating and certifying local housing elements, and (2) monitoring the progress and actions of local jurisdictions in implementing the policies and programs stated in their housing elements. A state official described the process of certifying housing elements as "progressive discipline," in which HCD's involvement begins long before the housing elements are submitted. Specifically, HCD staff need to provide technical assistance for updating housing elements, engage in problem-solving with local governments on difficulties surfaced in the update process, issue letters of violations if local jurisdictions fail to adequately address the planning requirements, and finally, make a determination on certification. The lengthy administrative process is needed because a housing element is a complex and technical document, for which local officials must navigate myriads of planning rules. HCD must provide timely clarification throughout the update process and an analytical review for a completed housing element.

HCD also faces challenges in continuous monitoring of whether local actions (e.g., rezoning) are consistent with the housing elements. The data reveal that HCD's action in monitoring local compliance has primarily been reactive and complaint driven, and that it relies on inputs from stakeholders such as housing developers and advocates. An interviewee from HCD mentioned several supplemental strategies such as keeping track of jurisdictions with a conditionally approved housing element and utilizing the annual progress reports to identify jurisdictions that have failed to implement the identified programs to accommodate the housing targets. However, HCD has limited capacity to ensure that local governments plan and zone for the housing targets appropriately. As described by the interviewee, "because we cannot ground-truth everything in the housing element, we rely very strongly on stakeholders to tell us what's up."

COGs that developed a complex, multiple-criteria allocation method also face a moderate level of administrative burdens. As an interviewee from SCAG noted:

> I think we do have the capacity and staff, just because we have the modeling staff, data analysis staff, [and] research staff, and because we already do our transportation planning … But this time, [with] the more complicated formula, [the challenge is] explaining it to the decisionmakers and getting them comfortable enough to vote on it. That's beyond just staff work to develop it.

Therefore, at least in the case of a larger COG, the administrative burdens are less of an issue with capacity and staff competency but more of a challenge of ensuring that all member jurisdictions understand the methodology.

These findings suggest that both HCD and COGs face increased administrative costs associated with the complex rules prescribed in state law. In particular, the presumed advantage of administrative efficiency of a lead organization mechanism is considerably compromised in California's housing planning system. HCD needs to do a great deal of work to ensure that local

governments come up with meaningful housing plans, yet this process itself does not guarantee that more housing will be built. The findings are also consistent with the expectation that a regionally coordinated mechanism is suited to tasks requiring high levels of competency and expertise. Nevertheless, large COGs – such as SCAG – will likely confront challenges related to stakeholder engagement. Consistent with Barbour et al.'s (2011) study on California's experience in determining regional targets for greenhouse gas emissions reductions, the present analysis suggests that technical target-setting processes often present a high bar for stakeholder scrutiny because the data and methods are complex and not easily interpreted.

The Elusive Quest for Inclusive Decision-Making

Rules in California's housing planning system, such as mandating planning rather than building targets and requiring COGs to incorporate local input into the development of allocation methodology, in part seek to facilitate inclusive decision-making by allowing local communities to come up with their own housing plans and providing opportunities for their input. Such efforts lead to many complex rules and will likely come at the expense of administrative efficiency. Higher administrative costs may be justified if an inclusive planning process is thereby promoted. However, the data reveal that inclusive decision-making is not perceived as being adequately promoted in California's housing planning process.

Local governments generally acknowledged the efforts that SCAG staff put into developing a housing allocation methodology for the region. Nevertheless, because the state-assigned regional targets for the upcoming planning period are much higher than previously assigned, all interviewees from local governments expressed that these are challenging targets for the region. How the regional targets should be distributed became contentious in the SCAG region. Some interviewees spoke to the rationale for a multi-criteria allocation methodology, but

there appeared to be little agreement about how to properly construct one. Furthermore, a complex methodology may not be viewed as an effective way of facilitating inclusiveness. As one interviewee commented:

> I think that from a mathematical or a statistical perspective, you need to have that complexity because planning for housing isn't a one-variable equation … I think the complexity isn't necessarily the question. It is more of … (paused), it is also what other people have said that the local planning process is not incorporated into that equation.

While interviewees mostly agreed with the general idea about guiding more housing to locations accessible to jobs and transit, fewer agreed that the allocation method properly accounted for the needs (or capacity) for housing in their communities. Such arguments were clearly made in the formal appeals filed to SCAG. Jurisdictions cited reasons related to geographic constraints, lack of transit and other infrastructure, hillside fire hazards, concerns about historic preservation, and impact of the COVID-19 pandemic. Thirty-eight out of the fifty-two appeals filed disputed the allocation methodology and its application. The appealing jurisdictions were contentious in the appeals and were frustrated that their local conditions were not properly taken into account.

Moreover, jurisdictions that did not appeal did not necessarily agree with the allocated targets. Some interviewees expressed that an appeal is not worth pursuing because the chance of a successful appeal is low and/or because their housing targets are relatively low compared with the numbers their neighboring communities have received. As one interview described:

> The lack of appeal … just means that we looked at the process to appeal and the likelihood of the appeal being approved relative to our number compared with other communities, and we made the decision at that time not to file an appeal … I wouldn't say, you know, the community or the Council or staff are comfortable or good per se with the RHNA number.

The perceived lack of transparency by some local governments in passing the allocation methodology also adds to the issue of inclusive decision-making. The Orange County Council of

Government (OCCOG) described in detail in its comment letter how the currently adopted allocation methodology was introduced last minute and left member jurisdictions with no opportunity for review and discussion (OCCOG 2020). Throughout the interviews, interviewees from local governments in Orange County reiterated this incident and indicated that it had undermined an inclusive and collaborative process.

Local government interviewees also expressed that they felt that their hands are tied because of the large housing targets and the rules of what sites are deemed suitable for future housing development. The majority of the interviewees mentioned the need to demonstrate realistic development likelihood and capacity, such as examining existing leases, in order to include non-vacant sites in the inventory. Interviewees from larger jurisdictions indicated that individual research of every site is practically impossible. One interviewee mentioned that its jurisdiction is attempting to project future development patterns based on past permitting data, while several interviewees expressed that their jurisdictions are still grappling with planning standards and requirements related to compiling the sites inventory. Interviewees also generally anticipated that their jurisdictions need to rezone some properties to allow for higher residential density; however, some of them cited local constraints that may make it difficult to complete the rezoning within the statutory timeline. These constraints, among others, include local voter initiatives that place restrictions on building height and density and the additional process of Coastal Commission approval in some communities.

Overall, the findings suggest that, despite efforts to enable inclusive planning processes by providing opportunities for local input, with the lead organization assuming key strategic and operational decisions, consideration of the needs of individual entity is limited. Housing advocates generally contend that certain aspects of rule complexity, such as the consideration of

realistic development capacity, are crucial to addressing the state's housing shortage. The data here reveal that the sheer layers of requirements present a number of implementation challenges for local jurisdictions, regardless of their initial positions on the allocated targets. A regionally coordinated mechanism is utilized for the intraregional housing allocation process and can potentially better balance the needs for administrative efficiency and inclusive decision-making. However, the pursuit of an inclusive process is hampered by the fact that COG's decision-making is nested within the lead organization mechanism. As one interviewee remarked, "SCAG was given such a huge number from the state that … it just got pushed around to different jurisdictions." While using a multi-criteria allocation method may be conceptually appealing, in practice, the complex methodology became highly contentious and introduced concerns over measurement errors and transparency.

Undermined Flexibility and Certainty

In many ways, local governments view the state's housing planning system as neither flexible nor stable. As described above, the detailed, prescriptive rules of how local planning should go about accommodating the housing targets are viewed as significantly reducing local jurisdictions' flexibility in planning for housing. While local governments are allowed to appeal to COGs and challenge the assigned housing targets on the basis of concerns such as local planning factors and changed circumstances in their communities, these appeals rarely prevail. Indeed, in a series of public hearings in January 2021 that considered the fifty-two appeals filed to SCAG, only two were partially granted.[13]

[13] The appeals were granted based upon the County of Riverside's lack of regulatory jurisdiction over a former air force base, and Pico Rivera's designation in a flood hazard zone.

The convoluted housing allocation procedure and the often complex allocation methodology also introduce uncertainty in the housing planning process. Because each COG is charged with devising an allocation method for its region, there are significant variations in allocation methods across the state. According to the observation fieldnote, some housing advocates raised the concern that the lack of a standardized, statewide allocation mechanism might result in inequitable distribution of housing targets. As the housing targets were being finalized in the SCAG region, housing advocates sued HCD over the regional targets determined for the nine-county Bay Area region, stating that the state agency failed to adequately consider the number of jobs in the region (Schneider 2021). Such legal challenges further added uncertainty to the already tight housing planning time frame under state law.

Interviewees also expressed concerns surrounding the increasing number of housing bills passed. One interviewee noted, "they just keep changing the law all the time. They are increasing unpredictability." For local governments, the challenges are in part due to the need to understand and meet numerous new state requirements all at once. Interviewees anticipated that the regulatory landscape would continue to change. While they are generally knowledgeable about the state requirements and following the housing legislation that has been moving forward, it is hardly the case for many stakeholders. As one interviewee noted:

> I don't think that all of the cities realized, with all the new laws, how much environmental review might be required. Some of our cities are going to require quite a bit of rezoning, which then transforms into a very expensive environmental review process.

The uncertainty about what to expect from the new planning requirements is also observed in ongoing public discussions. From a sample of public meetings that occurred in March 2021, which was about six months from when the housing element is due for the SCAG region, I

observed that members of several local legislative bodies and planning commissions had just begun to learn about these rules. Communities that began the local planning process late may be particularly vulnerable to the legal uncertainty introduced by the new rules.

Concerns over Legitimacy

Internal legitimacy is established when implementation actors within the system view coordinated efforts as legitimate or beneficial. The literature suggests that internal legitimacy is likely to be lower under a lead organization mechanism. This is particularly true in the case of land use and development regulation where local governments have long exercised the authority to regulate land use within their jurisdiction and are hostile to state intervention (Pendall 1999; Scally and Tighe 2015). The data reveal evidence that internal legitimacy of the state housing planning system is further undermined, in part due to the overly complex, prescriptive rules.

As described earlier, SCAG was faced with the challenge of adequately explaining the complex allocation method to its member jurisdictions, among which some felt the methodology was adopted without thoroughly researched and vetted. Moreover, as of June 2021, more than 70 local jurisdictions in the state have passed resolutions stating that they are "strongly opposed to the current practice of the legislature … of continually proposing and passing multitudes of bills that directly impact and interfere with the ability of cities to control their own destiny."[14] An interviewee expressed that the growing number of housing bills was like some sort of punishment:

> You see that all the time in government where [the regulated groups] are not following that rule, [the authority thought,] well, we'd better set another rule so that they don't do

[14] The same (or very similar) language is used by the cities that have passed such resolutions. See: https://localcontrolca.com/resolutions.

> that … I am sure the state has the reasons [for introducing new rules], and I am sure part of it is you have jurisdictions that were totally taking advantage [of the system in the past] and manipulating the numbers … but we are just at a point right now where I feel like the state has gone too far.

On May 27, 2021, the board of OCCOG voted unanimously to sue HCD over its most recent housing allocation to the region, stating that "HCD did not follow the statutes outlined in state law to develop the projected number of units" (OCCOG 2021). As state officials and lawmakers continue to assess ways to address housing shortage and affordability, these situations constitute what some scholars referred to as extra-legal interference that "may distort the initially formulated imperative into an outcome" (Larsson 2013, 302).

A lead organization mechanism is posited to generally advance external legitimacy because it is more responsive to external expectations that are beyond the needs of individual actors within the system. The data reveal mixed evidence of external legitimacy. Housing advocates generally support HCD's expanded role in implementing and enforcing of the state's planning requirements. However, with the numerous complex rules in place, disputes tend to occur, and key decision-making may be deferred to the court. As one interviewee remarked:

> … after this round [of housing element update], cities are in the process of implementing or, perhaps, creatively finding ways to not implement [the housing elements], then those cities are going to have to be taking the tasks through litigation, and through the courts. And only then, perhaps, we will then have enough teeth to the laws.

HCD's leadership may be viewed as less legitimate by the general public if its decisions are frequently disputed.[15] Regarding the recent suit filed by housing advocates over the housing targets determined for the Bay Area region, legal scholar Chris Elmendorf (2021) argued that "while the activists' complaint has merit, the dispute should be resolved by the Legislature, not

[15] However, whether deferring decision-making to the court will reduce legitimacy is an empirical question beyond the scope of this study.

the courts." Nevertheless, as reflected in the interviews and observed in public discussions, some implementation actors and stakeholders anticipated that litigation would arise out of the many complex requirements as the planning processes unfold.

Conclusion

California has engaged in decades-long state-led housing planning efforts. Recent legislative changes have introduced a set of rules prescribing new housing target allocation mechanisms and planning standards, enforcement provisions, and procedures to enable inclusive engagement. Drawing on insights from a wide range of stakeholders gathered through interviews and observations of public events, this study reveals some positive developments on California's housing planning system and underscores the ways in which the complexity of the state's planning rules has posed numerous implementation challenges for state housing administrators, regional planners, and local elected officials and planners.

There are rationales for introducing some complexity to the system. Commentators and housing advocates have contended that certain aspects of the complexity, such as the consideration of realistic development capacity in local housing elements, are crucial to addressing the state's housing shortage. Given the political salience of local land use and development regulation, it is also beneficial to enable meaningful stakeholder engagement and inclusive planning processes (Tighe 2011). One approach is to provide opportunities for stakeholder input and tailoring some standards and requirements to different circumstances of the regulated entities. Such attempts are seen, for example, in the housing allocation process, which allows different regions to devise their own allocation methods and local jurisdictions to provide input and to appeal their housing targets. Furthermore, the current housing planning requirements

have prompted implementation actors at the state, regional, and local levels to communicate more extensively and set off broader conversations and debates about addressing housing needs in each community.

However, moving beyond the aspiration for an efficacious, inclusive state housing planning system, this study highlights implementation challenges related to administrative efficiency, inclusive decision-making, flexibility, legal uncertainty, and legitimacy perceived by different stakeholders. The most direct influence of complex rules on implementation actors is the added administrative burdens. This study finds that the added administrative efforts may not achieve much. HCD has limited ability to ensure that local governments plan and zone for the housing targets appropriately because it cannot ground-truth all components in local housing elements, nor is it clear how HCD can effectively monitor the implementation of local housing policies and programs. Another predicament is that the need to meet complex, rigid top-down requirements is likely at odds with the need to enable inclusive decision-making and flexibility in planning processes. There is some evidence that the rigidity and specificity of the rules may trigger resentment among local communities, especially for those receiving large housing targets. The present analysis also reveals concerns about legitimacy introduced by the convoluted housing target allocation process in the SCAG region, a finding consistent with prior claims that regional planning processes are inherently political, and that it is extremely difficult to strike the right political balance between competing values and priorities (Barbour et al. 2011).

This study suggests that California's housing planning system warrants simplification. One potential improvement is using a less complex housing allocation mechanism, which will be more intelligible to stakeholders and leave less room for political wrangling. Another potential reform would be to empower HCD to monitor local compliance based on the progress toward

building, not simply planning for, the housing targets. Currently, local jurisdictions are required to report the number of new housing units entitled in their annual progress reports, but such information is not used as the basis for determining compliance. If housing targets can be set using simpler methods, and if local compliance can be assessed based on the number of new units entitled or built, lengthy administrative processes of assessing housing needs and determining the compliance status of each locality would be substantially simplified. Meanwhile, it is much easier for local jurisdictions, developers, housing advocates, and residents to assess the compliance status and progress of their communities.

There are several limitations of this study that can be addressed in future work. The findings pertaining to implementation challenges at the regional and local levels are based on data that reflect the experience in the SCAG region and in a sample of local communities in two Southern California counties. The findings are also tempered by the time frame of the analysis. Future research should examine certified local housing elements and assess how they are implemented. Future analysis should also examine variations in implementation experience among different regions in California to obtain a more thorough picture of the factors that facilitate and inhibit implementation and their influence on achieving state policy goals.

Chapter 3. Allocating Housing Targets to Local Governments in California: A Bayesian Analysis of Multi-Criteria Allocation Method and Implications for Accessibility

Introduction

California's Housing Element law is intended to ensure that local governments plan for new housing to meet each community's needs and to accommodate future population growth. The law establishes processes for the state to periodically determine regional housing needs and for regional councils of governments (COGs) to allocate these housing needs to cities and counties in the form of numerical targets. The intraregional housing allocation process is intended to promote socioeconomic equity, facilitate efficient development patterns, and support long-range regional strategies to reduce greenhouse gas emissions (Cal. Gov. Code, §65584(d)). Accordingly, state law prescribes numerous criteria that COGs should incorporate into their allocation methodology, including local jobs-housing relationships and opportunities to increase the use of public transit. Yet, state legislators and administrators have little information to assess whether such multi-criteria allocation mechanisms effectively promote residential development in areas accessible to transit, jobs, and other types of opportunity (e.g., education).

The multiple policy objectives prompt decision-makers and planners to tailor housing targets to account for differences in local context. For example, the multi-criteria method that the Southern California Association of Governments (SCAG) recently adopted would allocate much higher housing targets to jobs-rich, transit-rich communities in the region's coastal counties, representing a significant departure from SCAG's practice of allocating the lion's share of new development to communities in inland counties with relatively limited accessibility to jobs and transit. SCAG's current allocation method is the product of substantial advocacy efforts, coupled

with leadership by some local elected officials, which surmounted significant opposition by many coastal communities (Dillon 2019). In practice, however, there is little consensus on how such target tailoring should be designed and implemented (see Chapter 2). Empirical investigation of the implications of housing allocation mechanisms is limited, and recommendations for practice often involve specific tweaks that may improve the multi-criteria methods, such as which indicators to include and how to measure, weight, and aggregate them. Many of these potential improvements, however, may be just as susceptible to technical difficulties as the original methods.

This study aims to explore the possibility for simplifying the housing allocation practices by assessing housing allocation methods of different levels of complexity. Focusing on the SCAG region, I compare the distributions of the housing targets in the region based on the multi-criteria method that SCAG used to allocate housing units to local governments for the 2021-2029 planning period and two simpler, hypothetical alternative methods. The empirical findings draw on Bayesian inference, which is suitable for analyzing data that is situational in time and circumstance and may rarely be replicated. This study finds evidence that California's method of allocating housing targets may be unnecessarily complex and, possibly, raise equity concerns. Simpler allocation mechanisms could potentially achieve the state's policy objectives with less administrative burden.

The remainder of this study is organized as follows. I first discuss the rationales for developing relatively simple and complex methods for allocating housing targets and the implications of housing allocations for accessibility. I then describe the three allocation scenarios assessed in this study. Next, I present the methodology, data, and findings of the Bayesian analysis of the allocation methods. Drawing on the empirical findings, I discuss the potential

limitations of using a multi-criteria method for the purpose of generating housing allocations. The concluding section highlights implications for simplifying California's housing allocation mechanism and for future research.

Housing Allocations and Implications for Accessibility

The housing allocation mechanism is a central component of a state housing planning system. It generates numerical targets indicating the number of new housing units that local jurisdictions are obliged to accommodate, and it can be devised through relatively complex or simple mechanisms. California takes a relatively complex approach that considers multiple criteria in allocating housing targets and requires the involvement of state, regional, and local housing and planning agencies. Several Northeastern states – such as Massachusetts – use a simple bright-line rule established in state law to set housing targets as a flat percentage of the existing housing stock (Fisher and Marantz 2015; Zheng et al. 2021).

Recent planning research has indicated several reasons why simple rules may be needed to manage complex urban environments (Moroni et al. 2018). In the context of land use planning and development regulation, several scholars have argued for bright-line rules on the basis of administrative simplicity (Graddy and Bostic 2010; Monkkonen et al. 2019). Bright-line rules are easy to understand by a general audience and leave little room for varying interpretation. Decision-making based on bright-line rules may be less susceptible to political wrangling, because "[w]ithout a complex allocation system, there is no one to lobby and nothing to game" (Monkkonen et al. 2019, 4). Bright-line rules typically do not require complex quantitative analyses or speculative projections, which can pose barriers to informed decision-making (Christiansen and Kerber 2006). Even if a complex allocation system accomplishes a set of

predetermined objectives, it may be inferior to simpler rules that could accomplish the same goals equally well (Driesen 2015).

On the other hand, a well-designed multi-criteria allocation method could potentially better achieve different policy objectives by tailoring housing targets to regional and local context. A simple bright-line rule is not conducive to such tailoring and is typically not perceived as enabling inclusive planning processes because there is little need for stakeholder discussion and negotiation of how the rule should be crafted (see Chapter 2). Simple bright-line rules may also be over- or under-inclusive, for example, by setting standards that allocate too many units to communities with weak housing markets or failing to allocate sufficient units to areas with disproportionately high rates of cost-burdened households.

Nonetheless, there is little empirical work in the planning literature that links measures of target achievement to the ways that targets are determined. There is some qualitative evidence that local officials and planners can perform their jobs more effectively when they have clear and stable expectations about how the targets are determined. For example, Massachusetts' fixed-percentage (10%) threshold for affordable housing has been in place since relevant state law was enacted in 1969. Goetz and Wang (2020) find that local officials are mindful of their compliance status and that they adjust accordingly their strategies for affordable housing development. On the other hand, little evidence exists that multi-criteria methods appropriately tailor housing targets. There is evidence that, in the past, California's housing allocation mechanism has not effectively served the goals of spurring housing production and promoting job accessibility (Lewis 2005; Monkkonen et al. 2019). One study focusing on the most recent housing allocations that several COGs devised for their regions indicates that the various objectives of the Housing Element law are not consistently promoted by COGs' allocation methods (Osterberg

2020). Prior research also indicates potential conflicts between some of the policy objectives that California's housing planning system seeks to promote, such as transit accessibility and different measures of neighborhood opportunity (Acevedo-Garcia et al. 2016). For example, areas with lower transportation costs tend to have high concentrations of Black or Hispanic residents (Reina, Wegmann, and Guerra 2019). To the extent that trade-offs between different policy objectives are presented, constructing a multi-criteria method that properly accounts for these objectives would be challenging.

In the context of housing planning, the spatial distribution of enforceable housing targets has implications for accessibility of transit and jobs. State governments can choose different types of policy instruments to enforce the housing targets (Zheng et al. 2021). In California, local jurisdictions must demonstrate in their land use and housing plans that they have sufficient site capacity to accommodate the allocated targets. Recent changes to California's housing planning law further compel local jurisdictions to adopt complementary rezoning programs and new policies to remove local constraints on housing development (Elmendorf 2019; Elmendorf et al. 2020a; 2020b). Therefore, to the extent that housing targets are allocated to communities that have good transit and employment accessibility, and that local land use and zoning plans are properly updated to allow more housing to be built, one could expect that such housing allocations improve accessibility.

Scholars have used varying measures of accessibility and opportunity to assess whether affordable housing policies have increased access to transit, jobs, and socioeconomic opportunity. For example, researchers often draw on the metrics used in the federally sponsored Moving to Opportunity (MTO) program and identify areas with poverty rates below 10 percent as high opportunity locations in evaluating the siting of subsidized housing (Ellen and Horn

2018; McClure 2006). Recent housing and transportation studies have also drawn on the nationwide Smart Location Database (SLD), developed by the Environmental Protection Agency (EPA), to derive measures of transit and job accessibility (Nasri and Zhang 2018; Palm and Niemeier 2016). Focusing on intergenerational mobility, Chetty et al. (2014) derive novel measures of social mobility and find substantial spatial variation in these measures.[16] The authors find that social mobility is strongly correlated with observable location characteristics – areas with higher mobility are characterized by lower levels of racial segregation and income inequality, better school quality, stronger social networks and community involvement, and more stable family structures. The analysis of housing allocation scenarios, detailed in the following section, draws on the metrics developed in the literature and provides evidence of the potential accessibility outcomes associated with different allocation mechanisms.

Descriptive Analysis of Allocation Scenarios

This study considers three allocation scenarios in the SCAG region, which covers the counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura. As detailed below, the first allocation scenario is based on SCAG's recently adopted multi-criteria method (MCM), and the two alternatives represent hypothetical allocation scenarios for municipalities in the SCAG region. The following analysis compares the allocation scenarios by examining the characteristics of the cities receiving high allocations under each of the three allocation methods.

[16] Intergenerational mobility is measured in both absolute and relative terms. The primary measure of absolute mobility is the mean rank in the national income distribution of the children from families with a national income rank at a given percentile. The primary relative mobility measure is the difference in the children's income rank outcomes associated with a 10-percent point increase in parent's income rank.

Three Allocation Scenarios

The first allocation scenario is based on SCAG's MCM that was reviewed and approved by HCD and adopted by SCAG in March 2020. As required by state law, SCAG's MCM accounts for criteria such as projected household growth and the accessibility of jobs and public transit. To promote the objectives of advancing socioeconomic equity and affirmatively furthering fair housing, the MCM also seeks to account for "factors that indicate areas that have high and low concentration of access to opportunity" (SCAG 2020a, 2).[17] For each local jurisdiction, the housing targets are segmented into four income levels: very low-, low-, moderate-, and above moderate-income, which correspond to 0-50 percent, 50-80 percent, 80-120 percent, and above 120 percent of the area median income (AMI) for the relevant county (Olmstead 2020). All cities and counties in the SCAG region must update their housing elements to reflect the housing allocations for the period of October 2021 through October 2029. The present analysis examines the distribution of housing allocations based on SCAG's adopted MCM (SCAG 2020b), which does not reflect the changes as a result of the appeals process (see Chapter 2). The reason is that the initial allocations are direct products of the MCM, although they are also very similar to the final allocations given that only two appeals were partially granted.[18] The context-dependent data also suggests that Bayesian analysis may be more appropriate than a frequentist framework for the purpose of statistical analysis, as detailed later.

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[17] Specifically, SCAG first identified a group of disadvantaged cities, which are those with over 50 percent of their populations in very low resource areas, as determined by the California Tax Credit Allocation Committee (TCAC)/HCD Opportunity Indices. This composite measure incorporates indicators such as poverty levels, low wage job proximity, math and reading proficiency, and pollution levels. Next, SCAG developed a factor called residual needs for these disadvantaged cities. These residual needs were subtracted from the disadvantaged cities' allocations and redistributed to non-disadvantaged cities within the same county.

[18] The total reduction for the two jurisdictions was redistributed proportionately back to the SCAG region. The total reduction of 3,132 units accounted for less than 0.2% of the total allocation of 1.34 million units for the region.

The two alternatives represent hypothetical allocation scenarios for the SCAG jurisdictions. The first is a bright-line rule that sets housing targets at 20 percent of local housing stock for all cities (20% Rule), as reported in the 2010 census (U.S. Census Bureau n.d.a). The 20% Rule resembles the fixed-percentage threshold used in the Northeastern states described above. The second is a modified bright-line rule (MBLR), which ranks cities based on a measure of job accessibility and sets housing targets at 25 percent of local housing stock (as of 2010) for the top half of the ranked cities and 15 percent of local housing stock for the bottom half. In this allocation scenario, job accessibility is measured as the number of jobs within a 45-minute automobile commute, aggregated at the municipality level.[19]

Unlike the MCM, the two hypothetical allocation methods incorporate a minimal number of criteria. Neither the 20% Rule nor the MBLR segments housing target allocations into different income categories, although options for promoting below-market-rate (BMR) development under these allocation mechanisms are discussed toward the end of this study. The chosen percentage thresholds allow the two hypothetical scenarios to approximate the MCM scenario in terms of average allocation per city. Specifically, cities in the SCAG region, on average, receive allocations of 6,212 units under the MCM, 6,043 units under the 20% Rule, and 6,493 units under the MBLR. However, it should be noted that this analysis focuses on the distribution of the allocated units across the region, rather than the absolute number of units allocated.

[19] There are many ways of constructing an allocation method. For example, one may also consider a method focusing on job accessibility by public transit. However, given the highly uneven distribution of public transit in the study area, this approach would significantly underestimate job accessibility for jobs-rich jurisdictions with few transit options.

Accessibility and Opportunity in Municipalities with High Allocations

The extent to which a given allocation method promotes access to transit, jobs, and opportunity can be assessed by examining the characteristics of communities receiving high allocations under this method. Under each scenario, I rank the total number of units allocated to each of the 191 cities in the SCAG region and examine the characteristics of the cities with total allocations above the 75th percentile.[20] These cities are referred to as cities receiving high allocations in Tables 1. Under all three allocation scenarios, the total number of units allocated to these cities accounts for over two-thirds of the total allocation for all cities in the region.

Table 1 describes the accessibility, opportunity, and demographic indicators for the 47 cities allocated the most units in the SCAG region under each allocation method.[21] These indicators are used in recent housing and transportation studies (Nasri and Zhang 2018; Palm and Niemeier 2016), as well as by Opportunity Insights (2019) and Knaap (2017).[22] The two accessibility indicators, derived from the SLD, include the number of jobs within 45 minutes by automobile commute and by public transit. To determine whether housing allocations align with SCAG's long-range regional strategy, I include the mean percentage of land within the regions' High Quality Transit Areas (HQTA) as of 2016 for the sampled jurisdictions. HQTAs encompass "areas within one-half mile of a fixed guideway transit stop or a bus transit corridor where buses

[20] The unincorporated areas of the six counties are not considered in the present study because there are no matching data on local characteristics of unincorporated county areas from the census and other sources. While it is possible to derive such variables, unincorporated areas are different from municipalities in many aspects, such as sizes and local governing structures.
[21] Twenty-eight cities receive high allocations (i.e., allocations above the 75th percentile) under all three methods.
[22] COGs typically use the TCAC/HCD Opportunity Indices to identify high opportunity or disadvantaged communities, but some commentators have raised concerns about the use of TCAC opportunity indicators to evaluate housing allocations (e.g., Osterberg 2020).

pick up passengers at a frequency of every 15 minutes or less during peak commuting hours" (SCAG 2016, 8).

Table 1. Means of Accessibility, Opportunity, and Demographic Indicators for Municipalities with High Allocations.

Variable	Cities with High Allocations under:			All cities
	MCM	20% Rule	MBLR	
Jobs within 45 minutes auto travel time (2010)	292,975	274,756	346,916	270,025
Jobs within 45 minutes by public transit (2010)	6,537	6,671	7,808	5,228
% land in HQTA (2016)	27	23	27	19
Mean third-grade math test scores (2013)	222	223	223	224
% unemployed	9	8	7	8
% with Associate degree or higher	30	36	36	37
% households receiving public assistance	4	3	3	3
% single-parent households	33	30	30	30
% below poverty level	16	14	14	14
% owner-occupied housing	53	54	53	58
% non-Hispanic white	27	37	31	36
Number of cities	47	47	47	191

Note: Third-grade math test scores are from the Stanford Education Data Archive (Version 3.0). The test scores are converted from the school district level to the municipality level using the crosswalk file from the 2014 School District Geographic Reference Files (GRFs) published by the U.S. Department of Education's National Center for Education Statistics.
*Source*s: 2013-2017 American Community Survey (U.S. Census Bureau n.d.b); SCAG (2019); U.S. Environmental Protection Agency (2014); Stanford Education Data Archive (Version 3) (Reardon et al. 2019).

The indicators of opportunity for socioeconomic advancement consist of local characteristics identified as strongly correlated to the spatial variation in social mobility in the literature, including mean third-grade math test scores in 2013 and percentages of: unemployed persons in the labor force, population aged 25 or older with an Associate degree or higher, households receiving public assistance, single-parent households, households below the poverty level, and housing units that are owner-occupied. Because land-use regulation has long conferred advantages on communities where non-Hispanic white residents predominate (Rothstein 2017;

Trounstine 2018), I also include the mean percentage of the population identified as non-Hispanic white in communities receiving high allocations.

Table 1 shows that, of the three allocation methods, the MBLR yields the best transit and job accessibility outcomes. Although cities with high total allocations under all three methods on average have superior job and transit accessibility compared with all cities in the region, cities with high allocations under the MBLR have the highest average number of jobs within 45 minutes by automobile and by transit. In addition, cities with high allocations under the MCM and the MBLR have, on average, 27 percent of their land in HQTAs, which is eight percentage points higher than the mean HQTA share for all cities in the region.

With respect to the opportunity indicators, cities with high allocations under the MBLR and the 20% Rule outperform those with high allocations under the MCM. Under all three allocation mechanisms, cities with high allocations have average poverty rates higher than 10 percent. But, compared to the average for all cities in the region, cities with high allocations under the MCM have poorer outcomes in terms of *all* opportunity indicators. In particular, under the MCM, cities with high housing allocations have a much lower percentage of the population with an Associate degree or higher. These cities also have a much lower percentage of non-Hispanic white population, compared with the average percentage for all cities in the region. Cities with high allocations under the 20% Rule and the MBLR differ from the regional average to a lesser extent, with many opportunity indicators showing less than two percentage points of difference.

In summary, the descriptive comparison of the three allocation scenarios suggests that the MBLR may be relatively more effective in guiding housing growth to transit- or jobs-rich areas.

On the other hand, cities with high MCM housing allocations show relatively poor performance in the opportunity indicators despite that the allocation process ostensibly accounts for access to opportunity.[23]

Bayesian Analysis of Allocation Methods

This analysis seeks to assess how housing allocations vary with a particular local characteristic when other factors are held constant. This inquiry is useful for evaluating allocation methods that account for different numbers of criteria. Under the MCM, if SCAG identifies a city as having relatively good access to transit, jobs, and opportunity, the city is likely to receive relatively high housing allocations. However, the housing allocation outcomes are less straightforward for cities that do not have superior performance in *every* indicator used in the allocation process. For example, a large city near job centers may receive a small allocation simply because it provides few high-quality transit options. In this case, the resulting allocation may stymie the goal of improving local jobs-housing relationships, even though job accessibility is one of the factors considered in the allocation process. On the other hand, the simpler 20% rule allocates more units to cities with larger populations, which may systematically differ from smaller cities in other local factors such as job accessibility and median household income. For this reason, it is helpful to isolate the relationship between the allocation outcomes and specific local characteristics of interest. For example, is there any association between housing allocations under the MCM and access to jobs, holding transit accessibility and other local factors equal? Is the association robust when different sets of local factors are controlled for? Is the association positive or negative? I employ the Bayesian model averaging (BMA)

[23] See note 17.

technique to assess these questions. The rest of the section describes the data, variables, and the Bayesian analysis method and presents the results of the analysis.

Data

The sample consists of all 191 cities in the SCAG region. Definitions and data sources of all variables and summary statistics are shown in Tables 2 and 3. The key independent variables include the accessibility of public transit and jobs. Transit access is measured as the land area of HQTA in the SCAG Region as of 2016. Job accessibility is measured as the number of jobs within a 45-minute automobile commute. Another local characteristic of interest is each city's median household income (MHI) relative to all cities in the region. As detailed below, cities with relatively high MHIs provide better access to opportunity for socioeconomic advancement.

Table 2. Variable Definitions and Sources.

Variable	Definition	Source
Total units (log): MCM	Natural log of housing units allocated under the MCM adopted by SCAG	(1)
Total units (log): 20% Rule	Natural log of housing units allocated under the 20% Rule	(2)
Total units (log): MBLR	Natural log of housing units allocated under the modified bright-line rule (MBLR)	(2), (5)
Very low-income units (log)	Natural log of very low-income (VLI) units assigned to cities under the MCM	(1)
Low-income units (log)	Natural log of low-income (LI) units allocated under the MCM	(1)
Moderate-income units (log)	Natural log of moderate-income (MI) units allocated under the MCM	(1)
Market rate units (log)	Natural log of above moderate-income (i.e., market-rate, or MR) units allocated under the MCM	(1)
Population (log)	Natural log of total population	(3)
Land area (2016, log)	Natural log of land area in 2016	(4)
HQTA (2016, log)	Natural log of land area in HQTA in 2016	(4)
Jobs within 45 minutes auto travel time (log)	Natural log of jobs within 45 minutes auto travel time in 2010	(5)
2nd MHI quartile (dichotomous)	=1 for cities with median household income (MHI) between the 25th and 50th percentiles of the regional distribution	(3)
3rd MHI quartile (dichotomous)	=1 for cities with MHI between the 50th and 75th percentiles of the regional distribution	(3)
4th MHI quartile (dichotomous)	=1 for cities with MHI above the 75th percentile of the regional distribution	(3)
% non-Hispanic white	Percentage of population identified as non-Hispanic white	(3)
% Black	Percentage of population identified as Black or African American	(3)
% Asian	Percentage of population identified as Asian	(3)
% single-family detached homes	Percentage of housing units that are single-family detached homes	(3)
% senior	Percentage of population aged 65 or older	(3)

*Source*s: (1) SCAG (2020b); (2) U.S. Census Bureau (n.d.a); (3) U.S. Census Bureau (n.d.b); (4) SCAG (2019); (5) U.S. Environmental Protection Agency (2014).

Table 3. Summary Statistics.

Variable	Mean	SD	Median	*Min*	*Max*	N
Total units (log): MCM	7.49	1.58	7.79	2.08	13.03	191
Very low-income units (log)	6.17	1.56	6.50	1.39	11.66	191
Low-income units (log)	5.64	1.55	5.95	1.39	11.14	191
Moderate-income units (log)	5.71	1.58	5.98	0.00	11.22	191
Market rate units (log)	6.51	1.71	6.76	0.00	12.19	191
Total units (log): 20% Rule	7.96	1.24	8.08	1.79	12.55	191
Total units (log): MBLR	7.93	1.30	8.17	1.95	12.78	191
Population (log)	10.63	1.26	10.8	4.33	15.19	191
Land area (2016, log)	17.19	1.09	17.17	14.20	20.92	191
HQTA (2016, log)	8.73	7.66	13.92	0.00	20.26	191
Jobs within 45 minutes auto travel time (log)	11.85	1.67	12.53	0.00	13.42	191
% non-Hispanic white	36.25	24.35	32.36	1.15	89.99	191
% Black	4.73	5.81	2.6	0.00	41.81	191
% Asian	13.64	14.73	9.57	0.00	67.05	191
% single-family detached homes	61.83	17.01	61.24	6.39	99.49	191
% senior	15.07	8.61	13.42	5.47	82.45	191

Note: The minimum values for the following variables are zeros: moderate-income (MI) units, market-rate (MR) units, land area in HQTA in 2016, and the number of jobs within 45 minutes auto travel time. Because zero cannot be log transformed, the minimum values for the natural log of these variables are coded as zeros.
Sources: SCAG (2020b); U.S. Census Bureau (n.d.a; n.d.b); SCAG Open Data Portal (2019); U.S. Environmental Protection Agency (2014).

I sort cities by MHI into four percentile-based categories: below the 25th, 25th-50th, 50th-75th, and above the 75th percentile of the regional distribution. Table 4 shows that these categories capture variations in selected indicators of opportunity for socioeconomic advancement and demographics (see also, Marantz and Zheng 2020). Cities in a higher income category have, on average, lower rates of unemployment and poverty, as well as smaller percentages of households receiving public assistance and of single-parent households. Meanwhile, mean third-grade math test scores are higher for these cities, as are the mean percentage of owner-occupied housing and the mean percentage of the population with an

Associate degree or higher. In other words, cities in a higher income category are communities with relatively good opportunity for social mobility. Further, for cities with incomes above the 75th percentile of the regional distribution, there are stark differences in mean housing allocations between the MCM and the two alternative methods. These high-income cities, on average, received allocations of over 3,000 units under both the 20% Rule and the MBLR. But they received fewer than 2,000 units under the MCM.

Table 4. Means of Selected Indicators and Housing Allocations, by Median Household Income Quartile.

Variable	**Percentiles of City-Wide Median Household Income:**			
	≤25th	25th-50th	50th-75th	>75th
Mean third-grade math test scores	216	221	227	233
% unemployed	11	8	7	5
% with Associate degree or higher	19	28	41	60
% households receiving public assistance	6	4	2	1
% single-parent households	43	33	27	17
% below poverty level	24	15	10	6
% non-Hispanic white	22	26	41	58
% owner-occupied housing	49	54	60	72
Units allocated under the MCM	1,700	15,122	4,538	1,977
Units allocated under the 20% Rule	3,354	11,939	5,223	3,606
Units allocated under the MBLR	3,144	13,686	5,628	3,451
Number of cities	48	48	48	47

*Source*s: Stanford Education Data Archive (Version 3.0) (Reardon et al. 2019); U.S. Census Bureau (n.d.a; n.d.b); SCAG (2020b).

In addition to controlling for measures of accessibility and opportunity, the regression analysis also controls for population size, land area, and percentages of detached single-family homes, residents aged 65 or older, and population identified as non-Hispanic white, Black, and Asian. These municipality-level demographic and socioeconomic characteristics are measured as of the 2013-2017 American Community Survey (U.S. Census Bureau n.d.b).

Bayesian Model Averaging

For each allocation scenario, multivariate regression analysis is used to isolate the relationship between a particular local characteristic, such as job accessibility, and the number of units allocated to the city. The dependent variable is the number of units allocated under a given allocation method.[24] Bayesian Model Averaging (BMA) – an extension of Bayesian inference – is used to estimate the regression coefficients for the reasons detailed below.

Some scholars contend that Bayesian inference is more suitable for analyzing data in studies of public administration and local governments (Gill and Witko 2013; Deslatte, Swann, and Feiock 2017). Data in these fields are often situational in time and circumstance and cannot be resampled as if from the same data generating process. From a Bayesian perspective, observed data are permanently fixed, and parameters (e.g., regression coefficients) are considered random quantities given the distributions based on some prior knowledge. Parameters of interest can be updated when new data become available. Conversely, from a frequentist perspective, parameters are quantities fixed by nature because there is assumed to be a "true" fixed population parameter. A Bayesian perspective may provide a more realistic depiction of the public policy decision-making process, in which decision-makers will likely update their beliefs and actions given the additional experience and knowledge. Such events are exemplified in this study by changes made after the appeals process to the housing allocations derived from the adopted MCM. Bayesian analysis has been applied in several studies of land use decisions (Aalders 2008; Celio, Koellner, and Grêt-Regamey 2014; Deslatte, Swann, and Feiock 2017), yet the utilization of Bayesian methods in public policy and planning research is low. As detailed

[24] The dependent variable and several independent variables are log transformed in the regression specification.

below, BMA is a Bayesian inference method that further accounts for the uncertainty about the robustness of the relationships between the independent variables and the outcome variable.

For the purpose of assessing the associations between allocation outcomes and local characteristics, the BMA method offers two advantages. Methodologically, provided a set of local characteristics of interest (e.g., measures of access to transit and jobs), BMA uses a computational process that considers all possible configurations of these variables and gives the probability that a real (i.e., non-zero) relationship exists between the allocation outcomes and a particular variable. This probability is referred to as the inclusion probability. A higher inclusion probability indicates that the relationship identified through the BMA process is relatively robust to a multitude of configurations of the independent variables. Substantively, local characteristics with relatively high inclusion probabilities are more likely to have a non-zero correlation with the allocation outcomes and can be thought of as more robust and important than those with lower inclusion probabilities. This information is particularly useful for evaluating the MCM, which accounts for multiple criteria related to accessibility and opportunity. For example, in the MCM scenario, what local characteristics are robustly correlated with the number of units allocated, and what are the implications for simplifying the allocation method?

The basic theory of BMA in a linear regression context is as follows (Montgomery and Nyhan 2010). Let X denote a vector of k independent variables theorized or posited to explain the outcome Y. Under a frequentist framework, one would estimate $Y = \beta X + \varepsilon$. However, there exists a model space $M = [M_1, M_2, \ldots, M_q]$ consisting of $q = 2^k$ possible model specifications, assuming that only the first-order terms of the covariates are included. The large number of possible model specifications creates uncertainty about which set of the covariates have robust associations with the outcome variable. BMA takes this uncertainty into account by deriving a

posterior probability $p(M_i|Y)$ for model M_i, which is the probability of obtaining M_i conditional on the observed data.[25] For a given independent variable, conditional on the observed data, the expected value of the coefficient β is computed as follows:

$$E(\beta|Y) = \sum_{i=1}^{q} p(M_i|Y)E(\beta_i|M_i, Y)$$

The estimated coefficient, also called the posterior mean, is the weighted expected value across all possible model specifications, with the weight being the posterior probability for each model. Similarly, the variances also account for the uncertainty of model specification. For this study, I implement the BMA estimators in Stata using the package introduced by De Luca and Magnus (2011). This procedure returns the estimated coefficients (i.e., posterior means), standard errors, *t* ratios (posterior mean/standard error), and posterior inclusion probabilities. Each variable's posterior inclusion probability is calculated as the sum of the posterior probabilities for all model specifications including this variable. It gives the posterior probability that a variable has a non-zero correlation with the outcome variable (Sala-i-Martin et al. 2004; Magnus et al. 2010). Therefore, the posterior inclusion probability indicates the relative importance of each independent variable. Prior research suggests that an independent variable is considered robustly correlated with the outcome if the absolute value of its *t* ratio is greater than one, or if its posterior inclusion probability is greater than 50 percent (Raftery 1995). Masanjala and Papageorgiou (2008) use a threshold value of 1.3 for the *t* ratio, which is roughly equivalent to a 90 percent confidence interval in frequentist hypothesis testing.

[25] In Bayesian statistics, a posterior probability is obtained conditional on new information (e.g., a new set of data collected). The posterior probability updates the prior probability using Bayes' theorem and can be used as a prior probability in subsequent analyses (Lynch 2007).

Results

Table 5 reports the BMA-estimated regression results for total units allocated under the three methods described above, and Table 6 reports the results for units allocated based on SCAG's MCM, segmented by income category (e.g., low-income units, moderate-income units, etc.). The estimated coefficient and the inclusion probability are reported for each variable. As explained above, the inclusion probability indicates the relative importance of each independent variable. For example, a local characteristic with an inclusion probability of 0.8 means that there is an 80 percent chance that the number of units allocated, based on a given allocation method, is associated with this local characteristic. In order to identify local characteristics that are robustly correlated with the allocation outcomes, I use a threshold of 50 percent for the inclusion probability, as suggested in the literature (Raftery 1995).

The results suggest that job accessibility, measured as the log of jobs reachable within a 45-minute automobile commute, is robustly correlated with *total* allocations in all three scenarios (Table 5). Holding other local factors equal, both total MCM and MBLR allocations will be higher for cities with greater job accessibility, but total units allocated under the 20% Rule will be lower for these cities. This finding suggests that the simple 20% Rule may not effectively guide housing growth to jobs-rich areas.

Under SCAG's MCM, cities with MHIs above the 75th percentile of the regional distribution would receive smaller allocations relative to comparable communities in the region. The coefficient of -0.63 suggests that average MCM allocation is estimated to be 50 percent

lower for these high-income cities, relative to cities in the rest of the region.[26] As noted above, these high-income cities are characterized by lower unemployment rates, better access to high-performing schools, and superior performance in other indicators of opportunity for socioeconomic advancement (Table 4). This pattern of association between allocation outcomes and income categories is not found in the two hypothetical scenarios. Thus, as compared with both the 20% Rule and the MBLR, SCAG's MCM may fare worse with respect to important indicators of access to opportunity.

Table 5. BMA-Estimated Regression Results for Total Allocation Outcomes.

Variable	**(1) Total Units (log): MCM**		**(2) Total Units (log): 20% Rule**		**(3) Total Units (log): MBLR**	
	Coef.	*Inclusion prob.*	Coef.	*Inclusion prob.*	Coef.	*Inclusion prob.*
Population (log)	**0.881**	**1.000**	**0.982**	**1.000**	**0.953**	**1.000**
Land area (2016, log)	**0.309**	**1.000**	0.004	0.138	-0.001	0.084
HQTA (2016, log)	0.001	0.098	0.000	0.090	0.002	0.263
Jobs within 45 minutes auto travel time (log)	**0.074**	**0.767**	**-0.023**	**0.754**	**0.041**	**0.850**
2nd MHI quartile (dichotomous)	0.013	0.113	0.006	0.126	0.004	0.093
3rd MHI quartile (dichotomous)	-0.016	0.125	-0.001	0.076	0.001	0.087
4th MHI quartile (dichotomous)	**-0.631**	**1.000**	-0.003	0.090	-0.035	0.281
% non-Hispanic White	0.000	0.071	**0.006**	**1.000**	**0.004**	**0.969**
% Black	0.000	0.071	0.001	0.181	0.000	0.079
% Asian	**0.014**	**0.996**	0.000	0.117	**0.006**	**0.976**
% single-family detached homes	0.000	0.080	**-0.003**	**0.965**	**-0.008**	**1.000**
% senior	0.001	0.125	**0.012**	**1.000**	**0.005**	**0.657**
N	191		191		191	

Note: Estimated parameters for accessibility, opportunity, and demographic indicators that are robustly associated with the allocation outcomes (inclusion prob. > 0.5) are shown in bold text. Constants are not reported.
Sources: SCAG (2020b); U.S. Census Bureau (n.d.a; n.d.b); SCAG (2019); U.S. Environmental Protection Agency (2014).

[26] Because the allocation outcomes are log transformed, the change in allocation outcomes associated with being in the top quartile of the regional MHI distribution equals to *exp*(coefficient)-1, all else held equal. While the reference group in the model consists of cities with MHIs below the 25th percentile of regional distribution, the allocation outcomes are found *not* systematically different among income categories for cities with MHIs below the 75th percentile of the regional distribution (inclusion prob. < 0.15).

These findings point to the potentially excessive complexity of the MCM. Notably, housing target allocations in total or at any income level are not robustly correlated with transit accessibility, measured as logged HQTA as of 2016 (Tables 5 and 6). In other words, compared to simple allocation methods, an MCM that ostensibly incorporates transit accessibility as a criterion does not necessarily more effectively guide housing development to transit-rich areas.

All three allocation methods tend to make higher allocations to larger cities. The relationships between housing allocation outcomes and several other demographic characteristics are relatively robust given an allocation scenario. Holding all else equal, the allocated units under the MCM and the MBLR tend to be higher in cities with a higher percentage of Asian residents. Allocations under the 20% Rule and the MBLR are positively and robustly correlated with the percentage of the population identified as non-Hispanic white and with the percentage of senior residents. All else equal, allocations under the 20% Rule and the MBLR tend to be higher in cities with a lower percentage of detached single-family homes.

Table 6 shows that, under the MCM method, more populous cities tend to receive higher allocations at all housing affordability levels, as do more territorially expansive cities. Allocations in the very low-, low-, and moderate-income categories tend to be higher in communities with greater job accessibility. Notably, all else equal, cities with MHIs above the 75th percentile of the regional distribution tend to receive lower allocations at all housing affordability levels, compared with cities in the bottom quartile of the MHI distribution.

Table 6. BMA-Estimated Regression Results for MCM Allocation Outcomes by Income Category.

Variable	VLI Units (log)		LI Units (log)		MI Units (log)		MR Units (log)	
	Coef.	*Inclusion prob.*	Coef.	*Inclusion prob.*	Coef.	*Inclusion prob.*	Coef.	*Inclusion prob.*
Population (log)	**0.829**	**1.000**	**0.815**	**1.000**	**0.877**	**1.000**	**0.999**	**1.000**
Land area (2016, log)	**0.337**	**1.000**	**0.369**	**1.000**	**0.348**	**1.000**	**0.237**	**0.996**
HQTA (2016, log)	0.000	0.087	0.001	0.096	0.000	0.082	0.001	0.148
Jobs within 45 minutes auto travel time (log)	**0.128**	**0.957**	**0.067**	**0.669**	**0.077**	**0.776**	0.020	0.291
2nd MHI quartile (dichotomous)	0.129	0.414	0.090	0.321	0.009	0.092	-0.005	0.091
3rd MHI quartile (dichotomous)	0.098	0.336	0.054	0.218	-0.006	0.086	**-0.272**	**0.811**
4th MHI quartile (dichotomous)	**-0.228**	**0.634**	**-0.309**	**0.774**	**-0.472**	**0.990**	**-1.147**	**1.000**
Demographic controls	YES		YES		YES		YES	
N	191		191		191		191	

Note: Estimated parameters that are robustly associated with the allocation outcomes (inclusion prob. > 0.5) are shown in bold text. Constants and demographic control variables are not reported.
Sources: SCAG (2020b); U.S. Census Bureau (n.d.b); SCAG (2019) U.S. Environmental Protection Agency (2014).

Discussion

Overall, these findings suggest a cautionary tale about using an MCM to direct future housing development to transit-rich, jobs-rich, and high-opportunity areas. The MCM analyzed in the present analysis may benefit low-wage workers by allocating more lower-income units to jobs-rich municipalities. However, by giving relatively small allocations to a group of high-income cities, the MCM may limit the ability of low- and moderate-income households to afford housing in high-income cities with relatively good opportunities for socioeconomic advancement.

The accessibility of high-quality transit service and jobs are two key criteria incorporated into the MCM. However, holding all else equal, the number of units allocated under the MCM is not robustly associated with a municipality's existing transit accessibility (measured as the extent

of HQTAs as of 2016). One possible reason is that SCAG measures transit accessibility as the projected local population within planned HQTAs in 2045. The present analysis evaluates the relationship between allocation outcomes and existing HQTAs because the actual locations of HQTAs better capture existing needs for housing and transit services. Prior research suggests that planned future transit availability provides useful guidance for some of the current planning and development activities (Kim and Li 2020). Nevertheless, future distribution of HQTAs depends on policies and programs that are implemented by multiple agencies confronting myriad constraints and uncertainties.

The results suggest that an MCM may be unnecessarily complex for the purpose of generating housing allocations, and that the simpler MBLR has two advantages over the MCM. First, while both the MCM and the MBLR allocate more housing units to areas with higher job accessibility, the MBLR can achieve this goal with far lower administrative burden. Second, the MBLR promotes access to opportunity more equitably than the MCM, which allocates fewer units to high income communities relative to lower income communities.

The findings also bolster prior claims that COGs should rely more on publicly available data from external sources (versus collected local input and internal projections) in the allocation process (Osterberg 2020). The technical tasks demanded by an MCM not only increase administrative burdens but could also lead to counterproductive policies due to constraints related to knowledge and information, such as difficulties with determining the "best" formula or choosing the appropriate indicators.

It should be noted that unlike the MCM, the 20% Rule and the MBLR do not segment allocations by income level (e.g., categories such as low income and moderate income). If total

housing targets were allocated without any affordability requirements, a local jurisdiction may simply try to fulfill its targets by planning for or permitting mostly market-rate units. The simplest adaptation to avoid this outcome would be to apply HCD's determination of housing needs for each income category for the SCAG region.[27] A more complex, but potentially more effective approach would give powerful incentives for permitting below-market-rate housing, in the form of reduced obligations to accommodate market-rate housing. One possible strategy would be to allow one below-market-rate housing unit to count for multiple market-rate units, for the purpose of fulfilling housing targets.[28] For example, one extremely low-income unit (affordable at 0 to 30 percent of AMI) could count for four market-rate units, one very low-income unit (affordable at 30 to 50 percent of AMI) could count for three units, one low-income unit (affordable at 50 to 80 percent of AMI) could count for two units, and one moderate-income unit (affordable at 80 to 120 percent of AMI) could count for 1.5 units. Alternatively, for municipalities that fall short of their housing targets, the state could require minimum percentages of new construction, for example, 10, 15, and 25 percent, to be extremely low-, very low-, and low-income units. These numbers are simply illustrative. State agencies can analyze the additional costs associated with more stringent affordability requirements in order to more finely calibrate the incentives or the set-aside requirements for new development. State agencies could also delegate this task to regional planning agencies.

[27] Under this approach, each local jurisdiction in the SCAG region would be required to accommodate approximately 26, 15, 17, and 42 percent of total housing allocations as very low-, low-, moderate-, and above moderate-income units (see Kirkeby 2019).

[28] Elmendorf et al. (2020a) propose that local governments should receive fractional credits toward their BMR targets for each market-rate unit permitted/built, based on the rationale that adding new market-rate housing would potentially trigger some downward filtering of housing, increasing access to lower priced units within the region.

Conclusion

This study uses the BMA method to identify a set of local characteristics that are robustly correlated with the housing allocation outcomes under a given allocation method. This inquiry is motivated by the common use of MCMs in allocating housing targets to local governments in implementing California's housing planning requirements. Bayesian inference in general is suitable for analyzing data from one-time events, which are commonly seen in public policy and planning research. The BMA method utilized in this study provides a useful tool to explore, rather than test, statistical relationships, such as assessing how local characteristics of interest are correlated with the allocation outcomes given a particular allocation formula.

This study suggests that allocating housing targets to local governments based on a relatively simple, modified bright-line rule could potentially guide housing development to transit- or jobs- rich areas more equitably and with lower administrative burdens than the MCM recently developed by SCAG. A more complex allocation method that attempts to quantify and incorporate multiple policy objectives into the decision-making process may be unnecessary and, possibly, counterproductive. The assessment of different allocation scenarios in the SCAG region is consistent with prior claims that the current target allocation mechanism adopted in California can be simplified and improved. Although an MCM can – in principle — tailor housing targets to regional and local context in order to achieve multiple state policy goals, in practice it is prone to myriad technical difficulties and extensive political wrangling (see also, Chapter 2). As a result, an MCM may not lead to outcomes consistent with the stated objectives. The findings that the MCM allocations are systematically lower in high-income cities and that the allocations are not robustly correlated with transit accessibility suggest that using MCMs for housing allocations may be vulnerable to these problems.

The proposed modified bright-line rule is one way of improving the target allocation process. The current allocation mechanism consists of two complex procedures. First, HCD determines the total target for each region, in consultation with regional COGs. Second, each COG develops and implements a method to allocate its regional target to the local governments within the region. State law prescribes multiple criteria for *both* procedures and thus compels COGs to employ complex allocation methods such as the MCM analyzed in this study. Rather than prescribe a multi-agency, multi-criteria target allocation process, state law could simplify the allocation mechanism. For instance, as shown in this study, it is possible to modify the fixed-percentage approach used in some Northeastern states by incorporating one additional criterion – employment accessibility – and using a simple calculation with readily available national data. This approach is analytically and administratively simple, limiting the kinds of lobbying that may stymie some objectives of the housing allocation process, such as guiding growth to high-opportunity areas.

These findings are not without limitations that merit future scholarly focus. The analysis of accessibility outcomes associated with the allocation mechanisms focuses on cities in the SCAG region rather than all local jurisdictions in the state. The findings show the potential limitations of using an MCM to allocate housing targets to local governments in a large and diverse metropolitan area like the SCAG region. Although a single optimal allocation may not exist, future studies should extend this analysis to other regions and assess the outcomes associated with simple allocation methods. While this analysis focuses on municipality-level housing allocations, accessibility outcomes should also be assessed at the neighborhood level. Future analysis should examine the implications of local planning practice (e.g., identifying sites as suitable for development in local housing elements) for access to jobs, transit, and

opportunity. Such analyses would require better data at the parcel level compiled through various sources. HCD and regional planning agencies could collect local land use entitlement records and compile them with data related to accessibility and opportunity. Some regional planning agencies, such as SCAG, have been improving their parcel-level data by adding attributes that can help local jurisdictions identify and analyze their sites. HCD could facilitate this process throughout the state by developing standards and providing funding for collecting and compiling such data.

Chapter 4. Does Subsidized Housing Alleviate Residential Crowding among Renters in the City of Los Angeles?

Introduction

This study is motivated by the long-standing tension that exists between two types of housing strategies – one seeks to deconcentrate poverty and foster racially integrated communities, and the other one seeks to increase the supply and improve the conditions of affordable housing in neighborhoods of concentrated poverty and segregation (Goetz 2015; 2018). In implementing California's housing planning system, policy-makers and planners have used complex, technical modeling and mapping tools to direct new housing development to high opportunity areas and, in some cases, limit new housing opportunities in relatively poor, low-resourced locations (see Chapters 2 and 3).[29] The trade-offs of such housing planning strategies, however, are not well understood. There is little empirical evidence regarding how subsidized housing might address the housing needs in different types of neighborhoods that are near where such housing is provided. To fill the gap, this study focuses on the need for adequate dwelling space, which has been found largely unmet among low income, minority households (Clark 1992; Clark, Deurloo, and Dieleman 2000; Evans, Lepore, and Allen 2000; Rosenblatt and DeLuca 2012). This study examines whether residential crowding among renters is alleviated in neighborhoods close to newly subsidized housing in the City of Los Angeles.

[29] Specifically, to meet the statutory goal of affirmatively furthering fair housing, sites identified in local housing elements to accommodate the development of lower-income housing units should not be concentrated in low-resourced, high-poverty, or segregated areas. HCD recommends using the TCAC/HCD Opportunity Maps to identify high opportunity neighborhoods (Kirkeby 2020).

Despite that many perceive subsidized housing as a potential source of concentrated poverty (e.g., Massey and Kanaiaupuni 1993), the provision of subsidized housing in high poverty neighborhoods is important for addressing housing disparities. Many households living in these neighborhoods are faced with serious financial constraints and struggle to find affordable units that can meet their housing needs such as adequate dwelling space for each household member. While low-income households may benefit from moving into lower poverty neighborhoods, they often face myriad barriers that prevent them from doing so, such as the lack of access to public transit, the unavailability of affordable housing units, and discrimination against subsidized housing recipients (Rosenblatt and DeLuca 2012). Some households also consider factors such as supportive social networks, proximity to kin, and familiar local institutions and may prefer to stay in or near the same neighborhoods (Briggs, Comey, and Weismann 2010; Carrillo et al. 2016). Therefore, households may stay in their current high poverty neighborhoods due to barriers of the housing market or individual mobility choice. Newly subsidized housing nearby would potentially alleviate residential crowding in these neighborhoods by providing additional housing opportunities for incumbent households to switch to dwelling units that better fit their needs for space at relatively affordable prices.

Drawing on tract-level data from two American Community Survey (ACS) 5-year estimates (2006-2010 and 2015-2019), I specify regression models to analyze the relationship between neighborhood crowding alleviation and proximity to subsidized housing placed in service through federally subsidized or city-assisted programs between 2011 and 2014 in the City of Los Angeles. Under alternative model specifications, the relationship between crowding alleviation and proximity to newly subsidized housing is allowed to vary by selected neighborhood characteristics (e.g., level of poverty concentration).

I find no evidence that proximity to newly subsidized housing is associated with less crowding among renters in neighborhoods with relatively high poverty rates or a high number of crowded housing units. Rather, proximity to newly subsidized housing is associated with crowding alleviation in neighborhoods with a relatively high share of detached single-family homes. While the empirical evidence does not provide direct evidence that subsidized housing effectively addressed residential crowding in relatively crowded, high poverty neighborhoods, it highlights the need for additional research on residential location patterns in response to increased supply of subsidized housing to better inform ongoing policy debates related to where housing growth should be targeted.

The chapter proceeds as follows. First, I review the existing literature on the consequences and factors associated with living in crowded housing and discuss how these factors may work in tandem with newly subsidized housing to shape housing outcomes in neighborhoods where such housing is provided. Drawing upon this discussion, I then describe the research questions, methodology, and data. Next, I present the results and discuss the implications of the empirical findings. The last section concludes and highlights the need for additional research on the relationship between the supply of subsidized housing and residential location patterns.

Residential Crowding, Housing Inequality, and Housing Choice

Living in crowded housing is associated with multiple aspects of the physical and psychological well-being of the occupants. A crowded home may facilitate the transmission of airborne infectious diseases from one household member to another and create precarious living conditions with constant stressors and insufficient personal space. Prior research has linked

crowded living conditions to adverse mental problems among adults in households (Evans, Wells, and Moch 2003; Pierse et al. 2016; Regoeczi 2008). Conflicts among family members and the lack of supportive family interactions may also affect parenting and have implications for children's well-being and development (Bartlett 1998). Existing studies have found associations between crowded living conditions and children's poor physical health, educational performance, and behavior problems (Conley 2001; Goux and Maurin 2005; Leventhal and Newman 2010; Lopoo and London 2016). Focusing on the County of Los Angeles, Solari and Mare (2012) find that residential crowding is associated with negative outcomes in all five indicators of child wellbeing they studied: math scores, reading scores, internal behavior (i.e., withdrawal and sadness), external behavior (i.e., aggression), and general health.[30]

Low-income households often struggle to find units that fit their needs in the kinds of neighborhoods they want to live and have to make trade-offs such as giving up housing space (e.g., living doubled- or tripled-up with other families or friends). Therefore, as also suggested in established literature, the lack of access to adequate and quality housing is a salient dimension of housing inequality, which could further reinforce health and socioeconomic inequalities (Aizawa, Helble, and Lee 2020; Carter 2011; McConnell 2017). In a recent study, Almagro et al. (2021) find that living in crowded buildings was associated with increases in COVID-19 cases and hospitalization rates among essential workers in New York City, and that household crowding became a more important channel of disease transmission when many workers were laid off. Because a large share of people living in crowded buildings were Black, Hispanic, and low income, these disadvantaged groups were disproportionately burdened by disease exposure.

[30] The data come from the Los Angeles Family and Neighborhood Survey (LAFANS).

To shed light on potential policy solutions to residential crowding, existing research has sought to understand factors that contribute to the prevalence of residential crowding. Early studies have highlighted the dominant role of demographic and socioeconomic characteristics such as race/ethnicity, household composition, age, and immigration and poverty status (Burr, Mutchler, and Gerst 2010; Friedman and Rosenbaum 2004; Hall and Greenman 2013; Myers, Baer, and Choi 1996). The overall finding is that household crowding is more common among renters, younger families with children, lower income households, racial and ethnic minorities, and recently arrived and undocumented immigrants, particularly those from Latin America and Asia. A strand of these studies raises the question of the influence of cultural heterogeneity on housing decisions. Specifically, some suggest that people of Hispanic and Asian descent may be more accustomed to denser living arrangements (Pader 1994). On the other hand, some scholars argue that while different ethnic groups may differ in the way they perceive crowding, they suffer from similar, negative psychological distress associated with crowded living conditions (Evans, Lepore, and Allen 2000). More generally, the lack of space is strongly associated with the probability of moving; however, poor households may not be able to locate quality affordable housing when the need for additional space is present (Clark 1992; Clark, Deurloo, and Dieleman 2000).

Empirical evidence regarding the relationship between housing market conditions and residential crowding is scant and inconclusive. For instance, early cross-sectional analyses find mixed results on the relationship between residential crowding and housing market conditions, which are typically measured as rental vacancy rates and median gross rents, at the metropolitan level (Burr, Mutchler, and Gerst 2010; Myers, Baer, and Choi 1996). The lack of conclusive findings in part reflects that research of residential crowding is often beset with limitations in

data, research design, and conceptualization of crowding. For instance, prior to the release of the first 5-year ACS estimates (i.e., the 2005-2009 ACS), there existed little data on residential crowding at the neighborhood level (e.g., ZIP code areas and census tracts). Data limitations preclude the evaluation of changes in neighborhood residential crowding outcomes following changes in the supply of subsidized housing, which households living in crowded dwelling units can more likely afford. Such relationships should also be assessed at more fine-grained geographic levels because crowded housing units often cluster within large metropolitan areas (Clark, Deurloo, and Dieleman 2000).

More recently, researchers have turned their attention to individuals' housing decisions, particularly among low-income urban residents (Briggs, Comey, and Weismann 2010; Carrillo et al. 2016; Greenlee 2019; Rosenblatt and DeLuca 2012). These studies, drawing upon extensive qualitative field work or household-level longitudinal data on residential location, reveal the complexities of housing decisions for low-income people and help form the research questions this study seeks to address. These studies suggest that, to the extent that newly subsidized housing presents an opportunity for households living in crowded units to relocate and to obtain more housing space, many factors are at play in the housing search and attainment process.

These intertwining factors, depending on their relative importance, have implications for housing policy aimed at mitigating inequality in access to quality and affordable housing. Some scholars have found that factors such as reliance on social networks, the comfort of familiarity, and incidences of unanticipated moves often contribute to short-distance moves (Briggs, Comey, and Weismann 2010; Carrillo et al. 2016). In their interviews with participants of the federal Moving to Opportunity (MTO), Rosenblatt and DeLuca (2012) find that 40% of the families that once moved to low poverty neighborhoods with their housing vouchers moved back to higher

poverty neighborhoods in subsequent relocations due to affordability constraints and changing family structures. These narratives support efforts to provide affordable housing options and improve infrastructure and housing quality in disinvested, higher poverty places rather than simply assisting people in moving away. On the other hand, evidence also shows that relocation may be driven by the desire to distance oneself from non-reciprocal "draining ties" (Briggs, Comey, and Weismann 2010; Curley 2009; Kleit 2010; Rosenblatt and DeLuca 2012). Qualitative findings in these studies also show that family households constantly speak of the importance of safety and peace when looking for a place to live. While individual household's residential mobility process (i.e., how people move from one residence to another) is beyond the scope of this study, preferences of households are likely to be correlated with the characteristics of the neighborhoods where they live (Greenlee 2019). As detailed below, multivariate regression is used to estimate the relationship between neighborhood-level residential crowding outcomes and proximity to newly subsidized housing, controlling for several sources of neighborhood heterogeneity.

Research Questions, Data, and Methods

This study focuses on the City of Los Angeles and assesses the relationship between proximity to newly subsidized housing and neighborhood-level residential crowding among renters. I focus on renters because the sampled subsidized housing, as detailed below, is generally intended for renters, and because renters are found to be much more prone to crowding than are owners (Myers, Baer, and Choi 1996). In this study, residential crowding is considered alleviated if the number of crowded rental units decreased in a neighborhood during the study period. Specifically, drawing on data from two ACS 5-year estimates (2006-2010 and 2015-2019), I examine changes in the number of crowded rental units at the neighborhood level across

the city. Alleviation of neighborhood crowding is operationalized based on two measures: (1) a binary variable indicating whether the number of crowded rental units in a neighborhood decreased, and (2) the count by which the number of crowded rental units decreased between the two ACS periods. Proximity is operationalized as the distance to the nearest newly subsidized housing.

The empirical analysis examines whether proximity to newly subsidized housing is associated with alleviation of residential crowding among renters between the two ACS periods. I specify regression models that allow the relationship between proximity to newly subsidized housing and crowding alleviation to vary by several neighborhood-level characteristics as of the 2006-2010 ACS. In principle, more crowded, higher poverty neighborhoods are faced with more intense pressure on the supply of subsidized housing units. Existing research also suggests that family households prefer to live in or move closer to neighborhoods that provide "a nice family environment" such as those with higher shares of detached single-family homes (Briggs, Comey, and Weismann 2010, 413). For these reasons, and under the assumption that newly subsidized housing provides new housing opportunities for incumbent residents in nearby neighborhoods, proximity to such housing (i.e., smaller distance) is hypothesized to be associated with crowding alleviation in neighborhoods that had a relatively large: (1) number of crowded rental units, (2) percentage of the population in poverty, and (3) percentage of housing units as detached-single family homes. Statistically, such relationships can be tested through examining the coefficient for the interaction term of the proximity measure and each relevant neighborhood characteristic (Cohen et al. 2002; Jaccard, Wan, and Turrisi 1990). The rest of the section details the data sources, variable definitions, and the regression models.

Measure of Neighborhood Residential Crowding

The incidence of crowding can be assessed based on various measures, such as persons per room, persons per bedroom, and square footage per person (Blake, Kellerson, and Simic 2007). A crowded housing unit is most commonly defined as one with more than one person per room, on which data is available at the census tract level from the 5-year ACS estimates. One of the most used indicators for assessing living conditions and guiding policies related to public health and housing affordability is housing crowding rate, measured as the share of housing units that are crowded.[31] However, of interest to this study is how the incidence of residential crowding changed over time, and relying on crowding rate confronts both substantive and methodological challenges. Substantively, changes in crowding rates can be driven by changes in the numerator and/or the denominator. Decreases in crowding rates over a given period of time may simply reflect that new residents have moved into non-crowded units, but that the number of existing households living in crowded units remains unchanged or may even slightly increases. Methodologically, scholars have contended that correlations involving ratios confound the interpretations of results and are likely to lead to spurious findings (Pearson 1896; Wiseman 2009). Certo et al. (2020) demonstrate in their simulations that regression models including dependent variables operationalized as ratios may risk erratic coefficient estimates and substantial loss of statistical power (i.e., increase in Type II errors). The authors recommend focusing on the numerators of the ratios and including the denominators as separate control variables.

[31] See e.g., California's Healthy Communities Data and Indicators Project (HCI) of the Office of Health Equity (https://data.chhs.ca.gov/dataset/housing-crowding).

For these reasons, this study measures neighborhood residential crowding alleviation based on the change in the number of crowded units in a neighborhood. The first measure is a binary variable indicating whether the number of crowded rental units decreased between the two ACS periods in a census tract. The second measure is the count by which the number of crowded rental units in a census tract decreased during the study period. For tracts that experienced declines in crowded rental units, it is calculated as the absolute difference in crowded rental unit counts between the two ACS samples. Tracts that did not experience such declines are assigned a value of zero. As detailed below, given that one of the outcome variables is binary and that the other one is count data, different regression specifications are used to examine the relationship between proximity to newly subsidized housing and neighborhood crowding alleviation.

Proximity to Subsidized Housing

This study includes subsidized housing units placed in service through federally subsidized or city-assisted programs in the City of Los Angeles from 2011 through 2014.[32] Data on subsidized housing come from the National Housing Preservation Database (NHPD) and the Los Angeles Housing + Community Investment Department (HCIDLA). Both datasets provide rich project-level information including total units, precise location (i.e., street address and geographic coordinates), and time placed in service or when any subsidies attached to the property went into effect. Properties placed in service or with at least one form of subsidies activated during 2011 and 2014 are extracted from the two databases. Last, because subsidized

[32] To avoid simultaneity bias, the chosen period of time in which subsidized housing units were added does not overlap with the years covered in the ACS samples, from which measures of residential crowding are derived. Both newly built and rehabilitated subsidized properties are treated as new subsidized housing opportunities in the market and are included in the sample (see also, Ellen at al. 2007).

properties typically receive multiple forms of subsidy, the compiled list of subsidized housing is deduplicated by examining the property names, numbers of units, and addresses for potential duplicates. A total of 249 subsidize housing properties were placed in service or had at least one form of subsidies activated between 2011 and 2014.

The variable of interest, proximity to newly added subsidized housing, is measured as the distance of a neighborhood to the nearest newly subsidized housing in the period 2011-2014. Distance is calculated from the centroid of each census tract to the geographic coordinates of the nearest newly subsidized property. To account for the potential influence of large-scale housing development, I use the distance of a neighborhood to the nearest property with 50 subsidized units or more as an alternative measure of proximity. Approximately 75% of the sampled properties have more than one type of subsidy attached. Therefore, this study does not distinguish between the types of subsidized housing and seeks to assess whether and how measures of neighborhood residential crowding among renters would change as a function of proximity to newly subsidized housing.[33]

Regression Model

I first use logistic regression to model the likelihood that the number of crowded renter rental units decreased between the two ACS periods as a function of the distance from a census tract to the nearest newly subsidized housing as well as neighborhood demographic and socioeconomic characteristics drawn from the 2006-2010 ACS. Next, I use two-stage zero-

[33] Previous studies find the effects of subsidized housing on neighborhood outcomes, such as property values and the incidence of eviction filing, might vary across housing assistance programs (Ellen et al. 2007; Preston and Reina 2021). For this study, regression analysis can be done to analyze the relationship between crowding alleviation and proximity to a particular type of subsidized housing (e.g., Section 8 properties); however, the results are likely confounded by other types of subsidies attached to the sampled properties and proximity to other types of subsidized housing not captured in the subsample analysis.

inflated negative binomial (ZINB) regression to model the count by which crowded rental units decreased. ZINB regression is a type of model designed for count outcomes that are overdispersed (i.e., the variance is greater than the mean) and have excess zeros. The distribution of counts by which crowded rental units decreased displays both features, with a variance higher than its mean and with over 50% of the tracts that saw no decline in the number of crowded rental units. The first stage of a ZINB model uses a logit model to predict census tracts experiencing no decline in crowded rental unit counts, and the second stage is a negative binomial model, evaluating the magnitude of decrease in crowded rental unit counts as a function of the explanatory variables. Incidence rate ratios (IRR) are generated in the second stage of the ZINB model and can be interpreted as the factor by which the expected count is multiplied following a one-unit change in an explanatory variable, all else held equal.

One variable of interest is the *distance to the nearest newly subsidized housing* (d_{SH}). In the case of the logistic model, a negative and significant coefficient (which corresponds to an odds ratio less than one) would indicate that tracts closer to newly subsidized housing are more likely to experience decreases in crowded rental units compared to tracts farther away from such housing, all else held equal. In the case of the ZINB model, an IRR less than one for d_{SH} would indicate the expected magnitude of decrease in crowded rental units is larger in tracts closer to newly subsidized housing. Both the logistic and ZINB models control for tract-level demographic and socioeconomic measures that are commonly used in quantitative analysis of residential crowding, as described and summarized in Tables 7 and 8 (Burr, Mutchler, and Gerst 2010; Friedman and Rosenbaum 2004; Hall and Greenman 2013; Myers, Baer, and Choi 1996).

Table 7. Variable Definitions.

Variable	Definition
Total population (log)	Natural log of total population
Land area (log)	Natural log of land area
% Hispanic	% of population identified as Hispanic
% black	% of population identified as Black
% family households with children	% of households identified as family households with related children under 18
% young households	% of households with householders age 25-44
% recently arrived immigrants from Latin America	% of population identified as foreign born that entered the U.S. from Latin America in 2000 or later
% vacant rental units	% of housing units that were vacant rental units
Initial number of crowded rental units	Number of crowded rental units as of the 2006-2010 ACS
% poverty	% of population with income below federal poverty line
% detached SFR	% of housing units that were detached single-family homes
Distance to nearest subsidized housing (d_{SH})	The distance from the centroid of a census tract to the geographic coordinates of the nearest subsidized property

Note: All variables are measured at the census tract level and are as of the 2006-2010 ACS (U.S. Census Bureau n.d.c) except for d_{SH}, which is derived in geographic information system (GIS) software.

Table 8. Summary Statistics for Regression Sample.

Variable	**Mean**	***SD***	**Median**	**Min**	**Max**	***N***
Total population (log)	8.17	0.44	8.21	3.58	9.07	1004
Land area (log)	5.25	0.89	5.17	2.85	11.23	1004
% Hispanic	47.21	29.62	48.12	0.00	99.68	1004
% black	9.26	14.34	4.11	0.00	91.28	1004
% family households with children	21.67	17.15	18.27	0.00	200.00	1004
% young households	42.41	12.19	42.92	0.00	100.00	1004
% recently arrived immigrants from Latin America	5.85	6.07	4.03	0.00	37.61	1004
% vacant rental units	3.05	4.02	2.28	0.00	84.85	1004
Initial number of crowded rental units	153.20	150.96	114.50	0.00	912.00	1004
% poverty	19.07	13.05	16.64	0.00	76.51	1004
% detached SFR	41.93	29.78	38.41	0.00	100.00	1004
Distance to nearest subsidized housing (d_{SH})	0.89	0.83	0.64	0.03	6.58	1004

Source: U.S. Census Bureau (n.d.c).

The baseline regression model includes all variables shown in Table 7. In alternative model specifications, the proximity measure, d_{SH}, is interacted with (1) the number of crowded rental units, (2) the percentage of people in poverty, and (3) the percentage of housing units that were detached single-family homes. All three variables are measured as of the 2006-2010 ACS

and are mean-centered to allow meaningful interpretations of the coefficients and to reduce potential problems with multicollinearity (Jaccard, Wan, and Turrisi 1990). For example, with an interaction of d_{SH} and the percentage of people in poverty added to the model, the relationship between d_{SH} and the dependent variable is no longer assumed to be linear but varies based on the level of poverty concentration. The coefficient for d_{SH} indicates changes in the outcome variable associated with a one-unit change in d_{SH} (i.e., the slope) in neighborhoods with average poverty level, and the coefficient for the interaction term indicates the change in the slope given a one-unit change in the percentage of people in poverty.

Subsidized Housing in the City of Los Angeles, 2011-2014

This section provides a descriptive overview of newly subsidized housing placed in service between 2011 and 2014 in the City of Los Angeles and examines the tract-level average changes in the number of crowded rental units by proximity to the newly subsidized properties. Subsidized housing provided through federally subsidized or city-assisted programs in the period 2011-2014 represents approximately 24% of the growth in rental housing stock between the two ACS periods. Figure 3 depicts the spatial distribution of the identified subsidized properties across the city. The most prevalent types of subsidy come from three federal subsidized housing programs: the Low-Income Housing Tax Credit (LIHTC) program, project-based Section 8 program, and HOME Rental Assistance.[34] The LIHTC and project-based Section 8 programs provide subsidies that are attached to particular units in subsidized properties and establish affordability restrictions for these properties. The HOME Rental

[34] A total of 249 properties were identified, among which 232 received subsidy from at least one of these three programs.

Assistance program allocates funds to participating jurisdictions (e.g., states and local governments), which can use the funds to carry out a range of housing strategies through rehabilitation, new construction of housing, and rental assistance assigned to eligible households. The HCIDLA facilitates the financing of affordable and supportive rental housing development in the City of Los Angeles and builds and preserves housing in low-income communities using federal and state funds. During 2011 and 2014, a hundred and fourteen city-assisted properties were in service, of which only nine were not attached to any active federal housing subsidies during this time period.

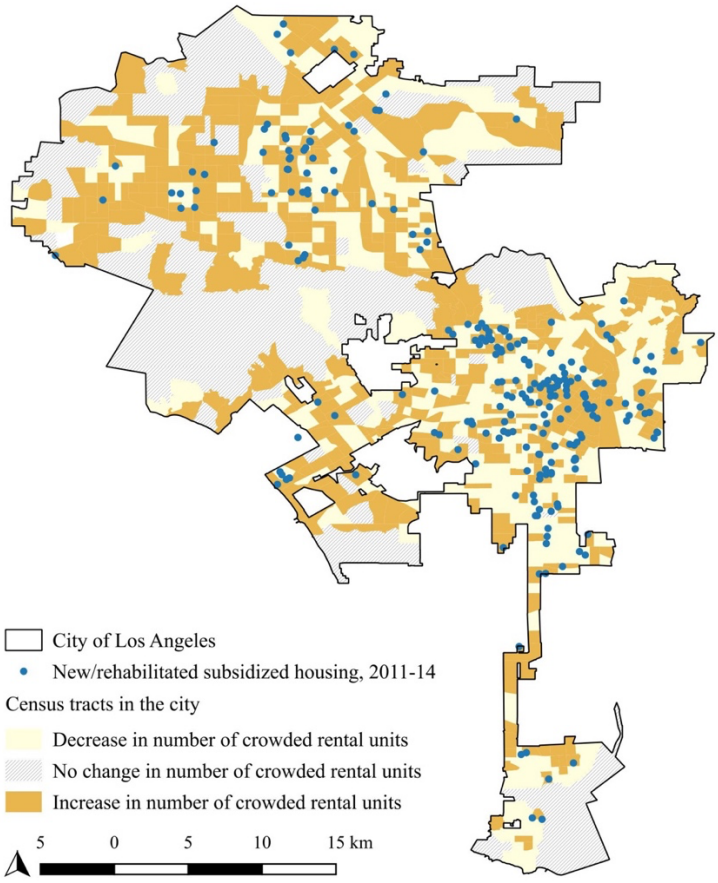

Figure 3. Change in residential crowding and newly subsidized housing (2011-14) in the City of Los Angeles.
Sources: Data on subsidized housing come from the National Housing Preservation Database (NHPD) and the Los Angeles Housing + Community Investment Department (HCIDLA).

On average, census tracts in the City of Los Angeles were .9 miles from the nearest newly subsidized housing placed in service during 2011 and 2014 and 1.2 miles from the nearest property with at least 50 subsidized units. As illustrated in Figure 3, census tracts in the vicinity of newly subsidized housing experienced both decreases and increases in the number of crowded rental units. Table 9 shows the total number of crowded rental units in each of the two ACS periods by the distance of each tract to the nearest newly subsidized housing. As of the 2006-2010 ACS, tracts that are within 0.5 mile from the closest newly subsidized housing had a total of over 97,686 (±2107) crowded rental units, accounting for over 60% of all crowded rental units in the city. Therefore, during 2011 and 2014, subsidized housing units were sited in neighborhoods where households living in crowded housing were already concentrated. The number of crowded rental units in census tracts that are within one-half mile of the closest newly subsidized housing is 94,646 (±1897) units as of the 2015-2019 ACS. While the point estimates of crowded rental units decreased over the two ACS periods, the difference is not statistically significant at the 10% level (because the two 90% confidence intervals overlap). The distributions of crowded rental units in the two ACS periods by the distance of each tract to the nearest property with at least 50 subsidized units follow similar patterns.

It is unclear from Table 9 whether proximity to newly subsidized housing contributed to any decrease in the number of crowded rental units during the study period. The spatial patterns discussed above are consistent with prior claims that residential crowding is shaped by a host of factors including household structure, cultural differences, purchasing power, preferences for certain types of neighborhoods, and housing availability. The regression analysis, detailed below, further isolates the relationship between residential crowding outcomes and proximity to newly subsidized housing.

Table 9. Total Crowded Rental Units by Distance to Nearest Newly Subsidized Housing.

	2006-2010 ACS		2015-2019 ACS		
	Units	*MOE*	Units	*MOE*	*N*
Distance to nearest subsidized housing (2011-14)					
0-0.5 mi	97,686	2,107	94,646	1,897	414
0.5-1 mi	35,582	1,319	36,348	1,273	265
1-1.5 mi	14,056	870	15,321	848	165
1.5-2 mi	3,781	457	4,498	480	76
>=2 mi	2,707	423	2,553	396	91
Distance to nearest subsidized housing (2011-14) (>=50 units)					
0-0.5 mi	73,316	1,823	72,504	1,654	290
0.5-1 mi	43,931	1,433	42,818	1,345	275
1-1.5 mi	19,835	1,002	20,600	946	180
1.5-2 mi	7,063	628	7,862	615	103
>=2 mi	9,667	742	9,582	713	163

Note: The 90% confidence level margins of error (MOE) are reported.
*Source*s: 2006-2010 ACS (U.S. Census Bureau n.d.c); 2015-2019 ACS (U.S. Census Bureau n.d.d).

Regression Results and Discussion

This section presents the empirical findings. For the logistic and ZINB analyses, respectively, I first describe the results of the baseline model and then the coefficients (expressed as odd ratios or IRRs) for the first-order variables, followed by a more detailed explanation of the results for each interaction term. At the end of this section, I provide a discussion of the empirical findings.

Likelihood of Decrease in Residential Crowding

Table 10 reports the results for the logistic regression with robust standard errors and odds ratios, which indicate changes in the odds that a tract would experience decrease in the number of crowded rental units for a one-unit change in an independent variable, holding all

else equal.[35] All four models include the distance to the nearest newly subsidized housing (d_{SH}) and tract-level demographic and socioeconomic characteristics. In supplemental analysis, I replace d_{SH} with the distance to the nearest housing with 50 subsidized units or more to examine the potential influence of large-scale subsidized housing. As shown in Table 12 in Appendix B, the results are highly similar to those reported and discussed in the main text.

In Model (1) of Table 10, the likelihood of decrease in residential crowding is not associated with d_{SH} at conventional levels of statistical significance, suggesting a possible nonlinear relationship between d_{SH} and the likelihood of crowding alleviation. The odds ratios for the control variables are generally consistent with expectations and are robust to alternative specifications shown in Models (2) to (4). All else equal, tracts with a higher percentage of the population identified as Black and those with a higher share of young households are more likely to see decrease in crowded rental units. The probability of decrease in crowded rental units is also higher in tracts that initially had more crowded units. These findings may suggest that the need for moving out of crowded housing is prevalent among African American people, young households, and those already living in crowded housing units. On the other hand, a higher percentage of recently arrived immigrants from Latin America is associated with a lower probability of decrease in crowded rental units. Lower rental vacancy rates are associated with a higher probability of decrease in crowded rental units. This pattern may suggest that households living in crowded units had been displaced in tight housing markets.

[35] In a logistical regression context, the logit function is expressed as the logarithm of the odds of an event. Here, the odds of decrease in crowding is the probability of decrease in crowded rental units divided by the probability of no decrease.

Models (2) to (4) allow the relationship between d_{SH} and the probability of decrease in crowded rental units vary by selected neighborhood characteristics. Model (2) includes an interaction term of d_{SH} and the initial number of crowded rental units in a tract. Because the measure of initial crowding is mean centered, an odds ratio of 2.09 for d_{SH} suggests that in neighborhoods with an average number of crowding rental units (about 153 units), the odds of decrease in crowding is more than doubled if these neighborhoods are one mile farther from the nearest newly subsidized housing. In other words, proximity to newly subsidized housing is *not* associated with a higher probability of decrease in residential crowding in neighborhoods with an average number of crowded rental units. Model (3) suggests that proximity to newly subsidized housing is *not* associated with a higher probability of decrease in residential crowding in neighborhoods with average poverty level (about 19% of people in poverty). Finally, in Model (4), there is no statistically significant association between d_{SH} and the probability of decrease in crowding in neighborhoods with an average percentage of detached single-family homes (approximately 42%).

Odds ratios for the interaction terms indicate how the relationship between d_{SH} and the probability of decrease in crowding would vary by a given tract characteristic. One way to interpret this nonlinear relationship is to hold the tract characteristic (e.g., % poverty) constant at different levels, and then estimate how the probability of decrease in crowded rental units would change given a one-unit change in d_{SH}. The results are illustrated in Figure 4, with the Y-axis indicating changes in the probability of decrease in crowded rental units for a one-mile increase in the distance to the nearest newly subsidized housing while holding a given tract characteristic at different levels. The shaded area indicates the 95% confidence intervals (CIs) for the estimates. Area below the zero line indicates that proximity to newly subsidized housing

(i.e., *smaller* distance) is associated a *higher* probability of decrease in crowding, while area above the zero line indicates the opposite.

Figure 4a shows that proximity to newly subsidized housing is associated with a *lower* probability of decrease in crowding at almost all levels of initial crowding. The peak of the bell-shaped pattern indicates that for tracts with approximately 300 crowded rental units, the probability of decrease in crowding is estimated to be lower by 0.22 if a tract is one-mile closer to the nearest newly subsidized housing, all else equal. For tracts with more than 300 crowded rental units, lower probability of decrease in crowding is also associated with proximity to newly subsidized housing (at the 5% level), but the magnitude of changes is smaller.

In Figure 4b, proximity to newly subsidized housing is not associated with the probability of decrease in crowding in lower poverty tracts (<18% of people in poverty); however, for tracts with approximately more than 18% of people in poverty, the probability of decrease in crowding is lower in tracts that are closer to the nearest newly subsidized housing.

Finally, Figure 4c shows that being closer to newly subsidized housing is associated with a higher probability of decrease in crowding in neighborhoods with a relatively high share (nearly 80%) of detached single-family homes. An opposite pattern is found in neighborhoods where less than 40% of the housing units are detached single-family homes. These findings suggest that newly subsidized housing near single-family dominant neighborhoods may help address the needs for more dwelling space among existing residents.

Table 10. Logistic Regression Results for Census Tracts in Los Angeles.
(Dependent variable=logit(p), where p is the probability of decrease in crowded rental units. Exponentiated coefficients (odds ratio) are reported.)

	(1)	(2)	(3)	(4)
Total population (log)	1.071	0.856	1.000	1.035
	(0.183)	(0.142)	(0.164)	(0.167)
Land area (log)	0.814	0.797*	0.815	0.793*
	(0.105)	(0.108)	(0.102)	(0.104)
% Hispanic	1.007	1.000	1.004	1.003
	(0.005)	(0.005)	(0.004)	(0.005)
% black	1.024***	1.020***	1.022***	1.020***
	(0.006)	(0.006)	(0.006)	(0.006)
% family households with children	1.001	1.001	1.003	0.999
	(0.009)	(0.009)	(0.009)	(0.009)
% young households	1.024***	1.019**	1.022**	1.019**
	(0.009)	(0.009)	(0.009)	(0.009)
% recently arrived immigrants from Latin America	0.913***	0.933***	0.919***	0.922***
	(0.021)	(0.021)	(0.021)	(0.021)
% vacant rental units	0.929***	0.935**	0.932***	0.937**
	(0.026)	(0.026)	(0.025)	(0.026)
Initial number of crowded rental units (mean-centered)	1.009***	1.006***	1.009***	1.010***
	(0.001)	(0.001)	(0.001)	(0.001)
% poverty (mean-centered)	0.992	0.993	0.970**	0.996
	(0.010)	(0.010)	(0.012)	(0.010)
% detached SFR (mean-centered)	1.012***	1.016***	1.013***	1.029***
	(0.004)	(0.005)	(0.004)	(0.006)
Distance to nearest subsidized housing (d_{SH})	1.050	2.091***	1.407**	1.214
	(0.120)	(0.461)	(0.221)	(0.155)
Interaction of initial crowding and d_{SH}		1.007***		
		(0.002)		
Interaction of % poverty and d_{SH}			1.035***	
			(0.011)	
Interaction of % detached SFR and d_{SH}				0.985***
				(0.003)
N	1004	1004	1004	1004

Note: Robust standard errors are in parentheses.
Sources: U.S. Census Bureau (n.d.c; n.d.d).
*p < .10. **p < .05. ***p < .01.

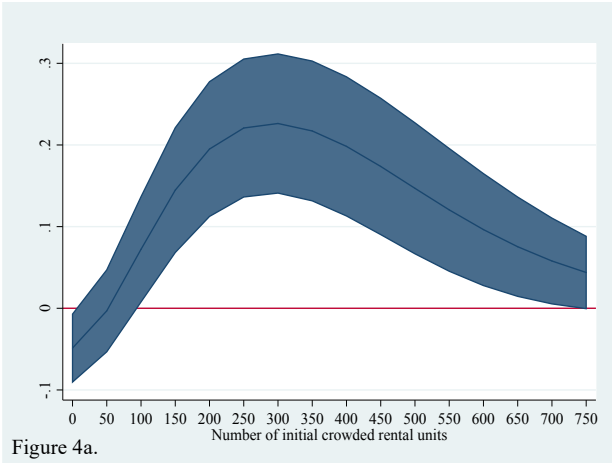

Figure 4a.

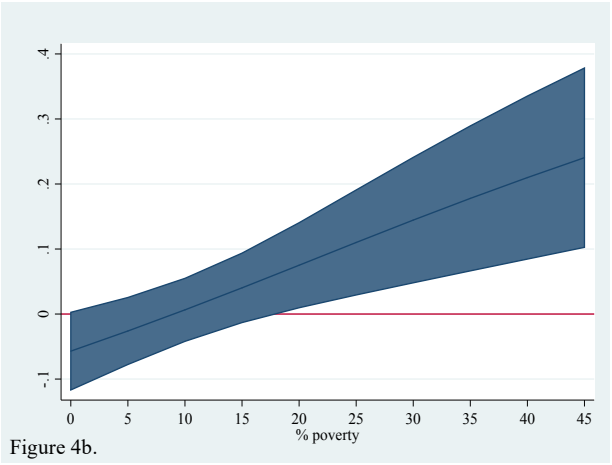

Figure 4b.

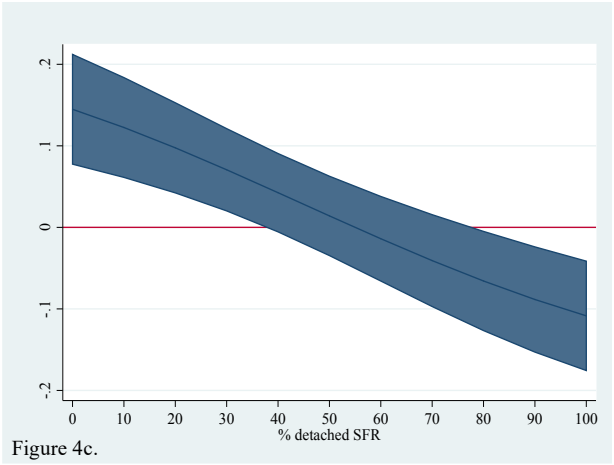

Figure 4c.

Figure 4. Changes in probability of decrease in crowded rental units for a one-mile increase in distance to nearest subsidized housing (Y-axis).

Note: Shaded area denotes 95% CIs. Area below the zero line indicates that proximity to newly subsidized housing is associated higher probability of decrease in crowding.

Magnitude of Decrease in Residential Crowding

Table 11 reports the ZINB regression results, which examine the magnitude of decrease in the number of crowded rental units in a tract. The four model specifications include the distance to the nearest newly subsidized housing (d_{SH}), neighborhood covariates, and the interaction terms.[36] Findings from the ZINB models are generally consistent with the logistic regression results discussed above.

The odds ratios are the results of the logit component of the ZINB regression, which in this case predicts the likelihood that a tract experienced *no decrease* in crowding during the study period. Here, the results of the logit component are consistent with those of the logistic regression analysis that examines the likelihood of decrease in crowded rental units (Table 10). The proximity measure, d_{SH}, is not significant in the baseline model of Table 11. Variables that are negatively associated with the likelihood of no decrease in crowding (e.g., % young households), as shown in Table 11, are also positively associated with the likelihood of decrease in crowding, which is shown in Table 10.

In the second-stage negative binomial models, d_{SH} is not associated with the magnitude of decrease in crowded rental units at conventional levels of statistical significance (Model (1) of Table 11). Nonetheless, as shown in Models (2) to (4) of Table 11, there may be statistically significant associations between the magnitude of decrease in crowding and proximity to newly subsidized housing in neighborhoods at certain levels of initial residential crowding, poverty concentration, and dominance of single-family housing, as illustrated in Figure 5. Regarding

[36] As shown in Table 13 in Appendix B, the results are robust to alternative specifications including the distance to the nearest newly added large-scale subsidized housing (>=50 units).

other neighborhood characteristics, the percentage of the population identified as Black, the percentage of recently arrived immigrants from Latin America, and the initial number of crowded rental units, are robustly correlated with the magnitude of decrease in crowded rental unit counts. These relationships are in the directions consistent with expectations and the findings of the logistic regression analysis (Table 10).

In Figure 5, the Y-axis indicates the number by which crowded rental units decreased given a one-mile increase in d_{SH} in tracts that experienced such decrease. The relationship between the magnitude of decrease in crowding and the proximity measure does not appear to vary by the initial number of crowded rental units in a tract (Figure 5a). As shown in Figure 5b, in low poverty tracts (< 6% of people in poverty), proximity to newly subsidized housing (smaller distance) is associated with a more substantial decrease in crowded rental units. However, in high poverty tracts (> 20% in poverty), the magnitude of decrease in crowded rental unit counts would be smaller as these tracts become closer to the nearest newly subsidized housing. Finally, Figure 5c suggests that, for tracts where more than 65% of the housing stock are detached single-family homes, proximity to newly subsidized housing is associated with a more substantial decrease in crowded rental units.

Table 11. ZINB Regression Results.

	(1)		(2)		(3)		(4)	
	Odds ratio	IRR	Odds ratio	IRR	Odds ratio	IRR	Odds ratio	IRR
Total population (log)	0.933	0.965	1.168	0.940	1.001	0.999	0.966	0.962
	(0.160)	(0.128)	(0.195)	(0.124)	(0.165)	(0.137)	(0.156)	(0.130)
Land area (log)	1.232	1.102	1.257*	1.099	1.230*	1.082	1.264*	1.103
	(0.160)	(0.070)	(0.172)	(0.068)	(0.154)	(0.071)	(0.166)	(0.070)
% Hispanic	0.993	1.005**	1.000	1.003	0.996	1.004*	0.997	1.004*
	(0.005)	(0.002)	(0.005)	(0.002)	(0.004)	(0.002)	(0.005)	(0.002)
% black	0.977***	1.006**	0.981***	1.004*	0.978***	1.004*	0.981***	1.005*
	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)	(0.003)
% family households with children	0.999	0.999	0.999	1.000	0.997	0.999	1.001	0.998
	(0.009)	(0.005)	(0.009)	(0.005)	(0.009)	(0.005)	(0.009)	(0.005)
% young households	0.976***	1.000	0.981**	1.000	0.978**	0.999	0.981**	1.000
	(0.009)	(0.004)	(0.009)	(0.004)	(0.009)	(0.004)	(0.009)	(0.004)
% recently arrived immigrants from Latin America	1.096***	0.978***	1.072***	0.981**	1.088***	0.980**	1.084***	0.979**
	(0.025)	(0.008)	(0.024)	(0.008)	(0.024)	(0.008)	(0.025)	(0.008)
% vacant rental units	1.077***	0.992	1.070**	0.994	1.073***	0.995	1.067**	0.993
	(0.030)	(0.013)	(0.030)	(0.013)	(0.029)	(0.013)	(0.030)	(0.013)
Initial number of crowded rental units (mean-centered)	0.991***	1.004***	0.994***	1.004***	0.991***	1.004***	0.990***	1.005***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
% poverty (mean-centered)	1.008	0.998	1.008	0.999	1.031**	0.991	1.004	0.999
	(0.010)	(0.005)	(0.010)	(0.005)	(0.013)	(0.006)	(0.010)	(0.005)
% detached SFR (mean-centered)	0.988***	0.999	0.984***	0.999	0.987***	0.999	0.972***	1.002
	(0.004)	(0.002)	(0.005)	(0.002)	(0.004)	(0.002)	(0.006)	(0.003)
Distance to nearest subsidized housing (d_{SH})	0.951	0.974	0.476***	1.009	0.710**	1.035	0.822	0.971
	(0.109)	(0.054)	(0.106)	(0.059)	(0.112)	(0.063)	(0.105)	(0.051)
Interaction of initial crowding and d_{SH}			0.993***	1.001***				
			(0.002)	(0.000)				
Interaction of % poverty and d_{SH}					0.967***	1.013***		
					(0.010)	(0.005)		
Interaction of % detached SFR and d_{SH}							1.015***	0.997**
							(0.004)	(0.001)
N	1004		1004		1004		1004	
Likelihood-ratio test of α = 0	0.544***		0.534***		0.538***		0.541***	

Note: The dependent variable is the count by which the number of crowded rental units decreased in a tract between the two ACS periods (2006-2010 and 2015-2019), which is predicted by a negative binomial model. The reported coefficients are in the form of incidence-rate ratios (IRR). The logistic component of the ZINB model predicts excess zeros (i.e., the probability of no decrease in crowding), with coefficients in the form of odds ratios. The results of the likelihood-ratio test of alpha = 0 suggest that a zero-inflated negative binomial model is preferable to a zero-inflated Poisson model.
Robust standard errors are in parentheses.
Sources: U.S. Census Bureau (n.d.c; n.d.d).
*p < .10. **p < .05. ***p < .01.

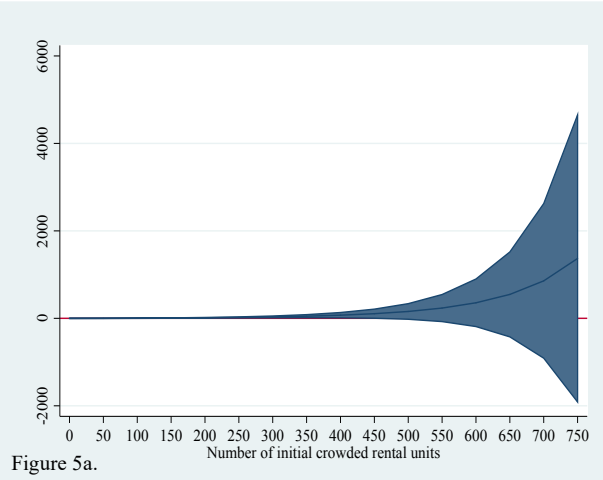

Figure 5a.

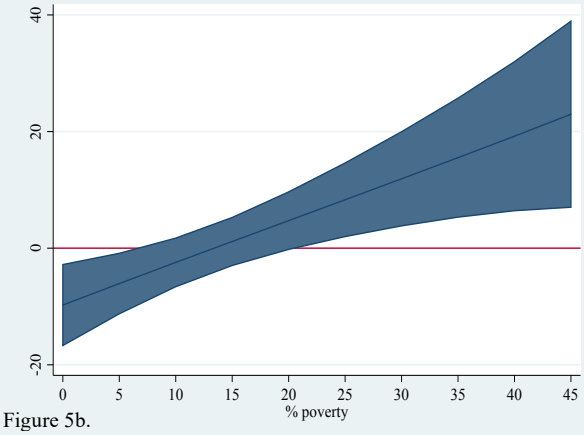

Figure 5b.

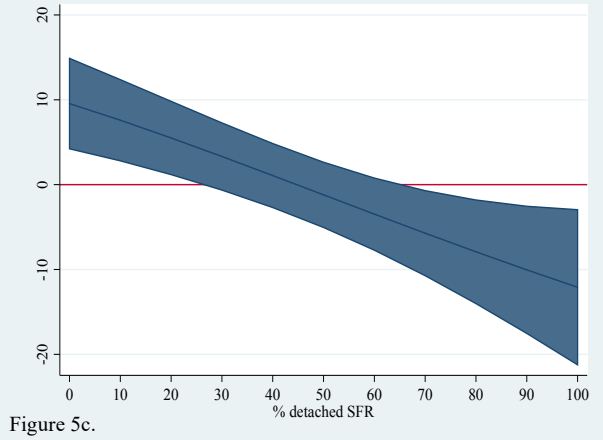

Figure 5c.

Figure 5. Changes in magnitude of decrease in crowded rental units for a one-mile increase in distance to nearest subsidized housing (Y-axis).
Note: Shaded area denotes 95% CIs. Area below the zero line indicates that proximity to newly subsidized housing is associated a more substantial decrease in crowded rental unit counts.

Discussion of Empirical Findings

There are two key findings from the above analyses. First, in relatively crowded, high poverty neighborhoods, proximity to newly subsidized housing is associated with lower likelihood of decrease in residential crowding among renters and, in tracts that experienced decrease in the number of crowded rental units, a smaller magnitude of decrease. These findings are contrary to the expectation that newly subsidized housing would alleviate residential crowding in relatively crowded, high poverty neighborhoods. One possible

explanation is that there are growing needs for affordable housing with the appropriate unit size in these neighborhoods. Such needs may come from existing residents (e.g., changing family structures) as well as from households moving into these neighborhoods during the study period. As found in prior qualitative field work, households that once moved out of high poverty neighborhoods might move back to such neighborhoods due to a variety of reasons such as housing quality problems and landlord discrimination (Rosenblatt and DeLuca 2012). The empirical results are robust to alternative specifications focusing on proximity to large-scale newly subsidized housing (see Appendix B). In other words, I find no evidence that proximity to large-scale newly subsidized housing would alleviate residential crowding in relatively crowded, high poverty neighborhoods. These findings may suggest that the needs for more dwelling space at affordable prices in these neighborhoods far exceed the supply of new subsidized housing opportunities. However, the lack of data on residential location patterns precludes the test of these claims.

Second, the number of crowded rental units are found more likely to decrease in single-family neighborhoods in the vicinity of newly subsidized housing. Conditional on the decrease in crowding, neighborhoods with a relatively low share of people in poverty and a high share of detached single-family homes would have a more substantial decrease in crowded rental units. These findings suggest that newly subsidized housing may provide an opportunity for incumbent residents in these neighborhoods to find dwelling units that better fit their needs for space. Prior claims that neighborhoods with higher incomes and homeownership rates are relatively stable over time compared to poor, aging neighborhoods may add some weight to the conclusion that newly subsidized housing near single-family neighborhoods would alleviate residential crowding (Wei and Knox 2015). Nevertheless, investigating who move in and leave

these neighborhoods in relation to changes in the housing markets will help substantiate the findings of this study.

These findings highlight opportunities for future scholarship. Future studies should examine individual household's residential location patterns to better understand how demand-side factors interact with new housing opportunities to shape neighborhood-level housing outcomes. For instance, in neighborhoods where newly subsidized housing became available, how to characterize the patterns of subsequent residential mobility flows (i.e., who stay, move in, and leave)? To what extent changes in neighborhood housing outcomes are associated with residential mobility flows and new subsidized housing opportunities? A related question is to compare residential mobility flows in neighborhoods that are deemed high opportunity with those deemed low-resourced and segregated, as categorized in the state's Opportunity Maps (California Tax Credit Allocation Committee n.d.). Because opportunity mapping often goes beyond simple measures such as poverty rates and shares of racial minorities, existing research points to numerous issues inherent in the mapping process including data quality, maintenance, and its ability to capture residents' perceptions of opportunity (Finio et al. 2020; Reid 2019). The utility of these opportunity maps can be assessed by examining the variation in residential mobility flows in neighborhoods of different levels of opportunity. Furthermore, if a substantial portion of lower income households is found to relocate among higher poverty or low-resourced neighborhoods, housing policies that prioritize housing subsidies to high opportunity areas would fail to address the growing housing needs in neighborhoods that are worse off.

Conclusion

Government agencies and nonprofit organizations have increasingly incorporated the use of opportunity mapping tools into state or regional planning efforts (Finio et al. 2020). In California, state agencies have used data from multiple sources to create Opportunity Maps and recommended that regional planning bodies and local governments utilize these resources to guide regional and local planning practices. However, besides potential issues related to technical difficulties, decision-makers also confront trade-offs between addressing the housing needs in relatively poor neighborhoods and promoting more integrated residential patterns. This study seeks to understand the changes of residential crowding in neighborhoods in the vicinity of newly subsidized housing. This relationship provides insights into the trade-offs involved in housing strategies that direct housing growth and allocate housing subsidies to areas deemed high opportunity and well-resourced.

For households with limited economic resources, new subsidized housing opportunities should facilitate households' switch to dwelling units that better accommodate their housing needs, all else equal. In this study, proximity to newly subsidized housing is hypothesized to be associated with decreases in residential crowding in neighborhoods that are relatively crowded, high poverty, or have a relatively large share of single-family homes. As discussed in the literature review, the needs for moving out of crowded housing are prevalent in these types of neighborhoods.

Focusing on the City of Los Angeles in the empirical analysis, I find that the number of crowded units is less likely to decrease in relatively crowded, high poverty neighborhoods in the vicinity of newly subsidized housing. Therefore, these findings do not provide direct evidence

that subsidized housing address residential crowding in these neighborhoods. However, as discussed above, these findings may reflect the situation that the supply of subsidized housing is lagging behind the growing demands for housing units with the appropriate size and at affordable prices. On the other hand, measures of crowding alleviation are associated with proximity to newly subsidized housing in single-family neighborhoods. These empirical findings lend weight to policies aimed at promoting diverse housing types and providing below-market-rate housing opportunities close to single-family neighborhoods. To substantiate the findings of this study, one promising future research direction is to analyze individual households' residential location patterns in relation to the supply of subsidized housing.

Although this study contributes to the limited empirical literature on the link between subsidized housing supply and neighborhood outcomes of residential crowding, there are limitations. This study is subject to unmeasured confounding and cannot provide causal evidence concerning the effect of newly subsidized housing on residential crowding in nearby neighborhoods. As discussed above, the present analysis cannot control for residential mobility flows in neighborhoods. Moreover, this study considers new subsidized housing opportunities created through both new construction and rehabilitation and cannot control for the type of rehabilitation programs. Properties that simply had a cosmetic rehab (e.g., patching, painting, and repairing leaks) differ from those involved a gut rehabilitation of dilapidated structures and may not be considered as new housing opportunities (Rosenthal and Listokin 2009). More generally, it is challenging to make causal inference concerning the effect of newly subsidized housing because the siting of such housing is not random. A preliminary analysis of this study reveals that the non-randomness of subsidized housing siting may only be addressed to a limited extent through using quasi-experimental design techniques such as propensity score methods (Austin

2011; Rosenbaum and Rubin 1983). The main challenge is that it is difficult to construct a valid group of tracts comparable to tracts in the vicinity of subsidized housing using these techniques. A more promising approach would be to better measure neighborhood heterogeneity and changes over time through improved data. Furthermore, as in many studies of residential crowding, measuring crowded housing based on the threshold of one person per room cannot distinguish whether households make their living arrangements by choice or due to limited options. Crowding measures also tend be underreported, especially if respondents violate the law with such living arrangements (Routhier 2019). One potential improvement is using geolocation data to measure crowding more accurately such as at the building level (see also, Almagro et al. 2021). It should also be noted that undocumented immigrants face additional structural barriers to housing due to the lack of legal status and eligibility for housing assistance. A better understanding of residential outcomes and housing needs among undocumented immigrants through both quantitative and qualitative methods is particularly important for urban areas with a large number of immigrants.

Chapter 5. Conclusion

In order to address housing shortages, California has undergone a series of changes to its housing planning legislation since 2017. Such legislative changes have introduced numerous new rules and prompted implementation actors at the state, regional, and local levels to communicate more extensively about how to address housing needs in each community. This dissertation, consisting of three essays, examines the implementation of California's current housing planning system at different levels of government and highlights the trade-offs related to the complexity of the system.

This dissertation sets out to explore the performance trade-offs in the implementation process. The first essay (Chapter 2) underscores the ways in which current complex planning rules have introduced substantial administrative burdens on state housing administrators, regional planners, and local elected officials and planners. The rigid state requirements will also likely undermine inclusive decision-making and flexibility in planning processes. The second essay (Chapter 3) focuses on the intraregional housing allocation process, in which each COG must incorporate multiple criteria in developing the methodology for allocating regional housing needs to local governments in order to achieve the state's goals of promoting housing development in areas accessible to transit, jobs, and socioeconomic opportunities. A multi-criteria method, however, is administratively burdensome and subject to technical difficulties and local political pressures. Through the assessment of different allocation scenarios in the SCAG region, this essay finds evidence that a simpler allocation mechanism could potentially guide housing development to transit- or jobs- rich areas more equitably and with lower administrative burdens. The third essay (Chapter 4) turns to planning implementation at the local level. Motivated by the emphasis in state planning rules on guiding housing development to

areas deemed high opportunity, this essay seeks to contribute to a better understanding of the trade-offs involved in directing new housing opportunities, especially subsidized housing, away from relatively poor neighborhoods. Focusing on the City of Los Angeles, this essay finds evidence that newly subsidized housing would alleviate residential crowding in single-family neighborhoods but not in relatively crowded, high poverty neighborhoods. The empirical findings are contrary to the expectation that increased supply of affordable housing opportunities would allow existing residents in nearby neighborhoods to switch to dwelling units that can better accommodate their housing needs. These findings may reflect the situation that the supply of subsidized housing is lagging behind the demands for affordable housing units with the appropriate size in relatively crowded, high-poverty neighborhoods. To substantiate the findings of this essay, future research should examine residential mobility flows in relation to changes in the supply of subsidized housing.

Together, the three essays suggest that California's housing planning system can be simplified and improved. First, decision-makers should be aware of the potential trade-offs among different policy objectives and, in some cases, need to recognize that important objectives may conflict. For example, as shown in Chapter 2, while many complex rules seek to empower HCD to take a stronger leadership role in overseeing local planning processes, the need to meet rigid, top-down requirements will likely conflict with the need to enable an inclusive planning process. One possible direction for improvement would be the adoption of simpler but potentially more effective monitoring and enforcement mechanisms, such as empowering HCD to assess local compliance based on the number of units entitled or built rather than to determine the compliance status of local housing plans through lengthy administrative processes. Local progress toward building, not simply planning for, the housing targets will also serve as a more

objective and intelligible standard for stakeholders to assess the implementation of local housing policies and programs.

Second, state-led housing planning efforts can also be improved by reducing the use of administratively complex procedures and the reliance on overly technical approaches. Chapter 3 demonstrates that a multi-criteria allocation mechanism may not necessarily result in planning targets that are appropriately tailored to local conditions. These findings are consistent with prior research indicating that some planning objectives – such as promoting housing development near transit and promoting racially integrated residential patterns – could potentially conflict with each other (Reina, Wegmann, and Guerra 2019). As noted above, decision-makers should recognize and manage the trade-offs among different objectives and, when possible, consider simpler alternative approaches that are administratively less cumbersome and less susceptible to technical difficulties.

Last, to better assess local planning practice, state and regional agencies should continue to facilitate the collection of local planning and entitlement data. California is already heading in this direction, such as requiring local jurisdictions to submit annual progress reports and developing a one-stop data portal accessible to a wide range of users. Different sources of data should be further standardized and compiled in a way that permits the merging and analysis of data indicating regulatory variables and housing development outcomes at fine-grained geographic scales.

While this dissertation contributes to a better understanding of the challenges and tradeoffs in the implementation of California's housing planning system, there are several limitations that merit future research. First, this dissertation is limited by the time frame and

geographic coverage of the assessment. As the housing planning process continues to unfold in California, future research should look at the updated housing elements certified by HCD and evaluate the attainment of housing targets throughout the planning period. To better inform state policy efforts, future studies with statewide coverage can provide a more thorough picture of the factors that facilitate and inhibit the implementation of housing planning rules and the implications for achieving state policy goals. Second, future research should use more fine-grained data (e.g., parcel-level land use data, entitlement data, residential mobility data, etc.) to assess the implications of different housing strategies and inform the debate about the kinds of areas where California should prioritize housing development. Finally, in light of the discussion about complexity, future research should assess the utility of the technical planning tools in place. For example, state agencies have increased and encouraged the use of tools such as opportunity mapping to direct housing to identified high opportunity areas. More rigorous evaluations are needed of the mechanisms for identifying locations of high priority development areas and the kinds of trade-offs involved in guiding housing growth to different types of areas. It will also be important that future research empirically assess whether such planning tools properly capture housing needs and access to opportunity.

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Appendix A. Interview Topic Guide

The following interview questions, arranged by topic, are used to guide the interviews. Following the active interview approach, questions are modified according to each interviewee's background and responses during the interview.

Background

1. What is the name of your organization/agency?
2. What are the key responsibilities of _____(name of the organization/agency) for implementing the state's housing planning requirements?
3. What is your position and your role with respect to the implementation process?

Housing Target Allocation to Local Governments

1. (For interviewees from HCD and SCAG) Could you describe the housing allocation process and the major actors involved in this process?
2. (For interviewees from HCD and SCAG) What types of collaborations and tensions occurred in this process?
3. (For interviewees from local governments) Do you have a good understanding of how the housing allocation is determined?
    a. Could you describe the involvement of your jurisdiction in the housing allocation process?
    b. Do you think the allocation methodology capture the housing needs in your jurisdiction? Why or why not?
    c. Has your jurisdiction considered filing an appeal?

i. Why or why not?

ii. If yes, what are the main arguments for the appeal?

4. Did your agency work with a consultant in this process?
    a. If yes, could you describe the role of the consultant?
5. What kinds of resources and support did your organization receive?
6. What were the major challenges in the housing allocation process?
7. Could you describe the outreach efforts?
8. What were the key lessons from this round of housing allocation?

Compliance Monitoring and Enforcement (for Interviewees from HCD)

1. What are the strategies for ensuring that local governments remain compliance throughout the planning period?
2. What are the major challenges in monitoring local compliance, and how will they be addressed?

Housing Element Update (for Interviewees from Local Governments)

1. What is the current status of the Housing Element update for the 2021-2029 planning period in your jurisdiction?
2. Are you aware of the new requirements in state law pertaining to the Housing Element process?
3. Could you describe the community outreach/public engagement efforts?
4. Which state requirements do you think impact the Housing Element update the most?
    a. How will each of these requirements impact the Housing Element update?
    b. What are the challenges for meeting these requirements?

c. What are the strategies for meeting these requirements?

d. What kinds of assistance and resources did your jurisdiction receive?

5. Looking ahead, what (other) challenges do you anticipate, and how can they be addressed?

Additional Questions for Housing Advocates

1. Could you describe the involvement of your organization in the housing allocation process?
2. Do you think the current housing allocation mechanism captures the housing needs at the local level?
3. What roles does your organization play in the implementation of the state housing planning requirements?
4. What are the state requirements that provide powerful tools for the advocacy work that your organization has been doing?

Appendix B. Alternative Model Specifications for Chapter 4

Table 12. Logistic Regression Results based on Distance to Nearest Large-scale Newly Subsidized Housing (>=50 units).
(Dependent variable=logit(p), where p is the probability of decrease in crowded rental units. Exponentiated coefficients (odds ratio) are reported.)

	(1b)	(2b)	(3b)	(4b)
Total population (log)	1.086	0.874	0.977	1.068
	(0.185)	(0.152)	(0.167)	(0.172)
Land area (log)	0.788*	0.791*	0.800*	0.760**
	(0.101)	(0.105)	(0.101)	(0.099)
% Hispanic	1.008*	1.001	1.005	1.004
	(0.005)	(0.005)	(0.005)	(0.005)
% black	1.025***	1.021***	1.022***	1.022***
	(0.006)	(0.006)	(0.006)	(0.006)
% family households with children	0.999	0.999	1.001	0.996
	(0.009)	(0.009)	(0.009)	(0.009)
% young households	1.025***	1.021**	1.022**	1.021**
	(0.009)	(0.009)	(0.009)	(0.009)
% recently arrived immigrants from Latin America	0.914***	0.932***	0.922***	0.923***
	(0.021)	(0.021)	(0.021)	(0.021)
% vacant rental units	0.927***	0.928***	0.930**	0.928***
	(0.026)	(0.026)	(0.026)	(0.026)
Initial number of crowded rental units (mean-centered)	1.009***	1.007***	1.009***	1.010***
	(0.001)	(0.001)	(0.001)	(0.001)
% poverty (mean-centered)	0.993	0.994	0.970**	0.998
	(0.010)	(0.010)	(0.012)	(0.010)
% detached SFR (mean-centered)	1.011***	1.015***	1.013***	1.027***
	(0.004)	(0.005)	(0.004)	(0.006)
Distance to nearest subsidized housing (d_{SH50})	1.154*	1.626***	1.402***	1.288***
	(0.100)	(0.241)	(0.158)	(0.123)
Interaction of initial crowding and d_{SH50}		1.004***		
		(0.001)		
Interaction of % poverty and d_{SH50}			1.028***	
			(0.009)	
Interaction of % detached SFR and d_{SH50}				0.989***
				(0.003)
N	1004	1004	1004	1004

Note: Robust standard errors are in parentheses. *p < .10. **p < .05. ***p < .01.
*Source*s: U.S. Census Bureau (n.d.c; n.d.d).

Table 13. ZINB Regression Results based on Distance to Nearest Large-scale Newly Subsidized Housing (>=50 units).

	(1b)		(2b)		(3b)		(4b)	
	Odds ratio	IRR	Odds ratio	IRR	Odds ratio	IRR	Odds ratio	IRR
Total population (log)	0.921	0.964	1.144	0.914	1.023	0.970	0.936	0.962
	(0.157)	(0.129)	(0.199)	(0.124)	(0.175)	(0.131)	(0.151)	(0.131)
Land area (log)	1.271*	1.091	1.268*	1.086	1.252*	1.082	1.318**	1.084
	(0.164)	(0.066)	(0.169)	(0.065)	(0.158)	(0.066)	(0.173)	(0.065)
% Hispanic	0.992*	1.005**	0.999	1.003	0.995	1.004**	0.997	1.004**
	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)
% black	0.976***	1.006**	0.979***	1.004*	0.978***	1.005*	0.979***	1.005*
	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)	(0.006)	(0.003)
% family households with children	1.001	0.998	1.001	0.998	0.999	0.998	1.004	0.997
	(0.009)	(0.005)	(0.009)	(0.005)	(0.009)	(0.005)	(0.009)	(0.005)
% young households	0.975***	1.001	0.979**	1.000	0.978**	0.999	0.979**	1.000
	(0.009)	(0.004)	(0.009)	(0.004)	(0.009)	(0.004)	(0.009)	(0.004)
% recently arrived immigrants from Latin America	1.094***	0.978***	1.073***	0.982**	1.085***	0.980**	1.083***	0.979**
	(0.025)	(0.008)	(0.024)	(0.008)	(0.025)	(0.008)	(0.025)	(0.008)
% vacant rental units	1.079***	0.992	1.077***	0.992	1.075**	0.995	1.078***	0.992
	(0.031)	(0.013)	(0.031)	(0.013)	(0.030)	(0.013)	(0.031)	(0.013)
Initial number of crowded rental units (mean-centered)	0.991***	1.004***	0.993***	1.004***	0.991***	1.004***	0.990***	1.005***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
% poverty (mean-centered)	1.007	0.999	1.006	0.999	1.030**	0.991	1.002	1.000
	(0.010)	(0.005)	(0.010)	(0.005)	(0.013)	(0.005)	(0.010)	(0.005)
% detached SFR (mean-centered)	0.989***	0.999	0.985***	1.000	0.988***	0.999	0.973***	1.003
	(0.004)	(0.002)	(0.004)	(0.002)	(0.004)	(0.002)	(0.006)	(0.003)
Distance to nearest subsidized housing (d_{SH50})	0.866*	0.999	0.613***	1.008	0.712***	1.027	0.776***	0.999
	(0.075)	(0.041)	(0.092)	(0.043)	(0.081)	(0.042)	(0.074)	(0.040)
Interaction of initial crowding and d_{SH50}			0.996***	1.001***				
			(0.001)	(0.000)				
Interaction of % poverty and d_{SH50}					0.973***	1.010***		
					(0.008)	(0.003)		
Interaction of % detached SFR and d_{SH50}							1.011***	0.997**
							(0.003)	(0.001)
N	1004		1004		1004		1004	
Likelihood-ratio test of α = 0	0.544***		0.526***		0.537***		0.541***	

Note: See note of Table 11.
Sources: U.S. Census Bureau (n.d.c; n.d.d).
*p < .10. **p < .05. ***p < .01.