The Politics of Delay in Local Politics: How Institutions Empower Individuals*

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Abstract

American local governments have unique control over land use. Previous scholarship has explored the aims of these institutions: some are explicitly targeted towards limiting density, while others ostensibly attempt to protect the local environment and enhance neighborhood participation. We know little about whether these policies are accomplishing their aims. This paper argues that the accumulation of regulations—regardless of goal—restricts the development of higher density housing by creating multiple opportunities for individuals or small groups to obstruct projects. Using a combination of permitting data, novel data on Catholic Church developments and residential lawsuits, and interviews, we find that places with more regulations of *all types* produce less multifamily housing. Moreover, our interviews suggest that regulations provide multiple opportunities for small groups to delay and/or stop development. One such mechanism is lawsuits: more regulated places feature more land use lawsuits, and places with more lawsuits have lower numbers of multifamily housing permits.

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1 Introduction

American local governments have unique control over land use. Their influence over zoning and planning is distinct from that of municipalities in other advanced democracies (Hirt 2014) and that of other levels of government in the American federal system (Trounstine 2016). A wide body of research in political science suggests that these measures emerged as exclusionary tools: many communities have incorporated as govenrign bodies in order to acquire institutional powers that allow them to more tightly regulate who can reside within their borders—especially along socioeconomic lines (Burns 1994; Dreier et al. 2005). Homeowners residing within these communities have a strong incentive to maintain their property values by pushing their local governments to constrain development and to maintain restrictive land use regimes (Fischel 2001; Been, Madar, and McDonnell 2014).[1] The exclusionary intent of some land use regimes was so unambiguous that they were the subject of multiple court cases (Burns 1994; Dreier, Mollenkopf, and Swanstrom 2004). The central mechanism by which zoning excludes along socioeconomic or racial lines is by constraining density: policies that prohibit the construction of multifamily housing prevent low-income individuals from moving into a municipality by restricting the supply of affordable, higher density housing.

Not all land use regulations, however, have explicitly exclusionary (or, at a minimum, density-limiting) aims—some seek to enhance the participation of groups that were previously left out of the development process. The combination of the excesses of urban renewal (Rae 2004; Schleicher 2013) and the dominance of a pro-growth, developer-oriented urban politics (Logan and Molotch 1987) led to the proliferation of local institutions to constrain developers and empower neighborhood-level and environmental interests (Gerber and Phillips 2004; Glaeser and Ward 2009; Schleicher 2013). These regulations both restricted the environmental impacts permitted to new developments—offering greater power to pre-

[1] There is some evidence that *even renters* may have incentives to promulgate socioeconomically restrictive land use policies (Hankinson 2017).

viously marginalized environmental interest groups—and enhanced public opportunities to participate in (and limit) the development process.

While the politics of the formation of these regulations has been widely studied, it is unclear how these two different types of regulations—with related, but distinct intentions—shape local development. A potential analogue is the federal notice and comment procedure which, has prompted important inquiries into which groups and interests it empowers in the bureaucratic rulemaking process (e.g. Yackee and Yackee 2006; Balla 1998). Given the number of cases of procedures and policies having unintended consequences and empowering particular interests, regulations seeking to empower environmental goals and citizen participation may have similar impacts to analogues that more explicitly target development and density.

One area where both sets of regulations have likely had a strong impact is on the provision of higher density housing. Housing costs in the nation's high-growth metropolitan areas have skyrocketed in recent years (White House 2016). In 2016, the Obama Administration suggested that "the growing severity of undersupplied housing markets is jeopardizing housing affordability for working families, increasing income inequality by reducing less-skilled workers' access to high-wage labor markets, and stifling GDP growth by driving labor migration away from the most productive regions" (White House 2016). Existing research—situated primarily in economics—broadly suggests that more restrictive land use policies prevent localities from keeping pace with rising demand for housing (Quigley and Rosenthal 2005; Glaeser, Gyourko, and Saks 2005; Gyourko, Saiz, and Summers 2008; Glaeser and Ward 2009; Glaeser 2011; Gyourko and Molloy 2014). Little of this research disaggregates regulations by type, and none of it explicitly considers the distinction between density-limiting and participatory regulations.

We present a theory that contends that, regardless of intent, land use regulations impinge on local housing affordability in high-demand locales by restricting the supply of high density housing. The accumulation of regulations matters at least as much as the type in imposing costs on housing development. Institutions that empower the public to participate in land use development provide one key mechanism by which these regulations restrict the development of higher density housing. What's more, they have a potentially profoundly distortionary impact on local democracy by empowering the voices of a very small group of highly motivated neighbors (or even individuals). The concentrated costs of development projects offer greater incentives for neighborhood groups (or even, we argue, individuals) that are highly affected by a proposal to mobilize against development than the broader population of a city that might more weakly favor an increased housing supply. Density-limiting and participatory regulations may provide these highly motivated individuals the tools with which to restrict higher density projects. This possibility speaks to broader debates in political science concerning the ability of institutions to distort democratic representation (Trounstine 2008; Binder 1997; Koger 2010; Yackee and Yackee 2006) and the policy consequences of unequal political voice (Schlozman, Verba, and Brady 2012; Gilens 2014)

This theory suggests that, at a minimum, land use institutions come with important tradeoffs that have yet to be fully unpacked. On the one hand, developer excess and environmental degradation are critical political challenges that necessitate government checks. The ability of the public to extract community benefits from developers serves as an important means of ensuring that developers are providing value to local communities. On the other hand, the lack of affordable housing in areas with high mobility could have a profound negative impact on many children's life opportunities (Chetty, Herdren, and Katz 2016). A greater supply of high density housing would help reduce sprawl by increasing urban density (Glaeser 2011). Reducing housing regulations might increase city median GDP by as much as 10 percent (Hsieh and Moretti 2015)

We empirically evaluate two implications of our theory. First, we test whether (and which of) these land use regulations constrain the development of higher density housing. Second, we also consider how local efforts at improving public input might affect the construction of higher density housing. To evaluate these questions, we begin this paper by developing a formal model of developer-neighbor bargaining in the contemporary regulatory context. Our model yields several important implications: (1) The *accumulation* of regulations—regardless of their intent—constrains the supply of housing; (2) Land use institutions empower *individuals* and *very small groups* to stymie development. The latter insight pushes against, to some extent, a wealth of excellent political science research that focuses on the dynamics of *groups* opposing development (Fischel 2001; Gerber and Phillips 2004; Been, Madar, and McDonnell 2014; Hankinson 2017). While mass dynamics may matter for the implementation of city-level institutional fixes to the problems created by land use regulations, to actually stop or delay a development, only a very small group is required. To empirically test these claims, we combine a variety of data sources, primarily from the case of Boston, including interviews with key stakeholders, regulatory and permitting data, novel data on the development of Catholic Church properties, and novel data on residential development-related lawsuits. Our results broadly support our theory's two key predictions—land use institutions limit development, in part by amplifying the voices of a very small group of highly motivated participants in the development process.

2 Land Use Policy and Multifamily Housing

Over the past four decades, land use institutions have become notably more restrictive in the United States (Glaeser, Gyourko, and Saks 2005; Glaeser and Ward 2009; Schleicher 2013). Many cities and towns use a wide variety of tactics to constrain new construction in general and multifamily housing in particular, including historical preservation, lower building limits, septic and wetlands limits, zoning for single- or two-family housing, minimum lot size requirements, parking requirements, and a lengthy approval process, among others. While they vary in the extent to which they intentionally constrain density, these institutions create costs for developers in two important ways. First, they directly add to costs of development. Perhaps most simply, these regulations take time to comply with, frequently requiring multiple public meetings as well as private meetings with city/town officials. A lengthier time to development means more time paying property taxes, maintenance and financing costs, and utilities for a property. In addition, each of these requirements can necessitate a developer providing a formal study documenting compliance with the regulation; these traffic studies, parking studies, shadow studies, and environmental reviews—to name just a subset of the documents developers are required to provide—can each cost thousands of dollars. Finally, to comply with regulations, the developer frequently has to offer costly alterations to his/her project, perhaps reducing the amount of housing or commercial space, or providing expensive additional infrastructure.

Second, given the neighborhood-level focus on the development process post urban renewal, *all of these policies* empower neighborhood groups and even *individuals* to challenge and slow down development. A neighbor can contend that a developer is not in compliance *with any of these regulations*, necessitating additional public meetings and studies—both of which are highly costly to the developer by introducing additional delay and uncertainty into the development process. A neighbor's unexpected objection at a public meeting will frequently cause a planning board (or other approval entity) to postpone an approval decision until the developer addresses the issue or more information (often through an additional costly study) is collected. Moreover, the existence of these laws provides grounds on which neighbors can file lawsuits. Importantly, lawsuits do not require a group of neighbors to oppose a project (though a group can certainly participate in and potentially strengthen legal action); only one individual with sufficient resources (both financial and time) can file a lawsuit that can delay a project by years.

To make these costs clearer, consider an example of how regulations surrounding parking requirements might increase the costs of development. Unless multifamily housing is allowed by right—that is, permitted under current zoning regulations without action by a zoning board and/or public hearings—it typically requires permits or variances. To obtain these permits/variances, a developer will provide city/town officials with detailed plans along with a variety of studies on topics like parking, traffic, and environmental impact. Neighbors opposed to the project—whatever their reason—might argue that, in contrast to the developer's study, the proposal does not, in fact, provide sufficient parking given the city/town's existing requirements. They might force additional public hearings on the topic or require the developer to produce additional parking studies. The public's opposition could also require the developer to hold additional meetings with city/town officials. All of these additional documents and meetings are highly costly to developers. Moreover, the developer will likely have to make expensive concessions by providing more parking in lieu of housing/commercial space. This illustrative example is not hypothetical—this exact scenario is currently unfolding in a wealthy Boston suburb according to one of our interview subjects, the town's housing director. What's more, this strategy does not require a large group of oppositional neighbors. A small, but intense group—or even just one individual who can credibly threaten a lawsuit—is enough to delay a project and extract concessions from a developer.

3 A Model of Regulated Development and Neighborhood Opposition

The above intuition can be described more formally in a model where a developer proposes a project requiring town approval (such as rezoning or a variance) and a neighbor(s) opposes the project. While prior work has analyzed housing regulations formally, such models have focused primarily on how incentives drive the formation of housing regulation (see Gyourko and Molloy (2014) for a detailed review of this scholarship). Ortalo-Magne and Prat's (2014) model, for example, explores household location choice, selection of residential real estate, and a collective choice model of local housing supply regulation. Hilber and Vermuelen (2016) investigate the incentives of homeowners and developers in influencing planning process. Other economists have formalized the impacts of various types of land use regulation

(Brueckner 2009). In their review of this research, however, Gyourko and Molloy (2014) argue that there has been too little modeling of the developer in efforts to understand the emergence of housing regulations. While we do not explore the sources of regulations in this paper, we provide an important first step in incorporating the developer into models of housing regulation and supply given a set of rules.

We model the process of developing a project as a conflict between two players, a developer (D) and a neighbor (N), over the size of a new development. The developer is an individual or corporation that (1) has rights to a parcel of land (with or without a building on it) and (2) wants to change the usage of that land to increase housing density, which is subject to local government approval. For example, the developer may seek to convert a single-family home to a multi-family home, expand an existing residential building to add more units, or replace a non-residential building with condominiums or apartments. The payoffs for developers are based on the profits earned by developing the project.

The neighbor is a single individual, or a neighborhood group. We can think of this player as the citizen(s) who bear the cost of opposing development. Generally, this will be the abutters of the property who may be organized through a neighborhood association. The costs of opposition include time, legal fees, and coordination if there is more than one neighbor. Examples include: organizing and attending group meetings; drafting and circulating petitions; attending town, zoning board, and other public meetings; lobbying town officials; hiring an attorney to represent the group; and fundraising to support opposition. Payoffs for neighbors are based on the how the developer's changes affect them. Assume that development the neighbor supports provides a positive payoff, development he opposes provides a negative payoff, and no development provides a payoff of zero.

We do not consider the local government(s) — the authorities that must approve a project — as players in the game making strategic choices. Instead, we treat government as Nature, making decisions based on random draws from known probability distributions.[2]

[2]Alternative models could including government bodies, such as planning boards, zoning boards of appeals, and others as strategic players as well, possibly responding to electoral or career incentives (e.g.

We model the development process as a simple two-stage sequential game with perfect information where a developer (D) can propose two types of projects, Big and Small. No approval is needed for a small project (projects "allowed by right"), but big projects must be approved by two different local government entities (i.e. a planning board and an environmental impact review board). For example a renovation of an existing building or the replacement of an existing building with a new building with the same capacity and footprint are small projects allowed by right and do not require approval. Changes in the use of the site, such as converting from commercial to mixed or residential use or increasing the residential density of the property would be considered a big project. Such projects normally require approval via variances and special permits for example. We limit the approval process to two distinct stages. However, the model is generalizable to additional approval stages (see Appendix A.3).

Developers want to choose a project that maximizes profits, subject to legal constraints. We define the big project to be the profit maximizing project that would be approved by the local government in the absence of neighborhood opposition. This project might require variances, changes in zoning, and special permits, all of which would be approved by the town if there is no opposition.[3]

Further, we restrict the model to cases where the developer and neighbors are in opposition to each other. That is, the construction of the big project provides a negative payoff to the neighbors. We do not consider cases where the neighbors want the developer to succeed, and might even be willing to work with and support the developer (pay a cost, such as attending a public meeting to voice support for the project).

Figure 1 shows the structure of the game. The sequence of approvals is fixed (i.e. the planning board must come before environmental impact review). Neighbors can choose to

Schleicher 2013).

[3]There may exist a large set of projects that the developer would like to be able to build, but which the town authorities would reject, even without neighborhood opposition. For example, a zoning board might approve rezoning a large single-family home to a three-family home if the neighbors do not object, but would not approve the construction of a 10-unit apartment building.

fight the approvals at each stage, by paying a cost, c_N. If the neighbors choose to fight, the developer can choose to fight, paying a cost c_D, or concede and proceed with the smaller project. If both parties choose to fight, the approval board makes a ruling — a random draw from a known probability distribution. There are known probabilities of success for the developer at each stage. Regardless of the outcome, the approval process introduces delay into the development process, such that payoffs from the projects are discounted by δ_D and δ_N for the developer and neighbor, respectively. Assume $0 < \delta_D < 1$ and $0 < \delta_N < 1$. Let ϕ_1 and ϕ_2 be the probabilities that the developer wins in stages 1 and 2; $0 < \phi_1 < 1$ and $0 < \phi_2 < 1$.

The costs of fighting for the developer and neighbor are both positive and non-zero, $c_D > 0$, $c_N > 0$. Let B_D be the payoff to the developer from constructing the big project, and S_D be the payoff from constructing the small project. These quantities represent the net profit from development, excluding the costs of a contentious development process. Assume $B_D > S_D$. Let B_N be the payoff to the neighbors from the construction of the big project, and S_N be the payoff from the small project. Since we restrict the model to cases where the neighbors prefer the small development to the big development, assume $B_N < S_N$. For simplicity, we standardize the payoffs such that $S_D = 0$ and $S_N = 0$, such that $B_D > 0$ and $B_N < 0$.

We identify several subgame perfect Nash equilibria of interest. Appendix A provides the derivations. First, we identify the conditions under which the developer proposes the big project and both players fight at both approval stages. Second, we show the conditions under which the developer will choose the small project at the beginning of the game. Third, we find the a special case where the neighbor chooses to fight in the first stage, but will concede in the second stage if it is reached.

When will developers and neighbors both choose to fight over the development of the big project? For the developer, the probability of success increases in each subsequent round, as the project survives sequential approvals. Therefore, if the developer knows the neighbors

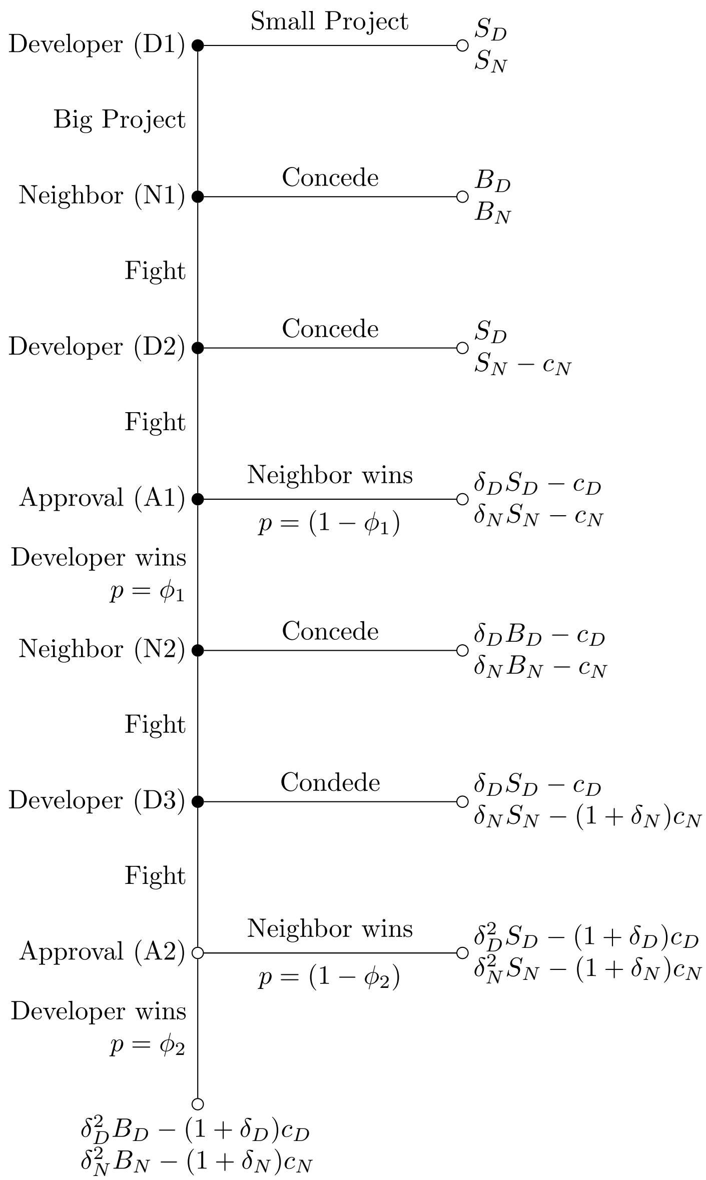

Figure 1: Approval Process Game

will fight at every stage, and the developer is willing to fight at stage one, the developer will also be willing to fight at stage two. The necessary condition for the project to be worth the fight is:

$$B_D > c_D \frac{(1 + \phi_1 \delta_D)}{\phi_1 \phi_2 \delta_D^2} \tag{1}$$

Unlike the developer, who will either always fight at every stage or never fight, neighbors have two different conditions for fighting, one at each stage of the approval game. The neighbor will fight in second stage if:

$$-B_N > \frac{c_N}{(1 - \phi_2 \delta_N)} \tag{2}$$

The neighbor will fight at the first stage if:

$$-B_N > c_N \frac{(1 + \phi_1 \delta_N)}{(1 - \phi_1 \phi_2 \delta_N^2)} \tag{3}$$

If all three of these conditions are met, in equilibrium the developer will propose the big project and fight at both stages, and the neighbor will fight at both stages.

For the developer, the decision to build the big project is based on the cost of fighting (c_D) and the value of building the big project relative to the small project (B_D), as well as the probability of winning in each round and the costs of delay from the approval process. If the costs of fighting and delay relative to the value of the big project are small enough, a developer will choose to fight even if the odds of winning approval are low.

For the neighbor, as the probability of the developer winning in each round decreases, neighbors will be willing to pay higher costs to fight. Further, even if the neighbor is certain to win ($\phi_1 = 1$, $\phi_2 = 1$), the neighbor may still choose to fight. In this case, both conditions reduce to $-B_N > \frac{c_N}{(1-\delta_N)}$. Since neighbors prefer delay if the project is built (discounting a negative outcome), they may still choose to fight if the benefit of delay exceeds the costs of fighting. Even in hopeless situations, we may still observe strong neighborhood opposition in equilibrium.

To illustrate this equilibrium, consider a simple stylized example with realistic parameter values. Suppose there is a big project whose profits to the developer (relative to a small project), are $1 million. Also suppose the developer is relatively likely to win approval as the probability of winning of 90% in each stage. Finally, suppose the developer's discount factor is 0.95, such that each delay period decreases the project value by 5% (due to property taxes, interest on loans, and other costs that must be paid while construction is delayed). With these values, the developer is willing to pay costs of up to \$394,000 each round to win approval. Given that most approval-stage costs, such as traffic studies, are in the thousands, or lows tens of thousands of dollars, the costs are likely to be well below this cutoff, making it worthwhile for the developer to fight.

Suppose that the neighbor values his loss from construction at \$10,000. This may be due in full or part to anticipated loss of property value, increase in traffic, or decrease in enjoyment of his own property. Moreover, suppose the neighbor's discount factor is also 0.95. For the neighbor, this reflects a preference for delay. Future development (and more time "as is") is preferred to development immediately. With these parameter values (and the 90% probability of approval in each round), the neighbor would be willing to pay up to \$1,450 in each stage to fight development. Fighting development in many cases is much less costly than this. The cost may be as little as the time cost of researching the development, attending a planning board meeting, raising potential problems, and demanding the developer make changes to the plans and/or conduct further studies. If the probabilities of approval were increased from 0.9 to 1 (certain approval), the neighbor would still be willing to fight (just to stall) as long as the per-stage cost of fighting was below \$500.

There is a another equilibrium where the neighbor's conditions are met, but the developer's condition are not. In this case, the developer will propose the small project in equilibrium, knowing that the neighbor will fight. Conversely, if the developer's condition is met but neither of the neighbor's conditions are satisfied, the developer will propose the big project and it will be approved without a fight. As illustrated by the example above, the cost for neighbors to fight is so low that this is unlikely to occur. In a third equilibria, described in Appendix A.2, the neighbor's condition for fighting in the first stage is satisfied, but the condition for fighting in the second stage is not. In this case, we may see the developer propose the big project and the neighbor fight in the first stage, even though he knows he will concede in the second. This condition only arises if $\phi_2 > \phi_1$ and $-B_N < \frac{c_N}{(1-\phi_2\delta_N)}$. The developer must be more likely to win in stage 2 than in stage 1, and the costs of fighting are sufficiently high. Even though the neighbor knows that they will concede in stage 2 if it is reached, they still prefer to fight in stage 1, in part because this provides an opportunity to win, and in part because of the value of delaying the big project even if it is eventually built.

In Appendix A.3 we consider how additional approval stages affect the outcome of the development process. Additional stages increase costs on developers, decrease the probability of development (if $\phi_i < 1$), and decrease the total value of the project (as it is discounted further in each round due to time delay). For neighbors, additional stages increase the probability of stopping development and delay the project further, making fighting more worthwhile.

4 Empirical Evidence: The Case of Metropolitan Boston

Because data on land use regulations is scarce, empirical research on the effects of such policies has required scholars to make tradeoffs between breadth and depth. Some research has used surveys of local officials to provide relatively cursory information about land use policy in a large number of cities (Gyourko, Saiz, and Summers 2008). In contrast, other work has developed extraordinarily deep regulatory data in one metropolitan area: Boston (Pioneer Institute for Public Policy Research and Rappaport Institute for Greater Boston 2005; Glaeser and Ward 2009). Because of our interest in better understanding the mechanisms undergirding land use institutions, we follow Glaeser and Ward (2009) and Pioneer Institute for Public Policy Research and Rappaport Institute for Greater Boston (2005) in analyzing Boston area communities in depth rather than attempting comparisons across a wider geographic area.

The depth of the Boston data is extraordinary. The Local Housing Regulation Database features regulatory data on 187 cities and towns located within 50 miles of Boston. For each community, coders tracked *all* regulations that could have an impact on housing development

Table 1: Demographics and Land Use Regulations for Selected Greater Boston Cities/Towns.

City/Town	Median Income	% White	Min. Sq. Ft. for Multifamily	Max. Frontage (ft.)
Cambridge	\$79,416	62.1%	900	20
Groton	\$116,642	93.6%	80,000	225
Marblehead	\$102,993	95.0%	5,000	100
Weston	\$199,516	83.4%	240,000	250

and could be measured objectively. Using a combination of surveys of local officials and city/town regulatory codes, researchers assembled information on 119 zoning, subdivision, wetland, and septic regulations (Pioneer Institute for Public Policy Research and Rappaport Institute for Greater Boston 2005). No other metropolitan area comes close to offering this level of detail about land use institutions. The depth and breadth of regulations covered means that we can disaggregate between less obviously density limiting land use regulations, like parcel shape and septic restrictions, and more explicitly density-targeting regulations like restrictions on multifamily housing.

On top of data quality, metropolitan Boston also represents an excellent case because of its extraordinary variation in land use institutions. Part of Boston's advantages are historical and geographical. Unlike some parts of the U.S., the relatively compact Boston metro area is divided into hundreds of autonomous cities and towns. This offers many opportunities to observe different regulatory configurations in places that are within miles of each other and similar in many other ways (economy, topography, and so forth). Table 1 illustrates variations within the Boston metro area for a selected set of Greater Boston cities/towns. The two regulations for which data are provided are: minimum lot size for multifamily dwellings (square feet) and the maximum frontage requirement in any part of the city/town (feet). In both cases, higher values correspond with more restrictive development requirements.

The variation is striking. Cambridge, MA's minimum lot size for multifamily housing is 900 square feet—in contrast with Weston's whopping 240,000. This is not just a story of difference between relatively large and diverse Cambridge, and small and homogenous Weston;

Groton and Marblehead—two small, homogenous, and affluent towns that are fairly similar to Weston—also exhibit markedly different regulatory environments. Indeed, (Glaeser and Ward 2009) find that land use regulations in Greater Boston are uncorrelated with standard demographic predictors, with the exception of historical density.

The chief drawback of focusing on one metropolitan area is generalizability. While our analyses will be able to tell us how housing regulations operate in metropolitan Boston, we might worry that our research will not be able to broadly speak to American land use institutions. We suggest that, although Boston certainly is not a stand in for all American metropolises, it offers insights into other inelastic high-growth areas that are not keeping pace with rising housing demand. Better understanding why individuals are unable to locate affordable housing in areas with the greatest job growth is one of general social importance (White House 2016). Moreover, because Boston is a highly fragmented metropolitan—featuring over 150 cities and towns—it offers an excellent opportunity to test whether places with a propensity to form large numbers of municipal governments do, in fact, use land use powers to exclude.

Below we present a mix of data from the Boston metropolitan area to tell a broad story. We combine interviews with elites with comprehensive analysis of observational permit and lawsuit data. We also present systematic analysis of the development of former church properties which often present unusual development opportunities in otherwise developed and very desirable areas. The qualitative evidence helps to elucidate the mechanisms outlined in the theory, while the quantitative data show patterns consistent with our theory across the metropolitan area.

4.1 Interviews

To illustrate how our proposed model might operate in the actual housing development process, we interviewed eight metropolitan Boston town officials, housing developers, and housing lawyers. For all subjects, we asked broad questions about their roles in housing development and exactly how neighborhood opposition—when it exists—stymies projects. Specifically, we asked (with slight modifications depending upon the individual's job): (1) "If I were a developer, what does the process to develop multifamily housing look like in the communit(ies) you work in?" (2) "In your experience, how often do citizens oppose multifamily housing?" and (3) "What tactics to they use?". While these general questions formed the basis of the interviews, we asked follow ups and let the conversation flow naturally around these main themes.

These conversations with elites provide support for the key ideas in the formal theory and in the project more broadly. Specifically, they highlight 1) neighbors' consistent resistance to projects that increase density, 2) the ways that relatively small groups of neighbors (or even sole actors) utilize legal mechanisms to challenge projects that will affect the density near their homes and 3) how these tactics, without necessarily blocking projects, can delay and/or shrink proposals by imposing costs on developers.

Strikingly, every single one of our interview subjects said that neighbors oppose multifamily housing virtually all of the time. One housing lawyer suggested, "Human instinct is to be adverse to change and like things the way they are....[They] see other people as intruding, making things more dense, more traffic, more problems." A nonprofit housing developer similarly suggested that near universal neighborly opposition to higher density housing stems in part from fear of change. She also, however, cited homevoter motivations rooted in concerns over property values: "neighbors oppose projects whenever they think it's going to change their neighborhood and threaten their property values." Consistent with our model and the broader economics and political science literature, neighbors have an interest in fighting multifamily housing. What's more, local statutory requirements mean that neighbors are made aware of nearby multifamily developments. When a project requires a variance and/or special permit in Massachusetts, all abutters are notified about the times of public hearings. Thus, those individuals most likely to intensely oppose a proposed project have the information necessary to do so.

Moreover, our interview subjects suggested that the local regulatory context ensures that this neighborly opposition frequently results in delays. In virtually all cases, the zoning and land use regulations cited encompassed both explicitly density-limiting policies as well as regulations that might be tied with other aims. Any individual can appeal a project as part of the permitting and variance process. One town official observed that these appeals typically result in the delays and concessions outlined above. Moreover, should the appeals process not work, individuals and/or groups opposed to a project can avail themselves of legal options. The non-profit developer said that, in her experience, these lawsuits "make things very costly to the builder," potentially dragging the process out for years. Indeed, the costs of legal action are such that the threat of legal action from *one credible neighbor* can extract significant concessions from the developer. One housing lawyer described a recent project he had worked on in which "one cantankerous neighbor" had a major impact on a project in a rapidly gentrifying neighborhood in greater Boston. While the project actually had wide support in the neighborhood, all of the involved players believed that there was a risk of litigation—the "ultimate threat"—because one neighbor with sufficient resources was steadfastly opposed to the development. Consequently, the developer entered negotiations with the individual neighbor and changed aspects of the project to suit his preferences. The non-profit developer cited similar experiences in her own work, noting "people just want to be bought out;" frequently, for a developer to avoid litigation, they are forced to buy adjacent property for more than it is worth. Another housing lawyer suggested that, while lawsuits typically involved multiple neighbors, they usually had a "ringleader" playing a central role in organizing and pushing for legal action—again revealing the power of one or a very small group of individuals to foment effective opposition to development. According to both housing lawyers, the power of appeals and legal actions to stymie development leads developers to enter negotiations with community groups and neighbors from the outset and to provide those groups a great deal of influence in dictating the contours of a project.

Importantly—and consistent with our model—these neighborly oppositional efforts are not necessarily aimed at immediately killing a project. Neighbors' push for delays and concessions, may however, pose a key limitation to development. One local official contrasted blocking a project with slowing it, noting that opposition "typically wouldn't deny a project" but would "slow it down a lot."In addition to the parking study case cited above, examples abounded of extra studies and meetings generated by neighbors' contestations. Another town official described a recent development proposal whose height led to a request for a shadow study—a document that was not typically required in her town and a study beyond the environmental review the project had already gone through. Project abutters also worried about traffic impacts, necessitating extra meetings with the town's Department of Transportation and an additional traffic study. All of these requests were costly to developers in terms of the extra time needed to complete these studies, the direct costs of conducting these studies, and the project concessions required in the wake of these studies. A nonprofit housing developer cited similar delays, noting that in many progressive areas, neighbors would raise "spurious environmental objections....People will raise water table issues, trees, traffic." A for-profit developer recalled a recent project in which he had to produce five traffic studies in an attempt to appease neighbors and town officials. A housing lawyer succinctly described the costs of these delays: "delay is the biggest enemy of development....the ability of anyone to delay development is the ability to kill it."

4.2 Permits

To more quantitatively assess how regulations might shape the provision of multifamily housing, we explore the impact of regulatory context on the number of building permits issued by city/town from 2000-2015 for single family, two-family, and multifamily housing.[4] Combining data from the U.S. Census with regulatory information from the Massachusetts Land Use Regulation database, we present a series of regressions in Table 2 (Appendix Figure B1 plots these results) measuring the impact of *all* land use regulations on the permitting of

[4]We combine 3-4 unit housing with 2-unit buildings because so little 3-4 family unit housing is constructed during this time period.

different housing types. These analyses generally follow those in Glaeser and Ward (2009), which also use permitting as a dependent variable; we, however, use share of single-family and multifamily permitted units—rather than a log of total permitted units—as our key dependent variables.[5] We also disaggregate by permit type rather than focusing our analyses on total number of permits. We code all regulations so that higher values of our regulatory indices indicate tighter regulation of multifamily housing. While these data do not allow us to directly observe the mechanisms outlined in the interviews, they do show general patterns in the relationship between land use regulations and housing development. Moreover, should we find that an accumulation of regulations—including those not directly connected with multifamily housing—has an effect on multifamily housing development, it would be consistent with our theoretical expectations that each additional stage of the development process increases costs for developers and enhances the neighbors' probability of winning.

Our results show that virtually all regulations dramatically increase a city/town's propensity to permit single family housing and decrease its likelihood of permitting multifamily housing. These regulations also appear on balance to reduce the the number of permits provided for two-family homes. Consistent with our theoretical predictions and interview evidence, highly regulated places are constructing less multifamily housing.

Moreover, a wide breadth of regulations appear to have a negative impact on the construction of multifamily housing. While it is relatively unsurprising that explicitly density-limiting regulations targeted towards multifamily housing would decrease multifamily housing permits, regulations pertaining to septic systems, lot shapes, and subdivisions also were negatively associated with multifamily housing permits (and positively associated with permitting for single family units). These negative effects persist even when we control for multifamily housing regulations. Many of these regulations are not obviously linked with

[5] We repeat the analysis with the dependent variable as the share of permitted buildings (rather than units) of each type. Appendix Table B1 present these results. As in Table 2, the share of single family housing increases with regulations, and multifamily housing decreases with regulations. The results are similar if we use Glaeser and Ward's (2009) logged measure. Appendix Tables B2 and B3 present results using log of total permits instead of the share.

Table 2: Regressions of Zoning Regulations on Permitted Units

Regulation Type	1 Unit	2–4 Units	5+ Units
All Regulations	0.017**	-0.003**	-0.013**
	(0.003)	(0.001)	(0.003)
Cluster Regulations	0.024	-0.005	-0.019
	(0.015)	(0.004)	(0.014)
Growth Regulations	0.045**	-0.005	-0.040**
	(0.012)	(0.003)	(0.011)
Inclusionary Regulations	0.001	-0.006	0.005
	(0.021)	(0.006)	(0.020)
Multifamily Regulations	0.059**	-0.009*	-0.050**
	(0.012)	(0.004)	(0.012)
Parcel Shape Regulations	0.078**	-0.014**	-0.064**
	(0.013)	(0.004)	(0.013)
Septic Regulations	0.040**	-0.008*	-0.032**
	(0.011)	(0.003)	(0.011)
Subdivision Regulations	0.548**	-0.038	-0.510**
	(0.110)	(0.033)	(0.106)
Wetlands Regulations	0.006	-0.005*	-0.001
	(0.009)	(0.003)	(0.009)

Each row and column corresponds to a separate OLS regression. For all regressions, N = 187 Massachusetts cities and towns. Dependent variables are defined as the percentage of units permitted by building type in each town from 2000 to 2015. Independent variables are defined as the number of regulations of each type in the Pioneer Institute for Public Policy Research and Rappaport Institute for Greater Boston (2005) database.

the provision of multifamily housing. For example, rules about frontage and percolation rates are not, on their faces, explicitly about housing type/density. Our results suggest, however, that, in practice, even these types of rules contribute to the affordability crisis in metropolitan Boston by constraining the availability of multifamily housing. While we cannot empirically demonstrate with these town-level analyses whether neighbors are using these regulations to delay development and/or render it more costly, these results are certainly consistent with our model and interviews suggesting that neighbors will raise a multitude of objections—some seemingly "spurious"—to fight unwanted projects.

Interestingly, one type of regulation designed to promote the provision of multifamily and affordable housing—inclusionary zoning—appears to have little impact on permitting. Indeed, inclusionary zoning appears unrelated to the permitting of either single family or multifamily housing. At least in Massachusetts, then, these measures appear to be ineffective at promoting greater affordability via increased housing density.

One concern with these empirical tests is that regulations might be correlated with demand for housing, and that lack of demand for multi-family housing caused by other factors may lead to low levels of development in some highly regulated places. In Tables B7 and B8 we add controls for distance from Boston and median household wealth, respectively. These are flawed tests: distance from Boston may have affected how the zoning regulations were written, and median household income may be driven by restrictive zoning regulations. However, they provide some useful insights. In towns far from Boston, we may expect lower demand for multifamily housing as commuting times for those working in Boston are higher.[6] We find that distance is associated with increased permits for single family homes and decreased permitted units for multifamily buildings. However, even controlling for distance, regulations still affect the units permitted; the share of single families homes increases with regulations, and the share of multifamily units decreases with regulations.[7] We expect that

[6]However some of these towns may be appealing for easy access to the technology companies along Route 128.

[7]The effect of regulations on buildings with 2–4 units is negative and significant at $p < 0.01$. The coefficient for regulations on buildings with five or more units is only weakly significant at $p < 0.1$.

wealthier towns should have high demand for multifamily housing, as they generally offer high levels of services, especially high-quality schools, and high property values, making it harder to purchase a home. We do not find a meaningful relationship between wealth and the types of units permitted, and controlling for wealth does not significantly change the effect of regulations. Given these results, we conclude that there is a significant relationship between regulations and the types of housing permitted, independent from demand for housing.

4.3 Catholic Church Developments

While the permitting results are consistent with our theory, they are descriptive. Indeed, the types of properties that become available for development are not random, and may, in fact, be correlated with the local regulatory context. To address this potential selection problem, we analyze the redevelopment of properties formerly owned by the Archdiocese of Boston. Before describing these data in greater detail, we stress that they cannot resolve all selection problems in our data: in particular, we cannot randomly assign regulations, which would be the ideal study design. Nonetheless, because of the random nature of Church property availability—which we discuss below—these data help to address the issue of non-randomness of property availability.

As a consequence of the Catholic Church's sexual abuse scandal, the Archdiocese of Boston was forced to sell hundreds of similar properties across a wide array of communities in Greater Boston. The redevelopment of these properties allows us to evaluate the impact of regulations on development because the Church sold a number of prime properties across Eastern Massachusetts in a relatively short period of time. Tracking what happened to these relatively comparable properties, many of which opened up spaces for development where such opportunities are very scarce, provides an alternative way to see how variance in local rules shapes development and residential density. Moreover, the availability of these similar properties is driven by external events and completely unrelated to the town's regulatory context.

We used MA registries of deeds to collect data on all Catholic Church property sales from 2004 to the present for Middlesex County (which contains a number of Boston suburbs in the Pioneer Institute for Public Policy Research and Rappaport Institute for Greater Boston (2005) data). These data include date of sale and whether the Church property was converted into a residential or commercial property. If the property became residential, we recorded the number of units included in the redevelopment, and whether the development was comprised of single-family, two-family, or multifamily housing.

Figure 2 shows that, conditional on pursuing residential projects, a community's regulatory environment shapes the type of housing that ultimately gets built and sold. We coded the properties based on the type of housing they were converted to (single family, attached townhouses, condo/apartment). The right side of the figure shows a plot of the housing type as a function of the number of regulations in the town. Higher values on the y-axis indicate "denser" forms of housing.[8] The plot shows a strong relationship between regulations and the shape of residential development. Essentially all of the denser land uses (e.g. condos) occurred in places with fewer regulations. In places with more regulations, properties became single family homes. To bolster these plots we estimated simple models. An ordered logit model, with our three categories of residential development and a control for distance from Boston, shows a strong an highly significant ($p < .001$) effect of higher numbers of regulations.[9] Similarly, a greater number of regulations significantly increase the likelihood of a property becoming single family houses.

In addition to the type of development, we also examined the number of units it became. In Figure 3 we plot the number of units a site became against the number of regulations. As with the type of development, there is a strong negative association between regulations and the number of units. As the figure shows, one development was abnormally large (roughly 140 units). With or without it, the basic relationship holds. Church properties redeveloped in more restrictive communities became relatively few new residences. Those developed in

[8]The data are actually categorical 1,2,3 but we added random noise to separate them on the plot.

[9]Here and below, these results persist whether or not we include standard errors clustered by town

Figure 2: Residential Church Development Type by Regulations

areas that are more friendly to multi-family housing were turned into many homes. We estimated this relationship with a simple regression controlling for distance from Boston. The relationship was highly significant as each additional regulation was associated with a decrease of more than one housing unit ($p < .01$) in a model that *excludes* the one very large development.[10]

4.4 Lawsuits

These permitting and Catholic Church results illustrate a clear link between stringent land use regulations and the permitting of multifamily housing. The strong relationship between *all* regulations—even those ostensibly unrelated to density—and the construction of mul-

[10]The relationship holds whether or not we include the large Hudson property and whether or not we cluster standard errors.

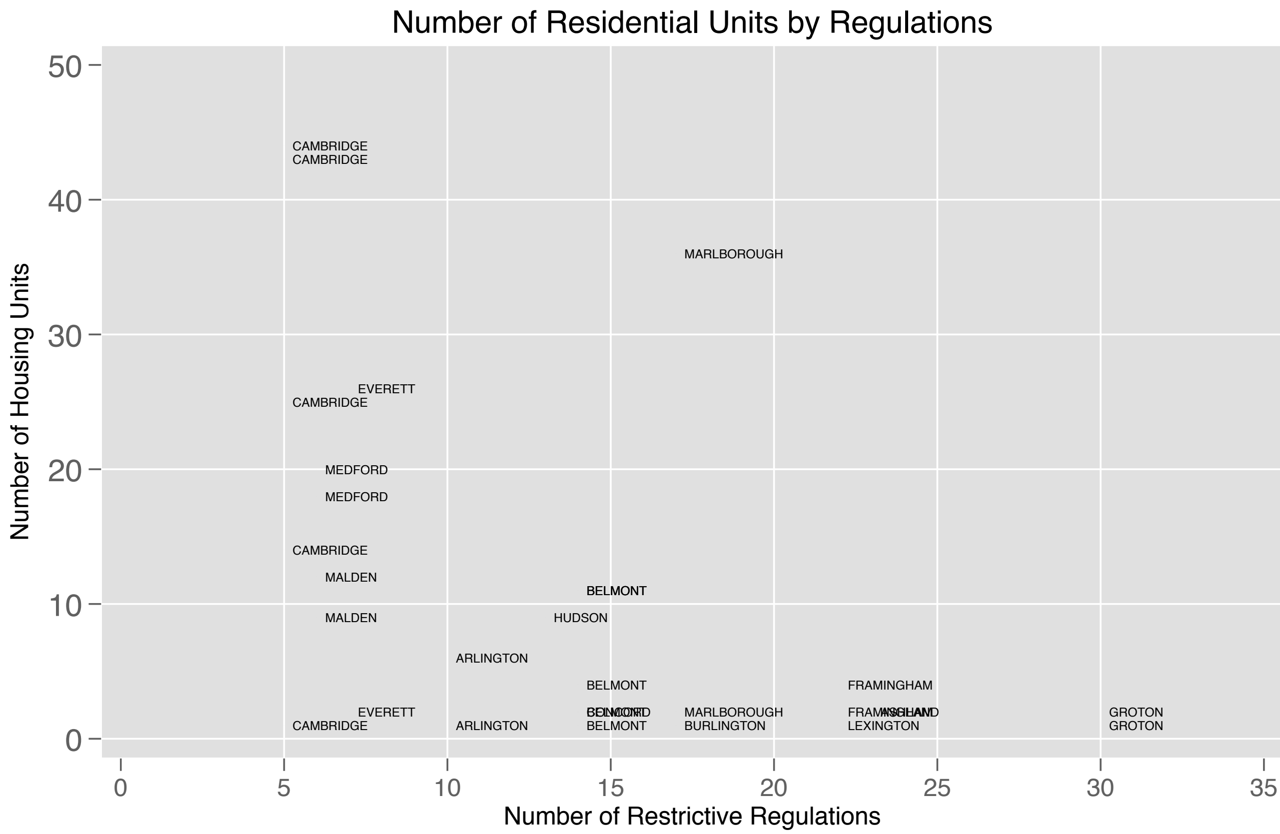

Figure 3: Number of Residential Units in Catholic Church Developments by Regulations

tifamily housing sugests that our theoretical story about the accumulation of regulations holds. These data, however, do not provide explicit evidence on mechanisms that explain these links. The interviews presented above, in concert with our theory, may point us to some answers. Indeed, the additional developer studies and meetings described in our interviews all would help to explain the strong negative relationship between land use regulations of all types and multifamily permitting. These meetings and studies are difficult to assess quantitatively—to our knowledge, there is inconsistent recording of these studies/meetings across cities and towns that would make a large-N analysis difficult. We can, however, provide more quantitative empirical assessment of one of the proposed mechanisms described in our interviews: lawsuits.

Figure 4 illustrates the posited relationship between regulations, lawsuits, and permitting based on our theory and interview data. More restrictive land use institutions should, separately from lawsuits, have a negative relationship with permitting—as we find. The source of this negative relationship includes the shadow studies, parking studies, environmental reviews, and additional meetings—among other things—that neighbors are able to force using existing regulations. In addition, we anticipate that regulations will also be positively associated with lawsuits, as neighbors take advantage of existing rules as a justification for legal action (or threatened legal action). These lawsuits—which have the potential to dramatically delay and/or stop development—should decrease permitting.

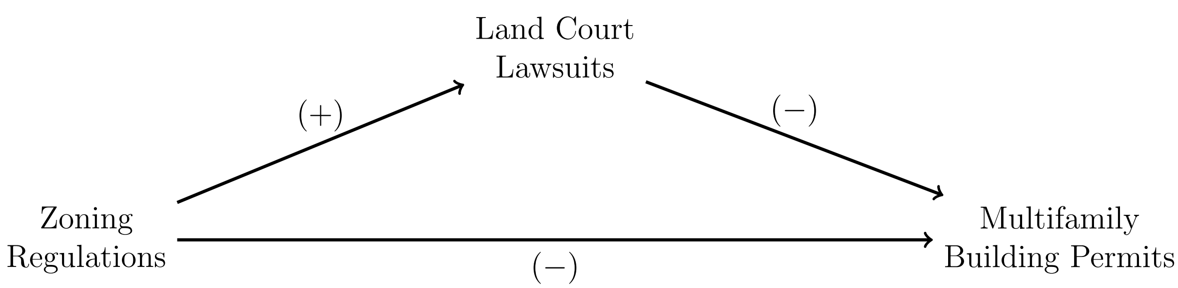

Figure 4: Hypothesized Relationships Between Regulations, Lawsuits, and Building Permits

While we cannot observe threatened lawsuits, a search of the MA Land Court records[11] provides a count of the number of lawsuits filed in each city/town. To identify lawsuits per town between 2000-2017,[12] we collected information on all land court cases featuring the terms "zoning," and "residential," with each city/town included in the "party" name.[13] We followed this procedure for all 187 cities/towns in the Massachusetts Land Use Regulation Database.

During this time period, 668 lawsuits related to residential land use were filed. There was a remarkable range in our data: Weston—an affluent suburb of Boston with a population

[11] We searched these records using the Social Law Library database.

[12] Our regulations data were collected in the several years preceding 2005; we felt that, while regulations from 2000 and 2005 were likely to be highly correlated (especially given the multi-year nature of the regulations data collection), using lawsuits from early years would potentially represent pretreatment data.

[13] This procedure parallels that in Glaeser and Ward (2009); because they were interested in septic and wetlands regulations, they included those terms as well. In addition, their longitudinal analysis was at the state, not city/town level.

of only 11,000—had a whopping 22 lawsuits, while 26 cities/towns had 0. Overall, however, the number of lawsuits per town is small, with the mean town experiencing 3.6 lawsuits and 140 of our 187 cities/towns featuring fewer than 5 lawsuits. These results suggest that the primary mechanisms by which neighbors restrict multifamily housing development is not *actual* lawsuits, but but rather credible threats and/or delaying of the development process through challenges and requests for additional documentation.

That said, filed lawsuits may play some role in restricting development. It is perhaps unsurprising that Weston—featuring the highest number of lawsuits in our data set—has permitted *no* multifamily housing developments in the last 16 years. More generally, our regression analysis reveals that the number of lawsuits per total number of housing units[14] is negatively associated with the provision of multifamily housing. (We opt to use a per capita measure of lawsuits because the raw number of lawsuits in part might proxy for total population of/total housing units in an area.) Figure 5 plots coefficients from regressions of lawsuits on the share of units permitted in each town by building type.

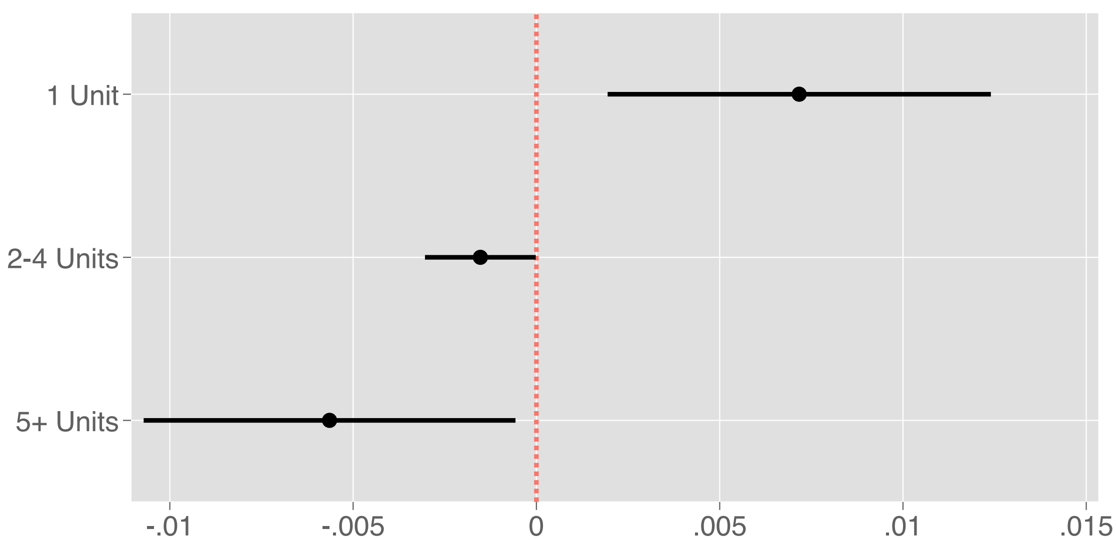

Figure 5: Coefficient Plot of Lawsuits on Permitted Units. Zoning Regulations on Lawsuits. Each coefficient is from a separate regression. Regression results in Table B4.

Moreover, there is evidence that the regulatory environment helps to predict the number

[14] We use 2000 U.S. Census figures for total number of housing units.

of lawsuits per capita filed in a community. Figure 6 shows that communities with higher numbers of *all* land use regulations experience a larger number of per capita lawsuits. When we subdivide by type of regulation, these effects appear especially strong for multifamily regulations and shape regulations. With both types of regulations in one model, the statistically significant impact of shape regulations vanishes, suggesting that multifamily housing restrictions most powerfully predict per capita lawsuit frequency (see Table B6). On balance then, lawsuits appear to be one mechanism by which land use institutions restrict development; as posited, more restrictive places have more lawsuits. These lawsuits, in turn, are negatively linked with multifamily permitting.

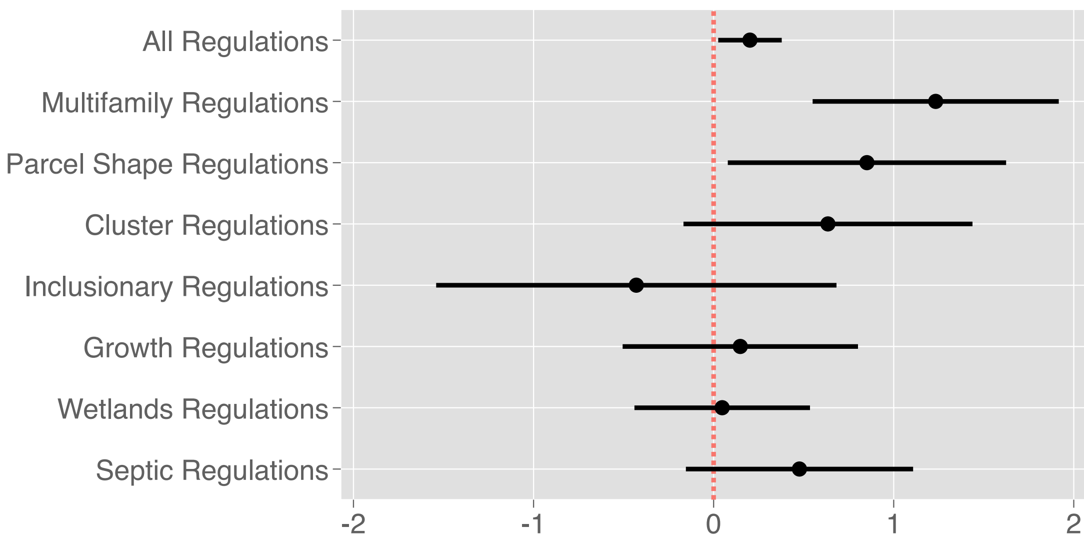

Figure 6: Coefficient Plot of Zoning Regulations on Lawsuits. Each coefficient is from a separate regression. Regression results in Table B5.

5 Implications for Land Use Policy

In sum, we find that the relationships posited in our theory section and Figure 4 hold. Greater land use regulations—including those not directly targeting higher density housing—are linked with the production of proportionally less multifamily housing. Our interview evidence suggests that neighbors are able to take advantage of the regulatory framework to impose a number of costs on developers that make such projects less feasible: these additional costs include a proliferation of studies and meetings, significant concessions in project design, and legal action (or the threat of legal action). Our quantitative analysis of city/town level lawsuits confirms that more regulated places experience more lawsuits per capita and that these lawsuits in turn appear to depress the development of multifamily housing.

These results help to understand a major puzzle in the study of land use politics: why big cities that are not dominated by homevoters still, in many cases, undersupply multifamily housing. Indeed, classic urban politics scholarship (Logan and Molotch 1987) suggests that politically powerful developers should form a growth machine that biases big cities in a pro-growth direction. In contrast, it is smaller, residential communities that should experience the restrictive homevoter politics described in Fischel (2001). The failure of cities like Boston, New York, and San Francisco—all cities with high percentages of renters—to provide ample multifamily housing suggests that growth machine and homevoter accounts do not fully explain what is occurring in many American economic centers. Instead, land use institutions render small groups extraordinarily powerful; this insight may help to explain why homevoters appear to be more powerful than the bulk of prior evidence would suggest (Been, Madar, and McDonnell 2014)

These findings come with important limitations. Our quantitative data cannot show the extent to which things like shadow studies and additional hearing requests affect permitting; we must rely on our interviews to provide this evidence. Moreover, because we cannot observe lawsuit threats, our lawsuits analysis likely does not fully capture the impact of legal action (or threatened legal action) on development. Finally, while the bulk of our empirical analyses are consistent with our theoretical predictions, none of our empirics on its own provides rigorous causal leverage. Although regulations are seemingly random, they are not randomized; we therefore cannot rule out that some omitted variable may be driving some of our results.

Importantly—and particularly relevant for policymakers and reformers—the permitting data suggest that regulatory frameworks that are ostensibly unrelated to multifamily housing—regulations governing lot size shape and septic systems, for example—can have a potent impact on the provision of higher density housing. Reformers hoping to create institutions more amenable to the production of multifamily housing need to consider the vast array of environmental and architectural regulations, any one of which can provide ammunition to oppositional neighbors. Specific regulations aside, the *accumulation* of regulations matters.

One additional policy solution that may help address the regulatory challenges uncovered in this paper is to limit neighbors' involvement. Our theoretical model and much of the political science scholarship on this topic is premised on the fact that neighbors consistently oppose new developments. Our analysis reveals that the contemporary regulatory framework renders this neighborly opposition (even in small numbers) a powerful obstacle to multifamily projects. Indeed, Schleicher (2013) argues that neighborhood-level decision-making on specific developments creates an imbalance between those who support new housing supply broadly and those opposing specific nearby projects.

It is possible, however, to create land use institutions that do not empower small groups of oppositional neighbors. One of the housing lawyers in our interview sample described a development in a gentrifying neighborhood in which the neighborhood generally supported a multifamily housing project, while one neighbor vociferously opposed the development. Because the neighbor was intransigent, but public opinion was generally favorable, the development team used the following strategy: they first made significant concessions to the neighbor to mitigate his opposition. Then, to ensure that they did not need a variance—thereby limiting the neighbor's ability to bring legal action—they harnessed neighborhood-level support to rezone the neighborhood. Rezoning required approval from the Zoning Board of Appeals and City Council in this community, necessitating significant public support. The changes, however, meant that a single well-resourced individual no longer had veto power. Obviously, this strategy required significant neighborhood-level support, something that a wealth of public opinion scholarship suggests is not always the case. In instances with at least somewhat favorable public opinion, however, reforms that remove strong neighborhood-level power are feasible and increase the likelihood of project completion.

Land use regulations that remove the ability of neighbors to contest projects via channels like public hearings, though, may increase the likelihood of lawsuits. Another housing lawyer in our interview sample believes that state laws in Massachusetts designed to allow developers to bypass neighborhoods may leave project opponents no other option other than to pursue legal action. Under MA Chapter 40B, developers proposing projects where at least 25 percent of the units are affordable can bypass local zoning and land use regulations in a city/town in which the affordable housing stock comprises less than 10 percent of total units. In non-40B developments, this housing lawyer believes that "you have compromise and negotiation at the local level." In contrast, the developer has a "different negotiating strategy with Chapter 40B." In particular, for neighbors "the only way you can get change is just to sue [the developers]." In the town in which the housing lawyer lives—which is frequently the target of 40B developments—she has found that developers rarely bother with a substantial public review process because they simply assume that neighbors will sue. Reforms that change the geographic scale of development decisions at a minimum need to offer opportunities for neighbors to have some influence and/or limit the grounds on which neighbors can file legal action.

While state-level streamlining might overly diminish neighborhood influence, political representatives in communities like Boston—places with highly localized land use regulation—should consider feasible solutions that reduce regulatory burdens and change the geographic scale of development decisions. Perhaps regional and/or county-level regulation could help address some of these challenges. Future scholarship that explores these issues on a more national scale might begin to unpack how geographic institutional variations allow for greater provision of multifamily housing. Moreover, future national-level research might further explore how to implement important environmental regulations—like septic guidelines—in a manner that does not overly impinge on affordable housing development. Such regulations are critically important in environmentally vulnerable areas, but can also be wielded as development blockades by oppositional neighbors. Even the most seemingly mundane of local policies comes with important tradeoffs that we hope future scholarship continues to unpack.

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Online Appendix

A Formal Model

A.1 Equilibrium where both players always fight

We begin by identifying the conditions under which the developer's strategy BFF and neighbor's strategy FF constitute a subgame perfect Nash equilibrium.

At $A2$, the expected value for D and N are:

$$EV_{D_2} = \phi_2 \left(\delta_D^2 B_D - (1+\delta_D)c_D\right) - (1-\phi_2)(1+\delta_D)c_D = \phi_2\delta_D^2 B_D - (1+\delta_D)c_D \quad (4)$$

$$EV_{N_2} = \phi_2 \left(\delta_N^2 B_N - (1+\delta_N)c_N\right) - (1-\phi_2)(1+\delta_N)c_N = \phi_2\delta_N^2 B_N - (1+\delta_N)c_N \quad (5)$$

$$(6)$$

The developer will only choose to Fight at $D3$ if EV_{D_2} is greater than the payoff from conceding:

$$\phi_2\delta_D^2 B_D - (1+\delta_D)c_D > -c_D \quad (7)$$

$$B_D > \frac{c_D}{\phi_2\delta_D} \quad (8)$$

Assuming the condition in equation 8 is met, the neighbor will choose to Fight at $N2$ if:

$$\phi_2\delta_N^2 B_N - (1+\delta_N)c_N > \delta_N B_N - c_N \quad (9)$$

$$-B_N > \frac{c_N}{(1-\phi_2\delta_N)} \quad (10)$$

Note that the left-hand side of equation 10 is positive, since $B_N < 0$. Assuming the conditions in equations 8 and 10 are both met, we now consider the decision to fight in the first stage.

The expected values at $A1$ for each player are:

$$EV_{D_1} = \phi_1 \left(\phi_2 \delta_D^2 B_D - (1 + \delta_D)c_D\right) - (1 - \phi_1)c_D \tag{11}$$

$$= \phi_1 \phi_2 \delta_D^2 B_D - (1 + \phi_1 \delta_D)c_D \tag{12}$$

$$EV_{N_1} = \phi_1 \left(\phi_2 \delta_N^2 B_N - (1 + \delta_N)c_N\right) - (1 - \phi_1)c_N \tag{13}$$

$$= \phi_1 \phi_2 \delta_N^2 B_N - (1 + \phi_1 \delta_N)c_N \tag{14}$$

The developer will fight at $D2$ if:

$$\phi_1 \phi_2 \delta_D^2 B_D - (1 + \phi_1 \delta_D)c_D > 0 \tag{15}$$

$$B_D > c_D \frac{(1 + \phi_1 \delta_D)}{\phi_1 \phi_2 \delta_D^2} \tag{16}$$

The condition for the developer to fight at $D2$, given in equation 16, is more restrictive the the developer's condition to fight in $D3$, given in equation 8 because $\frac{1+\phi_1\delta_D}{\phi_1} > 1$. Thus, if the condition is met for the developer to fight in $D2$, the necessary condition to fight later on at $D3$ must also be met.

The neighbor will fight at $N1$ if:

$$\phi_1 \phi_2 \delta_N^2 B_N - (1 + \phi_1 \delta_N)c_N > B_N \tag{17}$$

$$-B_N > c_N \frac{(1 + \phi_1 \delta_N)}{(1 - \phi_1 \phi_2 \delta_N^2)} \tag{18}$$

Unlike the developer's conditions for fighting, the neighbor's condition for fighting at $N1$ (equation 18) does not automatically imply that the neighbor will fight at $N2$ (equation 10).

Finally, given that the developer and neighbor will fight at every node, the developer will only propose a big project if

$$\phi_1 \phi_2 \delta_D^2 B_D - (1 + \phi_1 \delta_D)c_D > 0 \tag{19}$$

This is the same condition as the developer's willingness to fight at $D2$. Thus, there are three conditions that must be met for the strategies BFF and FF to constitute a SPNE: equation 16 for the developerand equations 10 and 18 for the neighbor.[15]

Consider equation 16. If this condition is met, the developer will propose the big project and fight at both approval stages; if it is not met the developer will propose the small project at $D1$. The decision to build the big project is based on the ratio of the cost of fighting (c_D) and the value of building the big project relative to the small project (B_D), as well as the probability of winning in each round the costs of delay from the approval process. If the costs of fighting and delay relative to the value of the big project are small enough, a developer will choose to fight even if the odds of winning approval are low.

Now consider the conditions for the neighbor. The neighbor will fight if $-B_N > c_N \frac{(1+\phi_1\delta_N)}{(1-\phi_1\phi_2\delta_N^2)}$ and $-B_N > \frac{c_N}{(1-\phi_2\delta_N)}$. As the probability of the developer winning in each round decreases, neighbors will be willing to pay higher costs to fight. Further, even if the neighbor is certain to win ($\phi_1 = 1$, $\phi_2 = 1$), the neighbor may still choose to fight. In this case, both conditions reduce to $-B_N > \frac{c_N}{(1-\delta_N)}$. Since neighbors prefer delay if the project is build (discounting a negative outcome), they may still choose to fight if the benefit of delay exceeds the costs of fighting. Even in hopeless situations, we may still observe strong neighborhood opposition in equilibrium.

A.2 Equilibrium where the neighbor fights and then concedes

There is one other interesting equilibria where the developer chooses the big project and both choose to fight. If the neighbor's condition to fight is satisfied at $N1$ (equation 18), but not satisfied at $N2$ (equation 10), the neighbor may choose to fight at the first stage, even though they know they will concede if they lose. This may be unlikely condition, as it

[15] If the developer's condition is not satisfied but the neighbors conditions are satisfied, the developer will choose the small project at $D1$ in equilibrium (or, equivalently, choose big at $D1$ and concede at $D2$). If both of the neighbors conditions are not met, the developer will choose the big project at $D1$, and the neighbor will concede at $N1$.

requires that:

$$-B_N > c_N \frac{(1+\phi_1\delta_N)}{(1-\phi_1\phi_2\delta_N^2)} \tag{20}$$

$$-B_N < \frac{c_N}{(1-\phi_2\delta_N)} \tag{21}$$

These conditions are only satisfied if $\phi_2 > \phi_1$ and $-B_N < \frac{c_N}{(1-\phi_2\delta_N)}$. The developer must be more likely to win in stage 2 than in stage 1, and the costs of fighting are sufficiently high. Even though the neighbor knows that they will concede in stage 2 if it is reached, they still prefer to fight in stage 1, in part because this provides an opportunity to win, ending the big project, and in part because they value delaying the big project even if it is built after stage 1.

In this equilibria, the developer's condition for choosing the big project and fighting is too restrictive, as the developer knows they will win in the second stage. Given that the neighbor will concede at $N2$, the developer's expected value of the first stage is:

$$EV_{D_1} = \phi_1\left(\delta_D B_D - c_D\right) + (1-\phi_1) - c_D \tag{22}$$

$$\tag{23}$$

The developer will fight if:

$$\phi_1\left(\delta_D B_D - c_D\right) + (1-\phi_1) - c_D > 0 \tag{24}$$

$$B_D > \frac{c_D}{\phi_1\delta_D} \tag{25}$$

A.3 N-stage Model

We do not formally model an N-stage game in this paper, but the intuitions of the two-stage model will apply to an N-stage game as well. When considering which project to propose, the developer will take into account the costs, probability of winning in each round, and discount factor. For developers, as additional stages are added, the probability of success decreases, the ultimate value of the project decreases (as it is discounted further for each round), and the total costs of fighting increase. With additional stages, the minimum value of the project worth building increases. For neighbors, additional stages decrease the likelihood of development, and make fighting more worthwhile.

B Permits and Lawsuits Models

Table B1: Regressions of Zoning Regulations on Permitted Buildings

Regulation Type	1 Unit	2–4 Units	5+ Units
All Regulations	0.009**	-0.006**	-0.003**
	(0.001)	(0.001)	(0.001)
Cluster Regulations	0.020**	-0.012**	-0.008
	(0.007)	(0.004)	(0.004)
Growth Regulations	0.014*	-0.008*	-0.006
	(0.006)	(0.004)	(0.003)
Inclusionary Regulations	0.005	-0.006	0.001
	(0.010)	(0.006)	(0.006)
Multifamily Regulations	0.029**	-0.019**	-0.010**
	(0.006)	(0.004)	(0.004)
Parcel Shape Regulations	0.040**	-0.023**	-0.017**
	(0.006)	(0.004)	(0.004)
Septic Regulations	0.023**	-0.014**	-0.009**
	(0.005)	(0.003)	(0.003)
Subdivision Regulations	0.281**	-0.182**	-0.099**
	(0.052)	(0.033)	(0.032)
Wetlands Regulations	0.005	-0.005	-0.000
	(0.004)	(0.003)	(0.003)

Each row and column corresponds to a separate OLS regression. For all regressions, N = 187 Massachusetts cities and towns. Dependent variables are defined as the percentage of units permitted by building type in each town from 2000 to 2015. Independent variables are defined as the number of regulations of each type in the Pioneer Institute for Public Policy Research and Rappaport Institute for Greater Boston (2005) database.

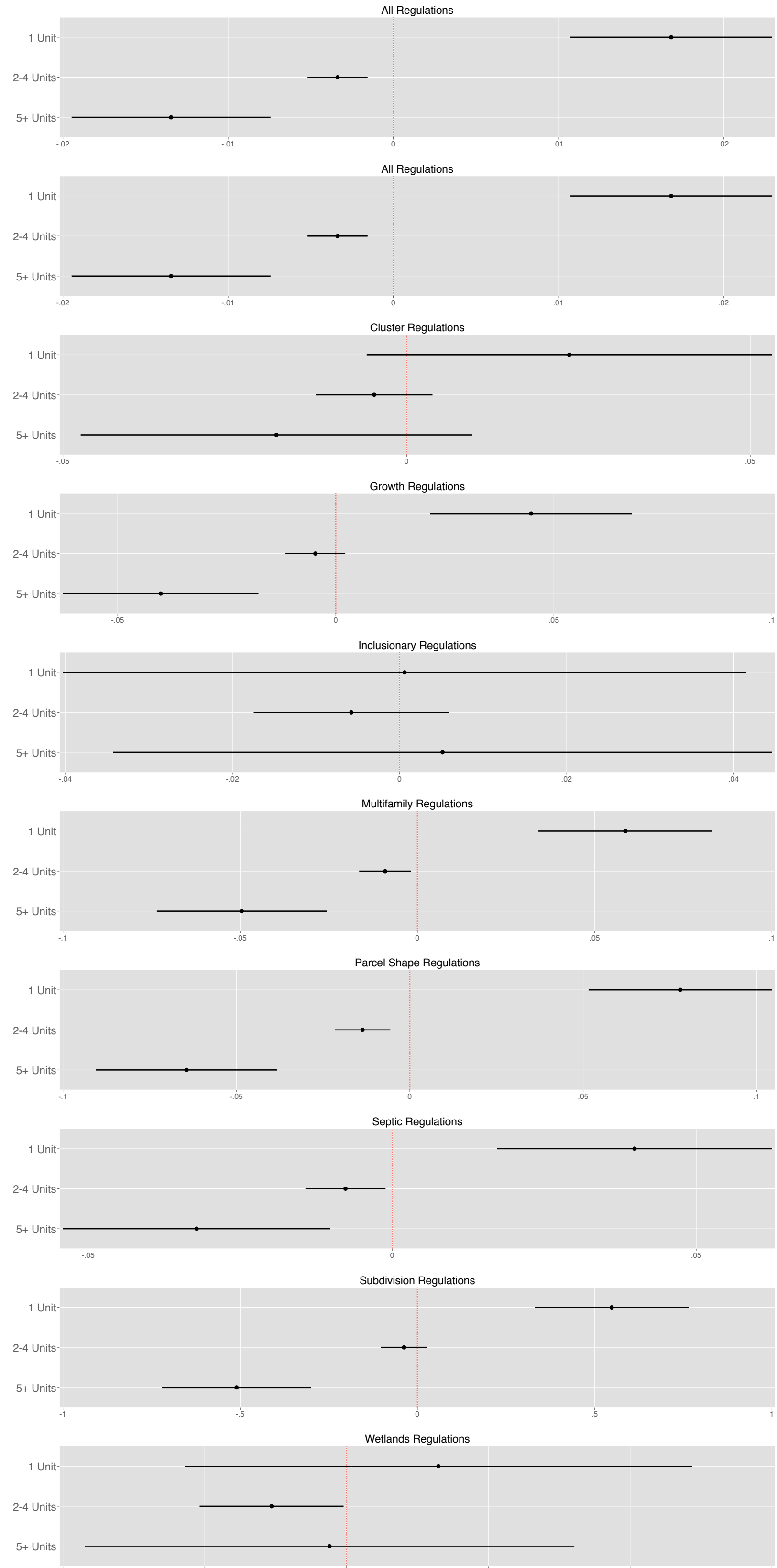

Figure B1: Coefficient Plots from Regressions of Zoning Regulations on Permitted Units

Table B2: Regressions of Zoning Regulations on Building Permitted Units (Logged)

Regulation Type	1 Unit	2–4 Units	5+ Units
All Regulations	0.044**	-0.055**	-0.070*
	(0.010)	(0.020)	(0.032)
Cluster Regulations	0.134**	-0.014	0.013
	(0.045)	(0.091)	(0.146)
Growth Regulations	0.105**	-0.084	-0.289*
	(0.036)	(0.074)	(0.116)
Inclusionary Regulations	0.057	0.092	0.263
	(0.063)	(0.126)	(0.200)
Multifamily Regulations	0.046	-0.286**	-0.469**
	(0.040)	(0.077)	(0.123)
Parcel Shape Regulations	0.134**	-0.342**	-0.518**
	(0.043)	(0.085)	(0.136)
Septic Regulations	0.129**	-0.141*	-0.146
	(0.035)	(0.071)	(0.114)
Subdivision Regulations	1.119**	-1.622*	-3.160**
	(0.347)	(0.700)	(1.113)
Wetlands Regulations	0.052	-0.015	0.115
	(0.027)	(0.055)	(0.088)

Each row and column corresponds to a separate OLS regression. For all regressions, N = 187 Massachusetts cities and towns. Dependent variables are defined as the natural log of one plus the number of buildings with permits issued with the specified number of units in each town from 2000 to 2015. Independent variables are defined as the number of regulations of each type in the Pioneer Institute for Public Policy Research and Rappaport Institute for Greater Boston (2005) database.

Table B3: Regressions of Zoning Regulations on Permitted Buildings (Logged)

Regulation Type	1 Unit	2–4 Units	5+ Units
All Regulations	0.044**	-0.054**	-0.038*
	(0.010)	(0.016)	(0.017)
Cluster Regulations	0.134**	-0.043	0.011
	(0.045)	(0.076)	(0.078)
Growth Regulations	0.105**	-0.078	-0.118
	(0.036)	(0.062)	(0.063)
Inclusionary Regulations	0.057	0.066	0.077
	(0.063)	(0.105)	(0.108)
Multifamily Regulations	0.046	-0.262**	-0.252**
	(0.040)	(0.064)	(0.066)
Parcel Shape Regulations	0.134**	-0.311**	-0.283**
	(0.043)	(0.070)	(0.073)
Septic Regulations	0.129**	-0.138*	-0.096
	(0.035)	(0.059)	(0.061)
Subdivision Regulations	1.119**	-1.447*	-1.552*
	(0.347)	(0.585)	(0.598)
Wetlands Regulations	0.052	-0.016	0.062
	(0.027)	(0.046)	(0.047)

Each row and column corresponds to a separate OLS regression. For all regressions, N = 187 Massachusetts cities and towns. Dependent variables are defined as the natural log of one plus the number of buildings with permits issued with the specified number of units in each town from 2000 to 2015. Independent variables are defined as the number of regulations of each type in the Pioneer Institute for Public Policy Research and Rappaport Institute for Greater Boston (2005) database.

Table B4: Regressions of Lawsuits on Permitted Units

VARIABLES	(1) 1 Unit	(2) 2-4 Units	(3) 5+ Units
Lawsuits	0.007**	-0.002*	-0.006*
	(0.003)	(0.001)	(0.003)
Constant	0.664**	0.063**	0.273**
	(0.026)	(0.008)	(0.025)
Observations	187	187	187
R-squared	0.038	0.021	0.025

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

Table B5: Regressions of Zoning Regulations on Lawsuits

Regulation	Coef/SE
All Regulations	0.202*
	(0.089)
Cluster Regulations	0.635
	(0.407)
Growth Regulations	0.148
	(0.331)
Inclusionary Regulations	-0.429
	(0.563)
Multifamily Regulations	1.233**
	(0.346)
Parcel Shape Regulations	0.851*
	(0.392)
Septic Regulations	0.477
	(0.320)
Subdivision Regulations	3.924
	(3.173)
Wetlands Regulations	0.048
	(0.247)

Each row corresponds to a separate OLS regression. For all regressions, N = 187 Massachusetts cities and towns. Dependent variables are defined as lawsuits from 2000 to 2016 per 10000 housing units. Independent variables are defined as the number of regulations of each type in the Pioneer Institute for Public Policy Research and Rappaport Institute for Greater Boston (2005) database.

Table B6: Regressions of Selected Zoning Regulations on Lawsuits

VARIABLES	(1) Lawsuits	(2) Lawsuits	(3) Lawsuits	(4) Lawsuits
All Regulations	0.202*			
	(0.089)			
Multifamily Regulations		1.233**		1.112**
		(0.346)		(0.388)
Parcel Shape Regulations			0.851*	0.298
			(0.392)	(0.430)
Constant	2.361	-0.933	4.382**	-0.886
	(1.814)	(2.093)	(1.027)	(2.097)
Observations	187	187	187	187
R-squared	0.027	0.064	0.025	0.067

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

Table B7: Regression of Permitted Units with Distance

VARIABLES	(1) 1 Unit	(2) 2–4 Units	(3) 5+ Units
All Regulations	0.008***	-0.004***	-0.005*
	(0.003)	(0.001)	(0.003)
Distance from Boston (miles)	0.014***	0.000	-0.014***
	(0.002)	(0.001)	(0.002)
Observations	187	187	187
R-squared	0.375	0.069	0.362

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

Table B8: Regression of Permitted Units with Wealth

VARIABLES	(1) 1 Unit	(2) 2–4 Units	(3) 5+ Units
All Regulations	0.015***	-0.002**	-0.013***
	(0.003)	(0.001)	(0.003)
Median HH Income 2000 (k)	0.001	-0.001***	-0.000
	(0.001)	(0.000)	(0.001)
Observations	187	187	187
R-squared	0.144	0.106	0.095

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