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**Guarding the Town Walls:
Mechanisms and Motives for Restricting
Multifamily Housing in Massachusetts**

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Abstract

Local governments frequently restrict multifamily housing by limiting the districts where it is allowed, creating procedural barriers to development, and mandating large lot sizes. Such restrictions are thought to reduce the ability of low- and moderate-income households to afford housing in desirable locations. In this paper, I use a new and unusually rich dataset on land use regulations in 186 Massachusetts cities and towns to test several hypotheses about why municipalities restrict multifamily housing. The results reflect two distinct waves of zoning, each of which used a different mechanism and was shaped by different determinants. Under regulations adopted in the 1940s and 1950s, communities with a large amount of existing multifamily housing, a city council form of government and higher land values tended to be less restrictive. The second wave of regulations, beginning in the 1970s, saw an increased use of special permits to allow multifamily housing and greater restrictiveness by smaller, more affluent communities.

Section 1 Introduction

Medieval cities surrounded themselves with massive walls, complete with moats and fortified gates, to protect against attacks by outsiders. Modern cities have developed a more subtle form of gate-keeping: land use regulation. Zoning, it is argued, helps control the demand for public services, protects property values and preserves open space, among other policy goals. But whatever the justification, the practical effect of zoning regulations is usually to limit the density of new housing development, particularly in affluent suburban communities. Since lower-density housing will be more expensive, all else equal, density restrictions limit the ability of low- and moderate-income households to afford housing in desirable communities.

This paper examines the determinants of multifamily housing regulation using a new dataset on land use regulations in eastern and central Massachusetts. Despite Bismarck's famous warning, observing the sausage factory provides an essential insight into how multiple and often conflicting interests result in the final form of regulations. The question of how restrictions affect housing production and prices is left for future research.¹

Urban planners and social scientists have long debated the motives for restrictions on highly dense housing, including multifamily structures. One hypothesis is that residents prefer to live with neighbors of the same social class or race, so that affluent or largely white suburbs will seek to exclude lower-income households and people of color through restrictive zoning. A related hypothesis is that current residents are concerned that multifamily housing will increase demand for schools and other public services without generating sufficient property tax revenue to offset the cost of these services. If so, communities with little commercial development that are more dependent on residential property taxes may be more concerned about the fiscal impact of multifamily dwellings. The type of municipal government may affect the degree to which pro-growth and anti-growth interests can influence regulations. The town meeting form of government may be more influenced by homeowners who are often hostile to multifamily development, while city councils may be more influenced by businesses and other interests favorable to development. Finally, zoning for multifamily dwellings may be influenced by

¹ A significant fraction of multifamily housing in Massachusetts is developed using a state law known as the Anti-Snob Zoning Act or Chapter 40B, that allows developers to construct housing affordable to low- and moderate-income households, even if it is prohibited by local zoning. The data currently available do not allow me to identify multifamily housing built under the Anti-Snob Zoning Act, so it is not possible to distinguish the effects of conventional zoning from the effects of the state law.

historical precedent or by market forces. If so, multifamily structures are more likely to be allowed in communities where they have long existed or which have higher land values.

To test these hypotheses, I construct multidimensional measures of regulation and regress them on municipal characteristics. The dataset on land use regulations allows me to distinguish several ways in which cities and towns restrict multifamily housing: first, by limiting the amount of land where multifamily structures are permitted; second, by requiring a special permit for multifamily housing instead of allowing it “as of right”; and third, by imposing dimensional standards such as minimum lot sizes. The zoning bylaws and ordinances² first adopted in Massachusetts in the 1940s and 1950s typically restricted multifamily dwellings to certain districts but allowed them to be built as of right, as long as they met dimensional requirements. A revision of the state’s zoning enabling act in 1975 led to the expanded use of special permits to regulate multifamily housing. Under special permits, municipalities decide whether to allow multifamily development on a project-by-project basis and may set conditions in exchange for granting permits. The special permit process increases local control over development and may increase uncertainty for developers.

In brief, this study finds that regulation of multifamily housing in Massachusetts occurred in two distinct waves, each of which used a different mechanism and was shaped by different determinants. Under regulations adopted in the 1940s and 1950s, multifamily housing was either allowed by right or prohibited altogether. Early zoning bylaws seemed to be driven by historical precedent and market forces rather than the desire to exclude lower-income households. Communities with a large amount of existing multifamily housing, higher land values and a city council form of government tended to be less restrictive. Towns with low-density housing in 1940 were generally agricultural communities with below average rents rather than wealthy suburbs, so wealth does not appear to have constrained density prior to the adoption of zoning. The second wave of regulations in the 1970s led to expanded use of special permits to allow multifamily housing. In this wave, exclusionary motives were more important; smaller, more affluent communities were more restrictive of multifamily housing. The hypothesis that predominantly white communities would be more restrictive of multifamily development could not be tested because there was relatively little variation in the racial composition of the

² Regulations are referred to as “bylaws” when the municipality is a town, an “ordinance” when the municipality is a city. All land in the state of Massachusetts is incorporated within city or town boundaries, so those are the entities responsible for zoning; counties do not have jurisdiction over land use regulation.

communities. The main contributions of this paper are an identification of historical changes in the type of regulation and its primary determinants, as well as the introduction of more comprehensive, nuanced measures of regulation than are commonly used.

Section 2 of the paper reviews the relevant literature; Section 3 describes the tools used to regulate multifamily housing; Section 4 explores the motivations for restricting multifamily development; Section 5 describes the measures of regulation; Section 6 discusses the empirical strategy; Section 7 presents the statistical analysis of the data and Section 8 concludes.

Section 2 Existing Literature

The paper draws on two main strands in the existing literature: the political economy of land use regulation and empirical work on measurement of land use regulation.

Political Economy of Zoning

Much of the literature on the political economy of zoning focuses on the financial and other motives that affluent communities have for excluding low income or minority households. By requiring a high uniform amount of land for each housing unit, current homeowners can ensure that new development will be of equal or greater value than existing housing stock – and that new households are similarly affluent (Fischel 1985). Exclusionary zoning thus leads to enclaves of high-income households with similar demand for public services; the quality of those services are reflected in high land values and housing prices (Stull 1974, Oates 1969, Gyourko and Voith 1997). Conversely, communities with a larger share of low-income households who are unable to pay for high quality services will have decreased land values (Yinger 1986).

Tiebout (1956) has argued that this type of exclusion and sorting may actually have some important benefits. Local homogeneity of demand for public services should enable public finance to operate more efficiently at the local than national level. Because consumer-voters sort themselves into residential locations according to similar preferences over tax prices and expenditure levels, local governments will be better able to provide public goods that reflect the preferences of their constituents than national governments. But many researchers are more skeptical about the advantages of exclusion for society. Fiorina (1999) and others have argued that the highly localized and fragmented process of land use regulation can be influenced by a small number of active participants, even if their goal is contrary to the preferences of the

passive majority. And Altshuler (1999) suggests that even if the objectives being served coincide with majority preferences, the majority is so narrowly defined that the outcome may be socially sub-optimal. He acknowledges that disaggregation and local primacy “provides partisans of racial-class homogeneity at the neighborhood level with great protection.” Moreover, the tendency towards exclusionary zoning appears to be increasing over time. Although residents in high-income communities have long attempted to restrict new development (Jackson 1985), in the 1970s, rising awareness of the fiscal impacts of development and an increasing hostility to high tax rates contributed to a greater ambivalence towards growth even among middle-income communities (Altshuler and Gomez-Ibanez 1993, Downs 1973). This paper will provide an empirical test of whether personal and fiscal exclusionary behavior drove zoning regulations in Massachusetts.

Measurement of Land Use Regulation

Empirical studies of the causes and effects of zoning have been hampered by the difficulty of measuring the stringency of regulations. Zoning bylaws consist of many different individual requirements and provisions, so it is difficult to construct a cumulative measure for the entire regulation. In addition, there is often uncertainty as to how the code is interpreted and enforced, particularly when the permitting process grants municipal officials a great deal of discretion. And because the content of zoning bylaws varies widely by location, it is often difficult to directly compare stringency across geographically dispersed jurisdictions.

Researchers have adopted three different strategies to deal with the measurement issue, none of which are wholly satisfactory. First, in small area studies with detailed data on dimensional or other requirements and housing characteristics, hedonic models can be used to identify price effects of specific regulations (for example, Green 1999, Pollakowski and Wachter 1990). Although probably the most accurate method of identifying effects of zoning, the data requirements for such analysis are very high. A second approach is to construct a composite index of regulation; the most notable example is the Wharton Regulatory Index constructed in the early 1990s (Malpezzi 1996). Such indices are somewhat arbitrary in the choice and weighting of variables and may rely on subjective assessments of local planners. The third strategy does not attempt direct measures of regulation, but calculates residual land values from housing prices and construction costs, then interprets high residuals as an implicit zoning tax

(Glaeser and Gyourko 2001, 2002; Pugash, Rosen, Van Dyke and Player 2002). This method may confound the price effects of zoning with the effects of public goods, however.

Section 3 Tools of Multifamily Housing Regulation

Zoning as of Right

Zoning bylaws divide a city or town into “districts” where particular uses are allowed. If a type of development is permitted “as of right”³ in a zoning district, the municipality is obliged to issue building permits for any proposed project that meets dimensional or other requirements specified for that district. Early zoning bylaws adopted by Massachusetts communities in the 1940s and 1950s allowed most types of development by right. These early bylaws also typically adopted a pattern of “cumulative zoning” under which land uses were ranked from highest, or most desirable, to lowest. The most restrictive district would permit only the highest use (generally single-family detached), the next district would permit the next highest use and anything higher (for instance, both single-family and two-family homes), and so forth, so that the “lowest” district would permit all uses allowed in any district. Multifamily structures were generally ranked as the lowest residential use, but above non-residential uses, so development of multifamily housing was generally allowed by right in commercial districts (Pollard 1931; Grossman and Levin 1962; City of Cambridge 1924; Town of Arlington 1937; Town of Milton 1938). By right development reduces ambiguity or uncertainty for developers because the municipality has little discretion to impose additional requirements on proposed projects, such as specific building designs or project amenities.

Zoning by Special Permit

Zoning through special permits is intended to give municipalities more precise control over proposed developments. In establishing municipal authority to issue special permits for development, the Massachusetts Zoning Act states: “Special permits may be issued only for uses which are in harmony with the general purpose and intent of the ordinance or by-law, and shall be subject to general or specific provisions set forth therein; and such permits may also impose conditions, safeguards and limitations” (Massachusetts General Law Chapter 40A 1975).

³ Types of development allowed “as of right” or “by right” may simply be referred to as “permitted uses.” Uses requiring a special permit may also be called “conditional uses” or “special uses.”

Special permits are issued by a designated group, generally the Planning Board or Zoning Board of Appeals, but in a few instances the Board of Selectmen or city council function as the Special Permit Granting Authority.⁴ State law requires a supermajority vote by the appropriate board in order to grant special permits: two-thirds of boards with more than five members, at least four members of a five-member board, and a unanimous vote of three-member boards.

The use of special permits to allow multifamily housing is a fairly recent development in Massachusetts zoning. A few communities began requiring special permits in the late 1960s and early 1970s, although their authority to do so was unclear. Use of special permits expanded greatly following a 1975 revision of Massachusetts zoning enabling legislation, commonly known as Chapter 40A,⁵ which required local bylaws to provide for the issuance of special permits. Although special permits were largely envisioned as a mechanism to allow limited commercial or industrial uses, the law specified that “a zoning bylaw may allow, by special permit, multifamily residential use in a non-residential area, if the public good would be served” and left open the door to allowing multifamily by special permit in more restrictive residential districts as well (August and Mitchell 1977). Special permitting for multifamily developments has become much more widespread since the 1970s. A 1972 survey of the 101 cities and towns closest to Boston showed that nearly 44 percent of the municipalities allowed multifamily housing entirely by right, 23 percent prohibited it altogether, while only one-third had some provision for allowing it through special permit (Massachusetts Area Planning Council 1972). By 2004, a survey showed that only 17 percent of those same towns allowed multifamily housing entirely by right, 16 percent prohibited it, and two-thirds required special permits for some multifamily housing (Pioneer-Rappaport 2005).

The conditions necessary to obtain a special permit for multifamily housing vary considerably but often give the community great latitude in imposing requirements. For example, the town of Northborough allows multifamily by special permit from the Zoning Board of Appeals in its Apartment District. All multifamily dwelling units must be served by

⁴ In other parts of the country, the Zoning Board of Appeals may be called the Board of Adjustment. A Board of Selectmen is a locally elected executive body.

⁵ Local authority to enact zoning derives from an earlier version of Chapter 40A, which delegates the state’s power over zoning to municipalities, and from the Home Rule Amendment of 1966 (Barron, Frug and Su 2004). The revised law required municipalities to bring their zoning bylaws or ordinances into conformity with new provisions by June 30, 1978, and most jurisdictions undertook comprehensive revisions of their bylaws during this time (Metropolitan Area Planning Council 1980; Town of Weston 2004; Town of Lincoln 2004; City of Cambridge 1980).

municipal water and sewer, although less than 25 percent of homes in Northborough are on town sewer. The developer is required to submit a detailed site plan and statement estimating impacts on consumption of public services, notably public school attendance and utilities, change in tax revenues, increases in traffic, environmental effects, and “harmony with the character of surrounding development.” The bylaw does not establish any clear criteria for what impacts will be considered acceptable, however, and states that “The Zoning Board of Appeals shall have the right to impose any reasonable requirements it deems necessary for the good of the town.” Moreover, the Apartment District is not designated on the zoning map – the town meeting must vote to rezone a parcel of land into the Apartment District before the Zoning Board of Appeal can grant the special permit (Town of Northborough 2004).

Cluster and Planned Unit Developments

Cluster and planned unit developments are a common variant of special permitting which often allow multifamily housing. Cluster development is designed to preserve open space by granting reductions in minimum lot sizes, frontages and street widths, but requires the developer to obtain a special permit for the entire project. Planned unit developments are designed to allow a mixture of commercial and residential uses, generally within non-residential districts, and may also reduce or waive traditional dimensional requirements. Both cluster and planned unit developments include uses which are generally not allowed in the underlying zoning districts; cluster provision may allow multifamily structures in otherwise exclusively single-family districts, for example, while planned unit developments often include apartments in non-residential districts, either as free-standing structures or above ground-floor commercial uses. Provisions for cluster and planned unit developments spread rapidly following the clarification of municipal authority in the 1975 Zoning Act. In 1972 only 17 percent of municipalities in the Boston metropolitan area provided for cluster development, but by 2004 nearly 80 percent allowed cluster development and 45 percent of those allowed multifamily housing through cluster provisions (Metropolitan Area Planning Council 1972, Pioneer-Rappaport 2005).

The special permit process for cluster and planned unit developments also varies by municipality, but generally gives the city or town substantial discretion. For example, the Town of Concord allows multifamily units by special permit from the Board of Appeals, when developed in combination with single-family detached, two-family or townhouse units as part of

Planned Residential Development. In order to obtain a special permit, a developer must submit a development statement, detailed site plans, floor plans, landscape plans, and “such additional information as the Board may determine” to the Zoning Board of Appeals, the Planning Board and the Natural Resources Commission. The special permit is granted only if the proposal is “sufficiently advantageous to the Town,” and the Board “may impose such additional conditions and safeguards as public safety, welfare and convenience may require” (Town of Concord 2004). The bylaw also outlines an alternative process of obtaining the special permit, following a public hearing held by the Planning Board and an approval of the preliminary site development plan by two-thirds vote of the Town Meeting.

Dimensional and Other Requirements

Zoning regulations also establish dimensional requirements for multifamily housing, as for other types of land uses. The most common dimensional requirements in residential districts are minimum lot sizes, setbacks from streets or neighboring lots, a minimum width of frontage and limitations on building height (in non-residential districts, size is often specified as a maximum floor-to-area ratio instead of minimum lot size).⁶ Cluster or planned unit developments usually require a minimum size for the entire parcel to be developed and may require a minimum amount of open space to be set aside. The dimensional requirements for multifamily housing often attempt to enforce very low densities, more comparable to that of single-family developments. For instance, the town of Berkley requires “at least one and one-half acres (65,340 square feet) per dwelling unit,” or at least 4.5 acres for a three-unit building. Townsend sets the maximum allowable density of one dwelling unit per two acres in one district, and one unit per three acres in the other district allowing multifamily. The largest minimum lot size required is in the town of Weston, which requires 600,000 square feet, or 13.8 acres, for any multifamily structure.

⁶ In early ordinances, requirements were often only vaguely articulated. For instance, the original zoning ordinance for the City of Cambridge states that in several districts, “Yards or courts...must be somewhat larger than at present”, with the most restrictive districts requiring “considerably larger” yards (City of Cambridge 1924).

Section 4 Determinants of Multifamily Housing Regulation

Traditional “Exclusionary” Zoning

As described earlier, researchers have long hypothesized that residents exploit their zoning power to maintain economic, racial or ethnic homogeneity within their communities. If so, we would expect affluent, primarily white communities would be more likely to restrict multifamily housing to exclude lower-income households and people of color. The sample of Massachusetts towns is too racially homogenous to test the effects of racial composition on zoning (as recently as 2000, the average municipality’s population was 91 percent white, non-Hispanic). The towns do vary significantly in wealth and in the share of foreign-born residents, however, and in their proximity to poorer neighbors. Towns whose immediate neighbors are poorer or more ethnically heterogeneous may be more concerned about in-migrants than similar communities that are more insulated. The Massachusetts suburbs include a number of industrial or formerly industrial “satellite cities,” such as Lowell, Lawrence and Lynn to the north of Boston, Fall River and New Bedford to the south, and Worcester to the west, so that some affluent suburbs border on poorer, more urban neighbors (Stuart 2004).

Even if residents have no personal dislike of people dissimilar to themselves, they may fear that certain types of households and developments will impose large financial costs on their communities. One of the reasons most commonly offered for opposition to new development in general and multifamily development in particular is that it will increase the number of school-aged children without generating sufficient additional revenues to cover the cost of educating them. Property taxes are by far the largest source of local tax revenues. The tax base in many suburban cities and towns is composed almost entirely of residential property. Residents of predominantly residential towns are more likely to be concerned that new development will impose a negative financial impact in the form of reduced property values, higher taxes, reduced services, or some combination thereof, while towns with substantial non-residential property can shift at least some of the fiscal burden of new development onto commercial interests.

Reaction to Exclusionary Zoning: The “Anti-Snob Zoning Act”

In 1970, responding to court-ordered school desegregation in Boston, the Massachusetts legislature enacted a law designed to force suburban municipalities to provide more affordable

housing.⁷ The Low- and Moderate-Income Housing Act, commonly referred to as Chapter 40B or the “Anti-Snob Zoning Act,” allows developers to submit a single application for an affordable housing project to a local Zoning Board of Appeals under an expedited approval process, known as comprehensive permitting. If the comprehensive permit is denied, or granted with conditions that the developer deems would make the project infeasible, the developer may appeal to the state Housing Appeals Committee, which has the authority to override the Board’s decision and order the issuance of the permit. Towns that can demonstrate that at least 10 percent of their existing stock meets the affordability criteria⁸ are exempt from comprehensive permitting (Massachusetts Department of Housing & Community Development 2004).

It is unclear whether Chapter 40B has significantly increased the amount of multifamily housing in the suburbs. Most suburban municipalities have vehemently opposed applications for comprehensive permits, which are granted only after protracted, bitter and expensive political and legal battles. For example in Newton, a fairly urbanized and politically liberal neighbor of Boston, a local not-for-profit organization proposed in 1970 to build 500 affordable townhouses and garden apartments scattered throughout the city. Owners of abutting properties and other opponents argued that the project would attract poor (and mostly black) families displaced by Boston’s urban renewal, result in overcrowding of Newton’s schools, higher local taxes, increased traffic congestion and decreased values of neighboring properties. The application was subsequently denied by the Board of Alderman, revised to include fewer units, denied a second time, and appealed to the state Housing Appeals Committee. Eventually a compromise plan to include 50 affordable units in a luxury condominium was agreed upon – after three years, 42 public hearings and several hundred thousand dollars in planning and legal costs (Haar and Iatridis 1974).

Some observers suspect that the most important effect of Chapter 40B has been to motivate towns to preempt comprehensive permit applications by altering their zoning

⁷ In 1966, the state legislature passed a bill calling for desegregation of the Boston public schools, to be accomplished by busing students between the city’s largely black neighborhoods and white areas, mostly working class neighborhoods of Irish or Italian origin. Representatives from Boston’s affected white neighborhoods protested that suburban districts should also be required to contribute to desegregation efforts, and in 1969 pushed through the Anti-Snob Zoning Act in an effort to force suburban municipalities to create more affordable housing and thus absorb some of the minority households from urban districts (Stockman 1992).

⁸ Housing may be considered affordable if it meets one of the following conditions. Owner-occupied units must be priced to be affordable under federal or state guidelines to households earning at most 120% of area median income. In rental developments with at least 25% of units affordable to low- and moderate income households, all rental units are counted towards the total affordable stock.

regulations to allow sufficient affordable housing to reach the quota on their own terms. In particular, some towns that had previously allowed little or no multifamily housing began to allow multifamily under a special permit process after Chapter 40B came into effect.

Accommodation of Existing Stock

At the time when most Massachusetts communities adopted zoning bylaws and ordinances in the 1940s and 1950s, there was quite a bit of variation in the amount of existing housing development. The larger cities and towns, particularly those close to Boston or along the coast, already had substantial housing stocks and well-established patterns of land use. In these communities, the districts that were created on initial zoning maps generally reflected the size and composition of the existing stock of buildings. However, many of the communities had little existing stock, since a majority of their land was used for agricultural purposes or otherwise undeveloped. Therefore one would expect that communities that had already developed substantial multifamily housing before the 1940s would have allowed more multifamily as a by-right use than rural communities with very low existing densities.⁹ Since multifamily housing was often allowed in non-residential districts under cumulative zoning, one would also predict that municipalities with larger concentrations of commercial and industrial uses prior to the 1940s would have zoned more land to allow multifamily housing by right.

The Form of Municipal Government

The process of adopting and amending local ordinances differs by type of municipal government, as established in the municipality's charter of incorporation. Under Massachusetts law, proposals to change existing zoning bylaws can be made by city or town residents or by local government entities such as the Planning Board. To take effect, changes require approval by a two-thirds majority of the municipal legislative body, following a public hearing (Zimmerman 1999; Barron, Frug and Su 2004). Municipalities with at least 12,000 residents can choose to incorporate as cities and elect a city council which has sole authority to adopt or amend municipal ordinances, although the public can attend and speak at council meetings. Municipalities incorporated as towns operate under the traditional New England town meeting

⁹ There may be considerable discrepancies between the existing housing stock and current zoning; it is quite common for existing structures to be "non-conforming uses," so that if the structures were demolished identical ones could not legally be rebuilt

format, under which residents of the town vote directly on proposed changes to town bylaws.¹⁰ Towns are required to hold one annual town meeting, usually in the spring, and may also call special town meetings at other times. In recent years attendance for most towns has been fairly low, around 10 percent of the eligible population (Fiorina 1999), so a relatively small number of interested residents could form a large voting bloc. The voting system at town meetings is composed entirely of local residents, often precluding the pro-growth interests who do business but do not live in the town. This would seem to favor the interests of homeowners and thus be more restrictive of new development in general and multifamily housing in particular. By contrast, city councils should be more insulated from direct pressure from homeowners – or alternatively, may be more liable to pressure from developers, business leaders or renters – and are likely to be less restrictive of multifamily development.

Section 5 Measures of Regulation

The primary data come from the Local Housing Regulation Database, a new database of land use regulations in eastern and central Massachusetts assembled by the Pioneer Institute for Public Policy and the Rappaport Institute for Great Boston. I was responsible for coding and cleaning much of the data. The database includes 187 cities and towns, roughly within a 50-mile radius of Boston; the City of Boston was excluded because it does not operate under Chapter 40A.¹¹ The geographic coverage of the dataset is shown by the map in Figure 1. The types of municipalities include older, dense inner-ring suburbs, industrial (or formerly industrial) satellite cities, large employment centers along a high-technology corridor, affluent bedroom communities and relatively undeveloped towns on the urban fringe. More detailed information on the development of the database can be found in Appendix A.

The definition of “multifamily housing” used in the bylaws and ordinances reviewed varies considerably across municipalities. In this paper, multifamily is defined as residential structures with three or more dwelling units.¹² Many communities in our sample regard attached single-family homes or townhouses as multifamily structures for zoning purposes. Some

¹⁰ In most towns, all adults who are registered to vote can cast ballots at Town Meetings. Some towns have a Representative Town Meeting format, in which voting is limited to approximately 100-150 elected representatives.

¹¹ Although the dataset collected information on 187 towns, the city of Lowell is excluded from the analysis because in 2004, entirely new zoning districts were established and the land area of the new districts was not available.

¹² In other metropolitan areas, multifamily is often defined as five units or more. Three-unit structures are more appropriate here because “triple-deckers,” a structure with three apartments each occupying a separate floor, is a common type of construction in Massachusetts and is treated by most municipalities as multifamily.

communities also provide for multifamily housing in which at least one resident must be a minimum age, typically 55 or 60 years old. Since the motivations for allowing elderly-only multifamily are likely to be different than the motivations for family housing, districts that allow only age-restricted multifamily are excluded from this analysis.¹³ Districts are also excluded if they only allow multifamily housing through conversion of existing structures.

The database on multifamily zoning requirements by district was matched with data on the geographic area of each zoning district to construct six measures of multifamily regulation.

- The percent of total land area in the municipality zoned to allow multifamily structures, by right (#1) and by special permit (#2). This is calculated as the sum of land area for each district, i , that allows multifamily by each process divided by the total land area of the municipality.

$$PercentLand = \frac{\sum Area_i}{TownArea}$$

- Average minimum lot size required for multifamily, by right (#3) and by special permit (#4).¹⁴ The average minimum lot size for the town is calculated by multiplying the minimum lot size in each district allowing multifamily by the area of that district, summing across all districts, and dividing by the total land area of all districts allowing multifamily by each process.

$$AvgLotSize = \frac{\sum MinLotSize_i \cdot Area_i}{\sum Area_i}$$

Each of these measures only captures one dimension of the regulations, however, and so may obscure the overall impact. For instance, a community that allows multifamily by special permit on a fairly large share of land may actually not accommodate much development because it

¹³ Excluding elderly-only districts changes the measures of regulation by special permit by large magnitude for only 15 municipalities and does not significantly alter the regression results, shown in Appendix Table C3. Since elderly-only housing virtually always requires a special permit, the by-right measures and results do not change.

¹⁴ The land area requirements can be expressed in a variety of ways, including minimum lot size, lot area per dwelling unit, or parcel size for multiple structures. I have chosen to use the minimum lot size as the most commonly indicated requirement. Many bylaws list a base lot size with additional land per unit; in such cases I calculated the minimum amount of land needed to build a three-unit structure, as the smallest multifamily building.

requires an extremely large lot size. Thus a more comprehensive measure is needed to capture the interaction of the two dimensions, land share and lot size.

- Maximum number of multifamily lots that could be developed, by right (#5) and by special permit (#6). This is calculated by dividing the land area in each district allowing multifamily by the minimum lot size in that district to calculate the number of potential lots per district, then summing the number of lots across all districts.

$$NumberLots = \sum \frac{Area_i}{LotSize_i}$$

The number of lots that could be developed incorporates both the amount of land that municipalities have designated for multifamily development by each process and the required minimum lot size, and is arguably the single best indicator of the zoning policies of the cities and towns. All else equal, towns that allow multifamily housing on more land (either in a greater number of districts or in larger districts) will allow more potential lots, as will towns with smaller minimum lot sizes. One might think that the number of lots was largely determined by the land area of the community, but it is not. There is no absolute limit to the number of lots that can be developed in a municipality despite the fact that city and town boundaries are fixed (unlike those within counties that may annex unincorporated land). Even a town with relatively small land area (or one that already has a large number of existing structures) can accommodate considerable new development if it chooses to allow higher densities. For example, the Town of Douglas has a land area of 24,474 acres, on 89 percent of which multifamily is allowed by special permit. At an average minimum lot size just under two acres, 14,488 multifamily lots could potentially be developed in Douglas by special permit. The city of Worcester is a similar size, 24,562 acres, and has zoned 19 percent of its land for multifamily by special permit, with an average minimum lot size of 9,000 square feet. So Worcester could develop about 22,587 multifamily lots by special permit, roughly 50 percent more than Douglas, despite allowing special permit multifamily on a much smaller share of land.

Descriptive Statistics of Regulatory Measures

Most municipalities allowed multifamily housing on only a small share of their land in 2004, as shown in Table 1. Thirty-four communities prohibited multifamily altogether, and

another 81 allowed it on less than 10 percent of town land, although 29 municipalities allowed multifamily to be built on 80 percent or more of their land. As one might expect, communities were much more generous in the share of land zoned for multifamily if development was allowed by special permit rather than by right. Two-thirds of the municipalities had no land zoned for by-right development of multifamily housing, and no town allowed multifamily by right on more than half its land. By contrast, less than one-third of cities and towns had no land zoned for special permit, 41 allowed multifamily by special permit on more than half the land, and 15 towns allowed it on more than 90 percent of land.

The average minimum lot size for multifamily housing varied considerably, as shown in Table 2. Lot sizes were generally smaller for multifamily structures allowed by right; over three quarters of by-right multifamily housing could be built on small to medium-sized lots (under 40,000 square feet), while only seven percent of municipalities allowing by-right development required a minimum lot size of 80,000 square feet or larger. By contrast, nearly 40 percent of towns allowing multifamily by special permit required at least 40,000 square feet, while 22 percent required a minimum of 80,000 square feet. It appears that multifamily housing allowed by special permit faces the double hurdles of an uncertain and cumbersome process and high land area requirements.

The number of lots that could potentially be developed as multifamily housing also varies considerably, as shown in Table 3. In addition to towns that prohibited multifamily housing altogether, in 15 towns, fewer than 100 lots could be developed as multifamily housing. At the upper end, 23 towns could potentially build more than 10,000 lots, although many of these towns are older and essentially built out, so that redevelopment would be required to create many new structures. Fewer than 20 percent of municipalities could potentially develop 500 or more multifamily lots by right.

Do these Measures Correspond to Outcomes?

Ideally one would like to test the accuracy of the measures of regulation used in this analysis by determining whether they predict multifamily housing construction and rents. If the maximum number of lots reflects the stringency of zoning, then one would expect that towns with fewer potential lots would issue fewer permits to build multifamily housing and have higher rents. Unfortunately, such an analysis is complicated by the fact that much of the multifamily

housing built in the most restrictive Massachusetts communities appears to have been developed under the provisions of Chapter 40B. Appendix B lists municipalities that have no land zoned for multifamily housing by either process but issued multifamily permits between 1980 and 2000. Since no complete and accurate inventory of the units built under Chapter 40B is currently available, it is impossible to distinguish the effects of conventional zoning from the effects of Chapter 40B. Efforts are being made to assemble a complete inventory; future research on the effects of zoning will be possible using these data. The results presented in Tables 4 and 5 provide a preliminary indicator of the relationship between the regulatory measures used here and housing market outcomes.

Although a definitive analysis must await better data, the results in Tables 4 and 5 suggest that the measures of zoning used here do influence multifamily permits and rents. When the number of multifamily units permitted and rents¹⁵ are regressed on the number of potential multifamily lots (shown in Table 4), all the estimated coefficients have the expected signs, although only half of them are statistically different from zero. The number of multifamily permits increases with the number of lots allowed by right and monthly rents decline with an increase in the number of lots allowed by special permit. When the number of potential lots is stratified into several categories, designated by dummy variables, the results suggest that the relationship between regulatory measures and permits and rents may be non-linear (Table 5). For example, communities that allow more than 1,000 lots by right have lower average rents than towns allowing fewer than 250 lots, as one would expect. But communities that allow no multifamily by right also have lower rents than those allowing up to 250 lots. The occasionally peculiar results for communities allowing no lots may reflect the effects of Chapter 40B since those are the communities where Chapter 40B is most likely to be used. Ignoring the towns permitting no lots, multifamily permits generally increase and rents decline with the number of potential lots, although some results are only weakly significant.

Section 6 Data Sources and Empirical Strategy

Aside from the measures of regulation, which come from the Pioneer-Rappaport survey described earlier, data on municipal characteristics are drawn from the decennial census and state

¹⁵ Data on the total number of new multifamily units permitted over three periods of time, 1980-89, 1990-99, and 2000-2003, are taken from the Census Bureau's construction statistics division. Rents are the monthly contract rents reported by the decennial census in 1970, 1980, 1990 and 2000.

administrative records. A full list of the variables and their definitions, sources, means and standard deviations can be found in Tables 6 and 7.

In many cases the most direct measure of the variable of interest is not available so some proxy must be employed. Some of the data used for 1970 characteristics are not available for 1940. For example, the proxy for wealth in 1970 is the share of the town's residents that have a bachelor's or graduate degree. This variable is not available in 1940, so for that year the proxy for wealth is the average monthly rent. Ethnic heterogeneity is measured as the percent of foreign-born residents in both 1940 and 1970.¹⁶ The difference in affluence or ethnic composition between a town and its contiguous neighbors in 1940 is measured by the percent difference in rents, dummy variables indicating whether the community had a much larger or much smaller share of native-born residents, and the distance in miles to the nearest satellite city or Boston. The measure of perceived fiscal vulnerability is the ratio of jobs to population in 1940 and 1970. The density of housing stock in 1940 is used as a proxy for the amount of multifamily housing constructed prior to the adoption of zoning. The predicted share of land on which multifamily housing is allowed by right is used to identify communities that had a small share of affordable housing prior to enactment of Chapter 40B. The form of government is given by a dummy variable indicating whether communities are governed by a city council; type of government does not change over time.

Empirical Strategy

To identify the determinants of multifamily housing regulation, I use cross-sectional variation in municipal characteristics at two points in time. Since zoning bylaws adopted in the 1940s and 1950s allowed multifamily housing by right, I regress the by right measures – number of lots, share of land and average minimum lot size – on municipal characteristics as of 1940. The regressions using by right measures test the hypotheses of personal and fiscal exclusionary zoning, type of municipal government and accommodation of existing stock. A small number of municipalities adopted their first zoning bylaws prior to 1940, raising concerns that 1940 characteristics are the results of zoning rather than the determinants. However the characteristics

¹⁶ The 1970 Census indicates whether immigrants were born in Canada, Germany, Ireland or Italy. However 1970 fell between waves of immigration in Boston, so the mean share of foreign-born is 6 percent, and the mean share from any one country is under 3 percent. Thus country of origin does not offer enough variation to test for ethnic differences in this sample, nor for difference in share of foreign born with neighboring towns.

used as controls change slowly over time, and the regression results using 1940 as a baseline are robust to several tests, discussed further in Appendix C. The measures of special permit regulation are regressed on municipal characteristics as of 1970, since allowing multifamily by special permit became widespread during the 1970s. Regressions on special permit measures also test the exclusionary zoning and type of government hypotheses, as well as response to incentives created by Chapter 40B. Approximately 30 municipalities had initiated special permits for multifamily prior to 1972; for these municipalities, baseline characteristics are taken from 1960. The general forms of the regression equations on lots allowed by right and special permit are shown below.

- (1) *Number of by right lots₂₀₀₄ = f(Rent₁₉₄₀, Job-to-pop₁₉₄₀, Percent native-born₁₉₄₀, Distance to satellite city, Housing density₁₉₄₀, City council)*

- (2) *Number of special permit lots₂₀₀₄ = f(Percent BA₁₉₇₀, Job-to-pop₁₉₇₀, Percent native-born₁₉₇₀, Distance to satellite city, Predicted share by-right land₁₉₇₀, City council)*

A large number of municipalities have no land and no lots zoned for multifamily housing by each process, as shown in Tables 1 and 3. Because a town cannot zone less than zero percent of its land, or allow fewer than zero multifamily lots, the data are effectively censored at zero (and in the case of percent of land allowing special permits, upper values are censored at 100 percent). Two strategies are used to address the restricted range of values. The first is to estimate probit regressions on binary variables indicating whether municipalities allow any multifamily by right and by special permit. The second is to use tobit models rather than ordinary least squares for regressions on the continuous measures, the number of potential lots and the share of land. Coefficients from the OLS models are biased towards zero, as shown in Appendix C, so results from tobit models will be presented in Tables 8 and 9.

A final concern with the data is the possibility of spatial autocorrelation; if municipalities imitate the regulations of their neighbors, then the measures of regulation will be spatially correlated independently of the municipalities' characteristics. Spatial correlation is tested in two ways: standard errors are clustered by geographic region and an OLS regression using a spatial weights matrix is estimated to correct for spatial autocorrelation (Conley 1999). Neither clustering nor including spatial weights significantly alter the standard errors, as shown in Appendix C, so these techniques are not used in the main regressions presented.

Section 7 Regression Results

Determinants of by-right Regulation

The regressions suggest that by-right regulation of multifamily housing is a function of historical composition of the housing stock, the type of municipal government and market pressures on land values. There is very little evidence in support of the exclusionary zoning hypothesis on the by-right measures. Table 8 presents regression results from eight specifications using four measures of by-right regulation as dependent variables. Columns 1-3 are probit regressions on the binary outcome, whether any multifamily housing is allowed by right in the community. Columns 4-6 show results of tobit models on the number of multifamily lots that could be developed by right. As a robustness check on the number of lots, Columns 7 and 8 show results of the two intermediate measures; Column 7 presents results of a tobit model on the percent of land allowing multifamily housing by right and Column 8 shows OLS regression results on the average minimum lot size required.

Communities that had highly dense housing prior to the adoption of zoning (suggesting that a significant amount of multifamily housing had already been developed) are more likely to allow multifamily housing by right and allow a larger number of potential lots. The results of the probit models in Columns 2 and 3 show that the probability of allowing some by-right multifamily housing increases with the number of housing units per acre of land in 1940, controlling for other municipal characteristics. Higher density is also associated with an increase in the number of multifamily lots allowed by right, shown in Columns 5 and 6. The median density of towns that allow any by-right development is approximately 0.33, or one housing unit per three acres of land. The estimated coefficients in Columns 5 and 6 imply that an increase in density to 0.5, or one unit per two acres of land, is associated with an increase of about 120-130 lots zoned for by-right multifamily (about 16% of the mean number of lots allowed). The positive correlation between historical density and by right-measures probably results in large part from a tendency to draw the initial zoning districts to accommodate the existing stock. Although municipalities were not technically constrained to follow pre-existing land use patterns – they could have chosen to make existing structures non-conforming uses – it is not surprising that early regulations would reflect what had already been built.

The results in Table 8 also suggest that communities governed by city councils are less restrictive of multifamily housing than those led by town meetings. On average, city councils

allowed approximately 1,300-1,500 more lots for by-right multifamily housing than town meetings, according to the results in Columns 5 and 6 (the estimate in Column 6 is only weakly significant). For the coefficients on council to be interpreted as causal, we should be careful to control for possible differences between cities and towns that may have an independent effect on regulations. The cities in the sample are smaller, satellite cities, not central cities, so the differences between types of communities are not as large as one might expect. In addition, the specifications shown in Columns 5 and 6 control for several characteristics on which cities and towns are likely to differ and which we would expect to affect restrictiveness: population size and density, a proxy for income (rent), demographics, and size of commercial base.¹⁷ It does not appear that population size or characteristics affect the stringency of by-right regulations; none of the coefficients on those variables are statistically different from zero.

The results offer little evidence that exclusionary zoning played a role in by-right regulation of multifamily housing. Higher income communities were no less likely to allow multifamily housing by right, shown by the statistically insignificant coefficient on rent in the probit models, Columns 1-3. Nor is income a significant predictor of the number of by-right multifamily lots allowed, shown in Columns 4-6. In fact, the coefficient on the proxy for income is positive in all specifications on the probability of allowing multifamily and the number of lots allowed, exactly the reverse of the expected sign if exclusionary zoning were driving restrictiveness. The coefficients on other possible indicators of exclusionary behavior – share of native-born population, differences in income and nativity with neighboring towns – are also statistically indistinguishable from zero in all specifications. The results offer no indication of fiscally motivated exclusion, either; the coefficient estimates on the ratio of jobs to population are also insignificant.

The final two columns of Table 8 offer a robustness check on the number of lots allowed; since the number of lots reflects both the amount of land zoned for multifamily and the minimum lot size, one would expect that influences on the composite measure of regulation will also be evident in the individual measures. Indeed, higher housing density is associated with a larger share of land zoned for by-right multifamily housing, shown in Column 7. The results do not show significant differences between city councils and town meetings on either the share of land

¹⁷ In addition to including the log of population, these regressions exclude cities over 100,000, since very large cities may differ from towns in unobservable ways that affect regulation. Only three cities were larger than 100,000 in 1940: Cambridge, Somerville and Worcester.

(Column 7) or the minimum lot size (Column 8). However, the interaction of an insignificantly higher share of land and smaller lot size collectively results in a significantly larger number of lots (Columns 5 and 6). Surprisingly, the results on minimum lot size imply that by-right zoning tried to accommodate market pressures on land values. Communities with higher monthly rents and higher job-to-population ratios tend to allow smaller lot sizes; higher rents and relatively more commercial activity should indicate higher land values. Neither of these determinants have a significant impact on the number of lots, however.

One possible threat to a causal interpretation of the effect of housing density on regulation is that density in 1940 might be endogenous, specifically that exclusionary behavior of wealthy communities prior to the adoption of zoning might have limited housing density. However, the relationship between wealth and density in 1940 is the inverse of our expectations, as shown in Table 9. Cities and towns in the highest rent quintile in 1940 had highly dense housing stocks, one unit per 1.1 acres, while the least expensive towns were very low density, about one housing unit per 17 acres – modest agricultural communities rather than wealthy suburbs. Thus wealth did not appear to have constrained housing density prior to the adoption of zoning. The relationship between income and density has changed over time; by 1970, there are no longer significant differences in density between the richest and poorest towns.

Similarly, if the adoption of a city council form of government reflected systematic underlying differences in communities that could directly impact zoning stringency, then the coefficient on type of government could not be interpreted as causal. Nearly all the communities that incorporated as cities did so between 1850 and 1900 following rapid industrialization due to specific locational advantages. Many towns harnessed their rivers to provide power for textile mills, leather tanning and shoe manufacturing, while others exploited natural harbors to develop shipbuilding and trade. However, the locational advantages that drove early industrialization in the 19th century diminished during the 20th century, particularly with the decreased cost of producing electric power, and most of Massachusetts' original industries had experienced significant declines prior to World War II. Thus although the initial adoption of city councils was non-random, the causes for the type of government no longer drove employment or population growth 50 to 100 years later when zoning bylaws were adopted. Indeed, population size and characteristics of cities and towns have been converging during the 20th century.

Results on Special Permit Measures

The regression results on special permit regulation of multifamily housing differ greatly from the results on by right regulation in that they offer considerable support for the exclusionary zoning hypothesis. In addition, special permit regulations reflect the incentives created by Chapter 40B and an effect of population size. Table 10 presents regression results from six specifications using four measures of special permit regulations as dependent variables.

Columns 1 and 2 are probit regressions on the binary outcome, whether any multifamily housing is allowed by special permit in the community. Columns 3 and 4 show results of tobit models on the number of multifamily lots that could be developed special permit. Columns 5 and 6 show results of the two intermediate measures as a robustness check on the number of lots; Column 5 presents results of a tobit model on the percent of land allowing multifamily housing by special permit and Column 6 shows OLS regression results on the average minimum lot size required.

The analysis of special permit regulations supports the exclusionary zoning hypothesis: communities with wealthier residents tend to be more restrictive of multifamily housing, as shown in Table 10. Towns with more highly educated residents are less likely to allow any multifamily housing by special permit, according to the results of the probit models shown in Columns 1 and 2. In addition, the number of multifamily lots allowed by special permit decreases with the share of residents holding college or graduate degrees, controlling for other municipal characteristics; a one percentage-point increase in the population share with college and graduate degrees is associated with a decrease of about 200 multifamily lots, according to the estimates in Columns 3 and 4. The share of native-born residents does not appear to have an impact on zoning stringency, although this may reflect the low overall levels of immigrants in 1970, as discussed earlier. There is no evidence of fiscally-motivated exclusion: the coefficients on relative size of the commercial base are not statistically different from zero.

The results also suggest that municipalities with little affordable housing prior to the passage of Chapter 40B may have responded to the legislation by allowing more multifamily by special permit. Communities that allowed little multifamily housing by right are more likely to allow some by special permit, according to results of the probit regression shown in Column 2.¹⁸ In addition, the smaller the predicted share of land on which multifamily was allowed by-right,

¹⁸ Because the share of land zoned for by-right multifamily in 2004 may differ from the share of land in 1970, I predict the share of land as a function of 1940 characteristics, using the specification shown in Table 8, Column 7.

the more lots are allowed by special permit, as shown in Column 4. Since a lack of land where multifamily housing is allowed by right probably indicates a small stock of affordable housing, these results support the hypothesis that the threat of Chapter 40B encouraged relaxation of restrictions on multifamily.

Unlike the results on by-right regulation, results in Table 10 suggest that population size affects the stringency of special permit regulation. Communities with a larger population are more likely to allow some multifamily housing by special permit, controlling for other variables, according to the results of the probit regression shown in Column 2. This may reflect the desire of small communities to retain their rural character.

Columns 5 and 6 of Table 10 show the results of regressions on the share of land zoned for multifamily by special permit and on average minimum lot size as a robustness check on the number of lots allowed. The exclusionary effect of wealth is apparent in the results on share of land, shown in Column 5; an increase in the share of population with higher degrees is associated with a decrease in the share of land allowing multifamily by special permit. The predicted share of by-right land does not have a significant effect on either of the intermediate measures, so the significant coefficient on the number of lots results from the interaction of weak effects in the expected direction on both the share of land and the minimum lot size.

Section 8 Conclusions

Regulation of multifamily housing in Massachusetts reflects two distinct waves of zoning that occurred during the twentieth century, each of which allowed multifamily housing through a different mechanism and was influenced by different determinants. When zoning was first widely adopted in the 1940s and 1950s, multifamily housing was either allowed as of right or prohibited altogether. The amount of by right multifamily allowed seems to have codified the existing housing stock, while minimum lot sizes reflected market pressures on land values. Communities governed by city councils were less restrictive of multifamily housing than those run by town meetings, allowing more potential multifamily lots. The results provide little evidence that personal or fiscal exclusion affected the by-right regulation of multifamily housing.

The second wave of zoning resulted in widespread adoption of a new mechanism – special permits – that gave municipalities more precise control over a form of development that was unfavorably regarded. Towns that allowed little or no multifamily housing by right were

more likely to allow it by special permit and allowed more potential lots by special permit, perhaps reflecting pressure from state legislation to provide more affordable housing. Given the complexity and discretion of the special permit process, the amount of land or number of lots where special permits are allowed may not be a very accurate indicator of whether a municipality truly wishes to accommodate more multifamily housing. Nevertheless, wealthier communities are less likely to allow multifamily housing by special permit and allow fewer potential lots.

Massachusetts cities and towns have several unusual characteristics that may require generalization before the results of this paper could be extrapolated to other locations. In the first place, the practice of requiring special permits for multifamily housing is less common in the rest of the country. However other procedural barriers to development, such as site plan review, should be taken into consideration. Second, the town meeting form of municipal government is peculiar to New England. Nonetheless, the general question of how the type of government and regulatory adoption process affects the balance of power between pro-growth or limited growth interests, or between homeowners, renters and business groups, can be applied to other geographic regions. For instance, regulatory outcomes that must be approved by elected officials could be compared to those approved by civil servants. Third, the degree of racial and ethnic homogeneity in Massachusetts (particularly in the time period examined) limited the ability to test for racial bias in restrictiveness; this study should not be taken as proof that race plays no role in exclusionary zoning, particularly given the extent of prior research on racial discrimination in housing markets. Fourth, it is not surprising that the historical composition of housing stock plays a large role in original zoning regulations in Massachusetts, since many communities were substantially developed long before land use regulations became common. In metropolitan areas that were more recently developed, or where municipal boundaries are still fluctuating due to annexation of land, the historical composition of stock may be less important. Finally, the fragmentation of political authority across a large number of small municipalities in Massachusetts may encourage NIMBYism, relative to more consolidated areas. Each small town can easily refuse to develop affordable housing without considering the impact on regional housing and labor markets, while in metropolitan areas with a few counties each jurisdiction may be forced to view its own behavior in a broader context.

The analysis presented in this paper illustrates the complexity of zoning regulations – and the importance of constructing measures of regulation that can capture at least some of the

complexities. Zoning is a subtle and nuanced tool; types of development that appear at first glance to be allowed may effectively be prevented by the details. The unusual richness of the dataset used in this paper offers opportunities for more finely tuned analysis of the causes and effects of regulation than previous data have allowed. Future research using these data will attempt to identify what characteristics of multifamily housing regulation make development more difficult or expensive, to understand how regulations affect housing market outcomes.

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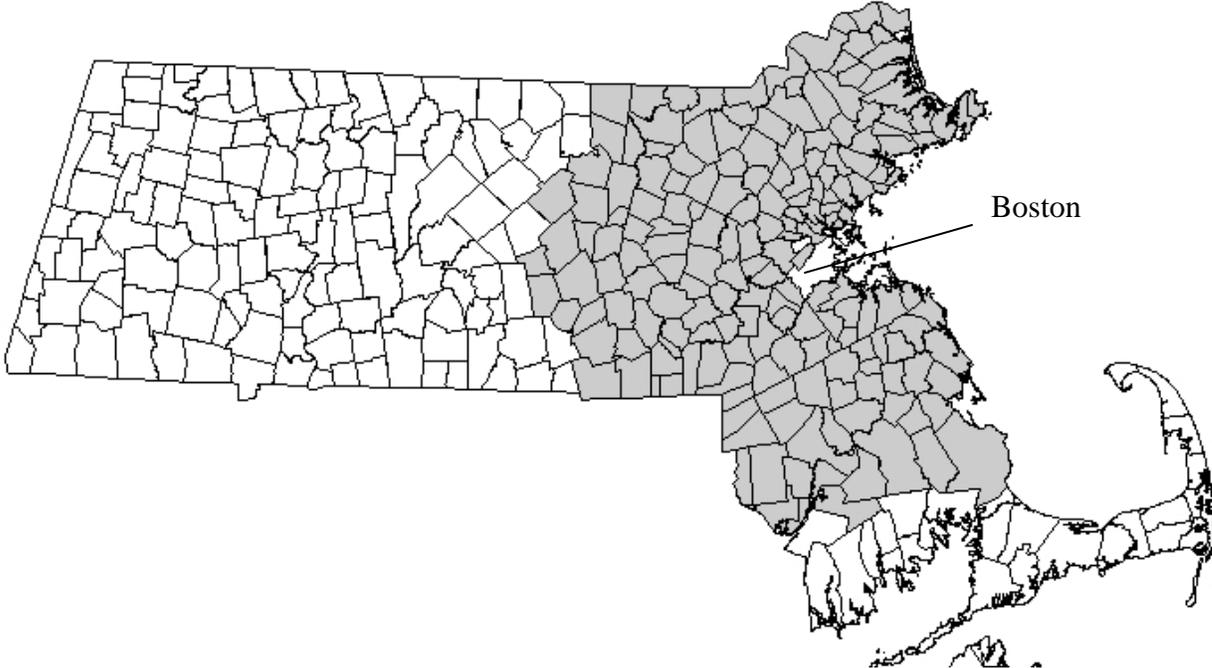
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Figure 1: Coverage of Land Use Regulation Database



Source: Local Housing Regulation Database

Table 1: Land Area Allowing Multifamily Housing

Pct of land area	Number/percent of municipalities					
	By right		By special permit		By either process	
None	127	68%	60	32%	34	18%
<10%	47	25%	65	35%	81	44%
11-20%	6	3%	13	7%	15	8%
21-50%	6	3%	7	4%	14	8%
51-80%	0	0%	14	8%	13	7%
81-90%	0	0%	12	7%	13	7%
91-100%	0	0%	15	8%	16	9%
Total	186	100%	186	100%	186	100%

Note: Columns may not sum to 100 due to rounding.

Table 2: Distribution of Average Multifamily Minimum Lot Sizes

Lot size (square feet)	Number/Percent of municipalities			
	By right		By SP	
Under 10,000	10	17%	17	13%
10-20,000	23	39%	30	24%
20-40,000	12	20%	32	25%
40-80,000	10	17%	19	15%
80,000 +	4	7%	28	22%
Total	59	100%	126	100%

Note: If multifamily is not permitted by a particular process, then no minimum lot size is defined. Municipalities may specify different lot sizes for each process, if both are allowed.

Table 3: Number of Potential Multifamily Lots by Process

Number of lots	Number/Percent of municipalities					
	By right		By special permit		By either process	
0	127	68%	61	33%	35	19%
1-100	8	4	11	6	15	8
101-500	21	11	21	11	24	13
501-1000	10	5	15	8	18	10
1001-2500	9	5	24	13	29	16
2501-5000	6	3	19	10	24	13
5001-10,000	2	1	14	8	18	10
10,000+	3	2	21	11	23	12
Total	186	100%	186	100%	186	100%

Note: Column 5 is not a summation of Columns 1 and 3. A municipality could allow 400 lots by right and 1000 lots by special permit, totaling 1400 lots by either process.

Table 4: Linear Relationship between Number of Multifamily Lots, Permits and Rents

Dependent variable:	Multifamily permits	Monthly rents	Multifamily permits	Monthly rents
Variable:	(1)	(2)	(3)	(4)
Number of by-right lots	0.065** (0.030)	-0.001 (0.003)		
Number of special permit lots			0.006 (0.004)	-0.005*** (0.001)
Constant	237*** (27)	470*** (9.7)	270*** (34.7)	486*** (10.2)
Time fixed effects	Yes	Yes	Yes	Yes
Observations	555	739	558	743
R-squared	0.24	0.52	0.11	0.55

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Non-linear Relationship between Number of Multifamily Lots, Permits & Rents

Dependent variable:	Multifamily permits	Monthly rents	Multifamily permits	Monthly rents
Variable:	(1)	(2)	(3)	(4)
No by-right lots		-64.6** (28.2)		
1-250 by-right lots	79.1** (39.4)			
251-1000 by-right lots	97.9*** (36.8)	-37.8 (32.7)		
1000+ by-right lots	362.9*** (95.3)	-74.6** (33.7)		
1-500 special permit lots			43.9 (29.7)	40.4 (30.4)
501-2000 special permit lots			111.3*** (37.7)	-8.4 (22.3)
2-10,000 special permit lots			92.6* (52.3)	-49.5** (24.6)
10,000+ special permit lots			156.3* (87.3)	-94.1*** (21.6)
Constant	214*** (24.6)	525*** (26.2)	227.4*** (33.7)	484.4*** (16.1)
Observations	555	739	558	743
R-squared	0.24	0.53	0.12	0.56

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: Tables 4 and 5 present estimates from OLS regressions on panel data of 186 cities and towns in three time periods for permits (total permits are aggregated by decade, 1980-89, 1990-99, and 2000-2003), and four years for rents (1970, 1980, 1990 and 2000).

Table 6: Variables Sources and Notes

Variable	Notes/sources
Rent, 1940	Monthly contract rent for rental units and imputed monthly rent for owner-occupied units, in constant 2000 dollars. Data unavailable on income, years of education completed, occupation, other measures of wealth for towns with population under 10,000. Source: Census of Housing, 1940
Pct BA plus, 1970	Share of population with BA or higher. 1960 values used for towns that adopted SP for MF before 1970. Source: Census of Population, 1960 and 1970
Pct native-born	Source: Census of population, 1940, 1960, 1970
Distance, satellite city	Distance in miles to nearest satellite city. Calculated using lat-long coordinates from centroid of city/town. Cities are Boston, Worcester, Lowell, Lawrence, Lynn, Fall River and Attleborough. Source: Census of population, 2000
Pct diff, neighbors' rent	Percentage difference between mean rent in municipality and neighboring municipalities, defined as those within 7 miles (approximates contiguous neighbors). Excludes neighboring municipalities across state borders in New Hampshire and Rhode Island. Source: Census of Housing, 1940
Less/more native-born than neighbors	Dummy variables indicating that municipality has 5 percentage points less or more foreign-born residents than neighboring municipalities. Sources: Census of population, 1940, 1960, 1970
Jobs-to-pop ratio	Sources: Jobs per town from annual employer survey conducted by Mass Division of Employment and Training, ES-202 (data available beginning in 1940). Population from census (1940, 1960, 1970).
City council	Dummy variable. Forms of government have not changed since 1920s Source: Community profiles, Mass Dept of Housing and Community Development
Housing density	Number of housing units divided by town area (acres). Source: Census of population, 1920 and 1930. Census of housing, 1940
Population	Source: Census of population (1940, 1960, 1970)

Table 7: Variable Means and Standard Deviations

Variable	Mean	Std. Dev.
Number of by-right lots	746	3587
Percent of land by right	2.34	7.24
Average lot size, by right	31,781	40,429
Number of special permit lots	3,448	6,695
Percent of land by SP	21.26	33.53
Average lot size, by SP	54,493	76,737
Housing density, 1940	0.60	1.34
City council	0.16	0.37
Rent, 1940	\$389	\$168
Percent BA or more, 1970	14.45	9.69
Percent difference, neighbors' rent, 1940	-7.73	31.70
Percent native-born, 1940	15.75	4.51
Less native-born than neighbors, 1940	0.20	0.40
More foreign-born than neighbors, 1940	0.10	0.30
Percent native-born, 1970	93.87	3.05
Job-to-population ratio, 1940	0.17	0.21
Job-to-population ratio, 1970	0.19	0.14
Town area, acres	11,677	7,507
Population, 1940	12,868	23,084
Population, 1970	19,292	22,619
Distance to nearest satellite city	14.64	7.46
N = 186		

Table 8: Determinants of By-Right Multifamily Zoning

Dependent variable: (Estimator)	Any by-right allowed (Probit: dF/dx)			Number of by-right lots (Tobit)			Pct land by right (Tobit)	Avg lot size (OLS)
Variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rent, 1940	0.0003 (0.0002)	0.0003 (0.0002)	0.0001 (0.0003)	4.36 (3.86)	0.48 (1.24)	1.12 (1.42)	0.000 (0.005)	-43.72** (18.01)
Pct native-born, 1940		-0.003 (0.009)	0.002 (0.012)		-20.59 (52.21)	9.63 (65.91)	-0.07 (0.22)	973 (1,214)
Job-to-pop ratio, 1940		0.133 (0.171)	0.143 (0.167)		1,081 (955)	1,135 (937)	2.56 (4.13)	-29,643** (14,763)
Distance, satellite city		0.007 (0.005)			41.84 (29.51)		0.20* (0.12)	-685 (926)
Housing density, 1940		0.132** (0.060)	0.129** (0.062)		748*** (229)	703*** (230)	5.88*** (0.96)	-969 (2,986)
City council		0.128 (0.147)	0.085 (0.146)		1,497** (717)	1,299* (725)	4.79 (3.02)	-9,948 (16,665)
Log(population), 1940		0.029 (0.051)	0.038 (0.051)		214 (275)	255 (278)	-0.61 (1.13)	-5,923 (5,758)
Pct difference, neighbors' rent, 1940			-0.001 (0.001)			-9.11 (7.43)		
Less native-born than neighbors, 1940			-0.049 (0.135)			-203 (779)		
More native-born than neighbors, 1940			-0.141 (0.091)			-742 (632)		
Observations	186	183	183	186	183	183	183	56
R-squared	0.008	0.125	0.134	0.001	0.049	0.050	0.122	0.23

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: Columns 1-3 are probit models on the binary outcome, whether any multifamily housing is allowed by right. Columns 4-6 are tobit models on the number of by-right lots, Column 7 is a tobit model on the share of land zoned for by-right multifamily. Column 8 is an OLS model on the average minimum lot size (in square feet). Coefficients are directly interpretable as marginal effects.

Table 9: Changes in the Relationship between Rent and Housing Density, 1940-1970

	Highest rent quintile	Lowest rent quintile	Difference
Monthly rent, 1940	665	229	436***
Housing density, 1940	0.897	0.057	0.840***
Number of by right lots	240	72	169
Percent of land, by right	1.55	0.334	1.21*
Avg min lot size, by right	25,445	45,023	-19,578
N = 36			
Monthly rent, 1970	656	310	347***
Percent BA plus, 1970	28.40	6.77	21.63***
Housing density, 1970	1.080	0.677	0.403
Number of special permit lots	1654	7402	-5747***
Percent of land, special permit	11.71	35.49	-23.79***
Avg min lot size, special permit	76,982	52,364	24,618
N = 37			

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 10: Determinants of Special Permit Multifamily Zoning

Dependent variable: (Estimator)	Any special permit (probit: dF/dx)		Number of special permit lots (tobit)		Percent land, special permit (tobit)	Avg lot size (OLS)
	(1)	(2)	(3)	(4)	(5)	(6)
Percent BA plus, 1970	-0.009** (0.004)	-0.009** (0.004)	-203.1*** (72.9)	-214*** (74)	-1.24*** (0.40)	2,500 (1,987)
Percent native-born, 1970		-0.009 (0.017)		-480 (294)	-1.08 (1.61)	2,725 (1,855)
Job-to-pop ratio, 1970		-0.026 (0.299)		-4,553 (5,401)	-13.06 (29.70)	-7,315 (32,011)
Distance, satellite city		-0.001 (0.005)		-39.51 (87.53)	-0.115 (0.482)	1,141 (700)
City council		0.108 (0.144)		2,974 (2,392)	3.24 (13.18)	18,539 (17,186)
Percent by-right land, predicted		-0.026** (0.010)		-557*** (193)	-1.44 (0.99)	1,132 (999)
Log(pop), 1970		0.132** (0.052)		1,235 (973)	-1.05 (5.30)	-27,257*** (9,189)
Observations	186	184	186	184	184	124
R-squared	0.026	0.099	0.003	0.009	0.009	0.19

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: Columns 1 and 2 are probit models on the binary outcome, whether any multifamily housing is allowed by special permit. Columns 3 and 4 are tobit models on the number of special permit lots, Column 5 is a tobit model on the share of land zoned for multifamily by special permit. Column 6 is an OLS model on the average minimum lot size (in square feet). Coefficients are directly interpretable as marginal effects.

Appendix A: Methodology for Local Housing Regulation Database development

Project Background

The Local Housing Regulation Database is a unique research tool that documents the regulatory practices of all communities within the greater Boston metropolitan area in order to enable systematic comparisons of local regulations for a majority of Massachusetts' cities and towns. The database was developed through a partnership between two organizations, the Pioneer Institute for Public Policy Research and the Rappaport Institute for Greater Boston. The Pioneer Institute is an independent non-profit public policy research institute based in Boston. The Rappaport Institute is a Harvard-affiliated institute that sponsors research and public service activities on policy issues of relevance to the Great Boston area. The two organizations partnered in 2003 to produce a policy study titled "Getting Home: Overcoming Barriers to Housing in Greater Boston" that explores the role of regulation in the Massachusetts housing market. The Local Housing Regulation Database study grew out of that undertaking.

The data obtained through the study is intended to be useful to two different types of consumers, and thus two different versions of the database were created. Academics and other researchers who perform quantitative analysis require data to be in the form of concise numeric or categorical variables that can be used with statistical software. The senior researcher, Jenny Schuetz, developed the data table version intended for quantitative analysis. It was also anticipated that qualitative researchers, advocacy groups or private citizens might wish to have access to the text of the regulations that were relevant to particular questions. The project manager, Amy Dain, developed the full text version of the database, which contains short answers to a smaller number of questions and sections of text from the regulations.

The following table shows an overview of project phases, described in greater detail below.

Project phase	Dates	Staff responsible
Survey development	January-May 2004	Project manager; advisors
Data collection	June 2004-January 2005	Project manager, researchers
Data coding and cleaning	October 2004-June 2005	Project manager, senior researcher
Verification & final revisions	March-June 2005	Project manager, senior researcher

The database covers a total of 187 cities and towns, all municipalities in Massachusetts within 50 miles of Boston. The coverage does not correspond to OMB definitions of the metropolitan statistical area, or other regional definitions; rather, it extends beyond the Boston MSA into communities that only recently have begun facing development pressures. Massachusetts has 351 cities and towns; this sample represents over half of them. The City of Boston was not included in the study because it does not operate under the state zoning enabling legislation.

Development of Survey Questions

Two broad criteria were established to select regulations to track: (1) Is the regulation perceived to have an impact on housing development and (2) Could the regulation be tracked across municipalities and measured objectively? The study looked at a range of residential land-use regulations including zoning, subdivision, wetlands, and on-site sewage disposal (septic) regulations. The study did not examine regulations related to commercial, industrial or recreational land uses.

The project manager developed the research questions iteratively, soliciting suggestions and reviewing the questions with experts in issues of residential permitting. The project manager conducted a literature review to establish the preliminary list of questions. The list was then refined through a series of four meetings with an advisory committee, which included several residential developers and builders, civil engineers, and a wetlands scientist. The project manager also solicited input on the draft questions from a range of organizations, including the Massachusetts Association of Homebuilders, Massachusetts Association of Conservation Commissions and Citizens Housing and Planning Association, and experts on land use law.

The four types of regulations captured in the database are zoning, subdivision, wetlands, and septic. Each municipality has its own local zoning bylaw or ordinance, which must be approved by the town meeting or city council. Nearly all municipalities have subdivision regulations adopted by planning boards that govern the design and construction of roads and other infrastructure. The few communities that do not have subdivision regulations are inner-ring suburbs, such as Cambridge and Brookline, which are not adding any new roads. Seventy percent of the municipalities studied have local wetlands regulations adopted by Conservation Commissions that go beyond the standards set by the state Wetlands Protection Act. Nearly

sixty percent have local septic regulations adopted by the Board of Health that go beyond the state’s regulations. The table below shows the number of municipalities with each type of regulation and the number of variables coded for each section in the data table version.

Regulation type	Variables	Municipalities
Zoning	64	187
Subdivision	14	181
Wetlands	21	131
Septics/Sewer	20	109

Data on minimum lot sizes and other standard dimensional requirements were not collected as part of the study. Mass GIS, the Office of Geographic and Environmental Information within the state Executive Office of Environmental Affairs, conducted a survey of dimensional requirements in zoning bylaws for all 351 cities and towns in 1999-2000 and assembled a database of these regulations that is publicly available. Therefore the Pioneer-Rappaport study did not duplicate these efforts.

Data Collection

The project manager and twelve research assistants conducted primary data collection. Prior to data collection, the project manager provided an extensive training for the research assistants on the regulatory issues and research methodology. Researchers obtained the regulations from a variety of different sources. When possible, researchers downloaded regulations from the municipalities’ websites. Zoning and subdivision regulations that were not available on websites were downloaded from a commercial firm, Ordinance.com, which provides local regulations for several states on a subscription basis. In cases where wetlands and septic regulations were not available on the municipal websites, researchers called the conservation commission, board of health or municipal clerk to obtain a copy. As not every municipality has wetlands, septic and subdivision regulations, researchers called or emailed municipal staff to determine whether the regulations existed.

Once regulations had been obtained, researchers reviewed the documents and recorded answers to the survey questions in a Microsoft Access database. If answers could not be determined from the regulations, researchers called or emailed the relevant municipal officials. For each question, researchers recorded a short answer (generally either “Yes” or “No” or a

single number, but occasionally longer text answers). The database also included a “Notes” field for each question into which the researchers copied and pasted lengthy sections of the regulations, emails from staff or summaries of phone conversations. The “Notes” sections were often several pages per question per town. The manager reviewed all data entries on a daily basis to ensure completeness and consistency across the research team.

Data Coding, Cleaning and Verification

Several types of changes were made to the database during the coding and cleaning phase. The senior researcher recoded some of the short answers, coded additional variables for the data table version, and developed a codebook to accompany the dataset. Both the project manager and senior researcher identified variables with incomplete or ambiguous data; gaps and questions were re-checked by reviewing bylaws and/or communicating with municipal staff. Answers in the data table version of the database are consistent with the short answers in the full text version, unless specifically noted otherwise.

For a number of variables, the senior researcher recoded the short answers to ensure that variables used consistent definitions and assumptions across all municipalities. For example, one survey question asked, “What is the width of pavement on a “typical” subdivision road?” Most municipalities define different road widths for different categories of roads, intended to serve different numbers of houses and automobile trips. Thus the initial widths recorded in the short answer to this question did not reflect widths of comparable streets; some were coded for “Lanes” with 4-6 houses, others for “Minor Roads” intended to serve up to 30 houses. The senior researcher created a new variable that identified the name of the road category intended to serve 10-30 houses, or the nearest equivalent, and recoded the short answer to correspond to that road type.

The senior researcher also coded additional variables from the text of the regulations to capture descriptive details. Many of the original survey questions were quite broad, while the text of the regulations included in the “Notes” field contained significant qualitative and quantitative differences in regulations across municipalities. For example, one survey question asked, “Is cluster/flexible development allowed by special permit anywhere in the municipality?” and researchers recorded “Yes” or “No.” However, specific details of the cluster provisions are likely to affect the feasibility or attractiveness to developers of using the provisions, such as the

minimum parcel size required and whether more housing units can be developed under cluster than under conventional subdivision standards. The senior researcher coded new variables from the “Notes” field for several of the original survey questions, notably on multi-family zoning, cluster development, inclusionary zoning, and growth management, as well as the dates various provisions were adopted or most recently amended (see notes below on timing of changes). All variable definitions and clarifying assumptions used to create consistency were documented by the senior researcher in the codebook that accompanies the dataset. The codebook also lists the survey question on which the variable is based, the type of variable (numeric or text), and information on interpreting the coded values (i.e category names and units of measurement). Definitions and clarifying assumptions are also documented in the full text version of the database.

Following data coding and cleaning, the project manager sent the short answers for 70 percent of the variables to planning departments, conservation commissions and health departments for verification. At least one department from 110 of the 187 municipalities returned the verification survey. Some of the questions and answers were excluded from the verification surveys to make review easier for municipal staff and to avoid confusion. For example, many municipalities have several types of cluster development with varying dimensional requirements. To avoid confusion, municipal staff were not asked to verify data coded from multiple cluster provisions, but were asked to verify that cluster provisions existed. Enough questions/answers were included for each issue tracked to catch any “red-flags” in the researchers’ coding and interpretation. The project manager and senior researcher revised the data to incorporate municipal comments and corrections, where appropriate.

Additional Notes and Comments

The database presents a snapshot of regulations that were on the books at the time of data collection (summer and fall of 2004). Regulations are cumulative documents – provisions are added, deleted or revised frequently, but even in instances when a new bylaw is adopted, it is rare for all the provisions to differ substantially from the previous version. Particularly because of the durable nature of buildings, the most basic elements of zoning bylaws – the districts established on the zoning map – may remain generally the same for long periods of time. In a few cases, towns amended their regulations during the period of data collection, so researchers

had to revise earlier data entries to reflect changes. When possible, the database documents the year in which each provision of interest was originally adopted and most recently amended.

What is actually built may vary from what appears to be allowed “on the books” for several reasons. First, variances can be granted that waive certain regulations for specific projects. Second, what is listed as “allowed” may be made infeasible by the details of the regulations, as appeared to be the case for some types of multi-family housing and cluster development. Third, some municipalities enforce “policies” that have not been formally promulgated, and thus are hard to track by researchers. For example, several conservation commissions enforce building setbacks from wetlands that are not codified in the local wetlands bylaw/ordinance. Fourth, outdated regulations that are still on the books may not be enforced. Staff at several health departments said that they do not enforce outdated regulations of septic systems. Finally, regulations are often vague or ambiguous, so interpretation of the same written language can vary across municipalities. For instance, conservation commissions varied in their interpretation of the width of jurisdiction from the mean annual water line of vernal pools; based on virtually identical language, some municipalities claimed 200 feet of jurisdiction, while others enforced only 100 feet. The database is coded according to the official or “on the books” regulations.

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Associated Industries of Massachusetts

Counselors of Real Estate

Homebuilders Association of Massachusetts

Massachusetts Association of Realtors

Massachusetts Business Roundtable

Massachusetts Lumber Retailers' Association

National Association of Industrial and Office Properties

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Additional notes on Mass GIS Database

To construct the measures of regulation, the senior researcher matched the district-level regulations to the Mass GIS database, which includes the land area of each district shown on municipal zoning maps. Not all districts in the Local Housing Regulation (LHR) Database could be matched to the Mass GIS database. The LHR database tracks multifamily that is allowed in both regular and overlay zoning districts, while land area is only available for regular districts defined on the zoning map. Where possible, the senior researcher coded regulations for underlying districts, but some bylaws do not clearly describe the location of overlay districts. Also, some multifamily districts must be rezoned by a vote of Town Meeting, so there is no fixed land area for these districts. Finally, some cities or towns created new districts after the GIS data was collected in 1999-2000. Missing data could potentially have a large impact on only a few towns, so the matching problems are unlikely to have a significant impact on the analysis.

Appendix B: Multifamily Permits in Towns that Prohibit Multifamily

City/town	MF permits, 1980-89	MF permits, 1990-99	MF permits, 2000-03	Multifamily units, 2000 stock
BERLIN	0	0	8	58
BILLERICA	6	64	336	1631
BOYLSTON	0	24	0	193
BRIDGEWATER	0	3	0	1652
CARLISLE	18	0	0	18
COHASSET	3	0	0	245
DIGHTON	0	6	0	166
HANOVER	270	0	0	345
HOPEDALE	26	68	0	340
LAKEVILLE	86	0	0	109
LITTLETON	119	0	0	243
LUNENBURG	0	4	10	98
LYNNFIELD	114	6	0	412
MARSHFIELD	30	48	0	1060
MEDWAY	6	26	35	454
MIDDLEBOROUGH	7	16	0	1169
MILTON	40	177	73	652
NORFOLK	0	0	3	107
PRINCETON	16	0	0	30
SHERBORN	0	16	24	51
SUDBURY	25	57	12	214
WAYLAND	0	24	0	206
WENHAM	0	55	0	175

Appendix C Three Robustness Checks

Table C1: Comparison of OLS, Tobit, and Spatially Corrected Standard Errors

Dependent variable: Number of by-right lots					
Estimator Standard errors	OLS			Tobit	
	Robust	Clustered	Spatially weighted	--	Clustered
Variable	(1)	(2)	(3)	(4)	(5)
Rent, 1940	-0.083 (0.407)	-0.083 (0.108)	-0.083 (.305)	0.48 (1.24)	0.48 (0.90)
Pct native-born, 1940	-15.07 (12.78)	-15.07 (12.90)	-15.07 (10.19)	-20.59 (52.21)	-20.59 (40.42)
Job-to-pop ratio, 1940	448 (328)	448 (532)	448 (321)	1,081 (955)	1,081 (1380)
Dist, satellite city	11.21 (7.32)	11.21 (9.27)	11.21 (6.94)	41.84 (29.51)	41.84 (28.09)
Housing density, 1940	522** (225)	522*** (83)	522*** (152)	748*** (229)	748** (308)
City Council	1,022** (444)	1,022** (398)	1,022** (416)	1,497** (717)	1,497* (778)
Log(population), 1940	-32.14 (89.50)	-32.14 (36.36)	-32.14 (46.08)	214 (275)	214 (192)
Observations	183	183	183	183	183
R-squared	0.38	0.38		0.049	

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Columns 1 and 4 compare estimates obtained from OLS and tobit. As expected, the coefficient estimates from OLS are biased towards zero, reflecting the constrained range of values of dependent variables. Clustering standard errors, both in OLS and Tobit models, makes very little difference in the size of the standard errors and does not result in any changes in statistical significance of the coefficients. Nor are the spatially weighted standard errors on the OLS model, shown in Column 3, substantially different from the robust or clustered standard errors. Thus to avoid downward bias from the truncated values, the tobit estimates will be used throughout the paper, without clustering of standard errors.

Geographic clusters are defined as follows. Municipalities in the inner ring of the Boston metropolitan area (inside Route 128) form one region, those west of Boston between 128 and Interstate 495 are another, those west outside of 495 are a third group, cities and towns on the North Shore are group 4, those on the South Shore are group 5, and the southwest along the Rhode Island border are the last group.

Table C2: By-right Determinants, Correcting for Zoning Adopted Prior to 1940

Twenty-two cities and towns had adopted zoning prior to 1940, raising concerns about possible endogeneity of the independent variables. It was not possible to obtain data on rents or jobs for earlier years, but housing density for those towns prior to original zoning was available from the 1920 and 1930 census. I ran two checks on the robustness of the 1940 results: first, I control for the pre-zoning housing density while dropping other time-specific variables; second, I omit the towns that adopted zoning before 1940. The results show some changes in the magnitude of coefficients and but no difference in significance of the main results.

Dependent variable: (Estimator)	Any by-right (Probit: dF/dx)		Number of by-right lots (Tobit)		Pct land by right (Tobit)	Avg lot size (OLS)
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Pre-zoning housing density	0.192*** (0.063)		1,370*** (484)			
Housing density, 1940		0.120* (0.064)		589** (259)	5.30*** (1.05)	-1069 (1378)
City council	0.211* (0.126)	0.085 (0.154)	5,412*** (1,659)	1,365* (783)	3.98 (3.19)	-16,705 (24,786)
Distance, satellite city	0.007 (0.005)	0.005 (0.005)	8.14 (82.0)	33.53 (31.53)	0.15 (0.13)	-1779 (4117)
Rent, 1940		-0.000 (0.000)		0.43 (1.52)	-0.001 (0.006)	-42.50 (31.56)
Pct native-born, 1940		0.010 (0.010)		27.73 (61.68)	0.18 (0.25)	1110 (2272)
Job-to-pop ratio, 1940		0.095 (0.168)		1,024 (967)	2.34 (4.05)	-35,396* (19,082)
Log(pop), 1940		0.078 (0.056)		474 (323)	0.57 (1.29)	-4339 (9954)
Observations	186	162	186	162	162	46
R-squared	0.138	0.126	0.031	0.048	0.114	.243

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table C3: Determinants of Special Permit Multifamily, Including Elderly-only Districts

Recalculating the measures of special permit regulation to include districts that allow only age-restricted multifamily housing does not significantly alter the results. Eight municipalities have no provision for non-age-restricted multifamily housing but do allow age-restricted; five of those allow elderly housing on 80 percent or more of the land area. Another ten municipalities allow non-restricted multifamily on less than twenty percent of land area, but age-restricted can be built on 80 percent or more of the town’s land. As shown below, the main results of the regressions do not change when including elderly-only districts. Virtually all age-restricted housing requires a special permit (it is a fairly recent trend), so neither the measures of regulation nor the regression results for by-right multifamily change.

Dependent variable: (Estimator)	Any special permit (probit: dF/dx)		Number of special permit lots (tobit)		Percent land, special permit (tobit)	Avg lot size (OLS)
Variable:	(1)	(2)	(3)	(4)	(5)	(6)
Percent BA plus, 1970	-0.004 (0.003)	-0.005 (0.004)	-169.1** (85.7)	-188** (87)	-0.87** (0.42)	2,230 (1,813)
Percent native-born, 1970		-0.013 (0.016)		-542 (356)	-2.03 (1.73)	3,536* (1,957)
Job-to-pop ratio, 1970		-0.162 (0.280)		-6,512 (6,586)	-13.80 (31.93)	-21,645 (33,029)
Distance, satellite city		-0.003 (0.005)		-165 (106)	-0.68 (0.52)	824 (752)
City Council		0.139 (0.120)		2,666 (2,919)	9.36 (14.23)	8,453 (15,841)
Percent by-right land, predicted		-0.025** (0.010)		-725*** (245)	-2.24** (1.12)	768 (938)
Log(population), 1970		0.079 (0.048)		1,240 (1,150)	-6.16 (5.55)	-16,328* (8,867)
Observations	186	184	186	184	184	130
R-squared						0.16

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Columns 1 and 2 are probit models of the binary outcome, whether any multifamily housing – including elderly-only multifamily housing – is allowed by special permit. Columns 3 and 4 are tobit models on the number of lots allowed by special permit; Column 5 is a tobit model on the share of land zoned for multifamily by special permit. Column 6 is an OLS model on the average minimum lot size (in square feet). All coefficients are directly interpretable as marginal effects.