Can State Law Combat Exclusionary Zoning? Evidence from Massachusetts

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Abstract: This paper empirically analyzes a Massachusetts law (Chapter 40B) allowing developers of income-restricted housing to appeal local land-use decisions to a state administrative body. Based on a unique dataset, we assess whether Chapter 40B was more likely to be used by developers in municipalities that place stronger restrictions on development. We find that the use of Chapter 40B to overcome regulatory barriers depends on the type of project. For rental development, developers were more likely to use the law in municipalities that were relatively accessible to jobs and that placed relatively stringent zoning restrictions on multifamily development. The use of Chapter 40B for condominium development was more likely in larger, less well-located municipalities with relatively stringent wetlands regulations.

1. Introduction

Fiscal (or exclusionary) zoning has long been an attribute of land-use regulation in the U.S. By deploying regulations such as minimum lot-size requirements, municipal governments can protect their property tax base (Hamilton 1975; 1976; White 1975). Such regulations can drive the price of housing beyond the reach of prospective entrants who might consume more local services than they would fund via property taxes. The combination of fiscal zoning with jurisdictional fragmentation of the kind described by Tiebout (1956) is associated with uncompensated negative externalities, including longer commute times, increased air pollution, concentrated poverty, and racial segregation (Howell-Moroney 2008).

Concern with the exclusionary effects of local land-use regulation motivated legal reforms, such as the 1969 enactment of the Massachusetts Comprehensive Permit and Zoning Appeals Act, more commonly called Chapter 40B after its location in the state's general laws (M.G.L. ch. 40B, ss. 20-23). According to a 1969 report by the Committee on Urban Affairs in Massachusetts, the law responded to "an acute shortage of decent, safe and low and moderate cost housing throughout the Commonwealth," caused by "restrictive zoning controls or similar local regulations" (Fisher 2013, 418–419). In this paper, we investigate whether Chapter 40B operates according to its apparent legislative intent and is used more systematically in the municipalities that most stringently restrict new residential development.

Chapter 40B empowers private residential developers to challenge local land-use regulations if a municipality's stock of low- and moderate-income housing (as statutorily defined) does not satisfy a pre-determined threshold and the municipality has not undertaken statutorily specified efforts to make up the shortfall.[1] If a municipality declines to allow a project including affordable

units, the developer can appeal to a state-level administrative body, which can effectively

override local development regulation. At least seven other states – California, Connecticut,

Illinois, New Hampshire, New Jersey, Pennsylvania, and Rhode Island – also provide state-level

review in order to overcome local regulatory barriers to housing development. Following

Dillman and Fisher (2009), we label such mechanisms "housing appeals regimes."

The efficacy of Chapter 40B is controversial and the law is politically contentious. Ellickson

(2010, 1020–1021) observes that local development regulations in Massachusetts municipalities

remain among the most restrictive in the U.S. Fischel (2011, 266) suggests that Chapter 40B

crowds out market-rate housing and encourages local governments to bar *all* housing

development in order to minimize their affordable housing obligations. Fisher (2013) finds that

while developers are able to obtain permits under Chapter 40B within a reasonable period of

time and with a limited amount of litigation, most suburbs nonetheless remain out of compliance

with law's affordable housing threshold. Some critics of Chapter 40B claim that, by facilitating

the override of local regulation, the law results in negative environmental outcomes that are not

adequately offset by social benefits (Flint 2002). In 2010, Chapter 40B survived a statewide

ballot initiative calling for its repeal.

Although Chapter 40B has engendered substantial controversy, evidence concerning its

effects remains scarce. This study provides such evidence by empirically examining whether

Chapter 40B was used during the last housing boom to break down exclusionary barriers. Our

empirical approach hinges on the fact that developers can obtain regulatory relief under Chapter

40B only if they provide affordable housing. In most projects built by for-profit developers

under Chapter 40B, twenty-five percent of the units must be affordable to moderate income

households (*i.e.*, households earning 80% of an administratively determined area median income) (Fisher 2008, 2).[2]

Our models test whether for-profit developers used Chapter 40B to overcome *systematic* local regulatory constraints on development. Because the value of affordable units did not exceed construction costs during our study period, we assume that developers opted for the Chapter 40B permitting process only when they expected the benefits of regulatory relief to exceed the costs of delivering subsidized units. If this is the case, then use of Chapter 40B should be positively correlated with the stringency of local regulatory constraints on housing development. On the other hand, developers may use Chapter 40B for reasons that have little to do with systematic stringency of local regulations. Rather, the regulatory relief may simply provide developers with idiosyncratic opportunities to undertake more intense development than allowed under local regulations, for example by building on sites particularly susceptible to storm water runoff problems or especially likely to increase traffic congestion. In this case, we expect to find little correlation between the use of Chapter 40B and measures of local regulatory stringency.

We assess whether Chapter 40B was more likely to be used by developers in municipalities that place stronger restrictions on development. Our models examine whether the stringency of such restrictions is correlated with the development of multifamily rental units and, separately, condominium units under Chapter 40B. We use a unique dataset concerning development under Chapter 40B and all other newly built housing in a sample of 129 municipalities surrounding Boston, Massachusetts. We combine this dataset with standard determinants of housing supply and demand including local land-use regulation, geographic attributes, and demographic variables.

We find that the use of Chapter 40B to overcome regulatory barriers depends on the type of project. Rental development generally occurred in larger municipalities that gave residents better access to jobs and had better infrastructure. Conditional on a municipality receiving multifamily rental development, developers were more likely to use Chapter 40B in municipalities that placed relatively stringent zoning restrictions on multifamily development. The use of Chapter 40B for at least one condominium development was more likely to occur in large, more distant suburban areas with more stringent wetlands regulations. We conclude that Chapter 40B has assisted developers in overcoming exclusionary barriers in the case of rental housing, but think that the desirability of condominium development under the law is more ambiguous.

The remainder of this article is organized as follows: Section 2 describes previous empirical research on housing appeals regimes; section 3 lays out our empirical strategy and describes our data; section 4 presents our findings; section 5 concludes.

2.   Prior research

Although a relatively large body of literature provides technical descriptions and anecdotal accounts of housing appeals regimes,[3] the topic has received little empirical analysis. The existing empirical studies, moreover, rarely address the relationship between local regulation and state law, and they sometimes focus narrowly on subsidized housing. Lack of attention to local regulation is problematic because such regulation can create the principal barrier to high-density development generally and income-restricted housing, in particular (Chakraborty et al. 2009; Joassart‐Marcelli 2007). A narrow focus on subsidized housing is equally problematic, because unsubsidized housing depreciates over time, eventually substituting for subsidized housing (Harding, Rosenthal, and Sirmans 2007). This study focuses explicitly on local regulation and accounts for all condominium and rental development during our study period.

Prior empirical research provides mixed evidence concerning the efficacy of housing appeals regimes. Cowan (2006) indicates that Chapter 40B and similar housing appeals regimes can increase the production of subsidized housing in suburban jurisdictions relative to comparable jurisdictions in states with no housing appeals regime. Lewis (2005) analyzes the effect of California's housing appeals regime (called a "housing element") on overall housing supply, finding that local compliance with the housing element in 1994 was uncorrelated with the number of residential building permits issued from 1994 to 2000. Mitchell (2004) compares housing development in New Jersey and Pennsylvania municipalities. Each state had a housing appeals regime during at least part of Mitchell's study period. New Jersey's regime was available only to developers of income-restricted housing, while Pennsylvania's regime simply required municipalities to permit a diversity of housing types (including multifamily projects), but imposed no affordability requirements. Mitchell finds that the probability that a newly constructed housing unit was not a single-family home was higher in the Pennsylvania municipalities than in the New Jersey municipalities during his study period.

Fisher (2013) analyzes the influence of Chapter 40B on ad-hoc local land-use regulation and the decisions of private developers. Controlling for plausibly relevant variables, she finds that municipalities are more likely to approve condominium projects under Chapter 40B than multifamily rental projects. In addition, municipalities are less likely to approve a project if the proposed site is zoned for single-family residential development than if it is zoned for commercial development. When a municipality denies a project, the developer almost invariably appeals, but most appeals are settled without an official decision.

3. Empirical Strategy and Data

This section describes our empirical strategy and data sources. The rest of the section is organized as follows: subsection 3.1 provides an overview of our empirical strategy; subsections 3.2 and 3.3 detail our model specifications; and subsection 3.4 describes our sample and data. Table 1 summarizes residential development in our sample, Table 2 presents definitions and sources for all variables, and Table 3 presents summary statistics for the right-hand side variables.

[INSERT TABLES 1, 2, AND 3 HERE]

3.1 Empirical Strategy

We analyze whether for-profit developers have used Chapter 40B to overcome local regulatory barriers to housing development. Precisely identifying the specific impacts of Chapter 40B on housing production would require knowledge concerning development that would have occurred in the absence of Chapter 40B. In many cases, a project permitted under Chapter 40B may simply substitute for development that would have otherwise occurred under the conventional permitting regime, contained in Chapter 40A of the Massachusetts General Laws. (Under Chapter 40A, such a development would be subject to local land-use regulations.) In these cases, the effects of Chapter 40B would be marginal to those of Chapter 40A, although Chapter 40B development could be denser than the counterfactual Chapter 40A development. In other instances, Chapter 40B may "unlock" parcels that, due to local zoning or environmental protection laws, were undevelopable under Chapter 40A.

We have found no observable counterfactuals for Chapter 40B outcomes. One candidate for comparison might be municipalities within the Boston area that had already crossed the Chapter 40B subsidized housing threshold at the beginning of the study period and were therefore not

subject to Chapter 40B. But, among the 144 municipalities for which we collected data,

municipalities over the threshold also differ from those below the threshold in other ways that

standard economic theory suggests could affect the supply and demand of new development.

Compared the 129 municipalities in our final sample, those over the threshold have, on average,

lower levels of educational attainment among residents, less land area, higher accessibility to

jobs, less restrictive land-use regulation, and a lower proportion of wetlands resources subject to

local regulation Therefore, development in these municipalities does not provide significant

insight regarding potential outcomes for municipalities in our sample. Municipalities in states

without housing appeals regimes could theoretically serve as counterfactual observations. Given

both the pervasiveness of housing appeals regimes in the Northeast U.S. and the close

relationship of housing demand to regional characteristics, however, we have found no plausible

candidates.

In order to assess the role of Chapter 40B in local housing markets, we therefore analyze

why for-profit developers use Chapter 40B for a higher proportion of rental housing and

condominium development in some municipalities as compared with others. In particular, we ask

whether local land-use regulation appears to affect the use of Chapter 40B, controlling for

plausible non-regulatory determinants of housing supply and demand. Because our measures of

regulatory stringency are unlikely to change dramatically over a short period of time (and in

many instances our data do not allow us to observe such changes), we use cross-sectional models

to explain the aggregate quantity of Chapter 40B development as a proportion all development

(for each relevant tenure type) from 1999-2005.

Particular characteristics of a site may influence whether a developer decides to use the

Chapter 40B permitting process instead of the Chapter 40A process. For example, local

wetlands regulations that prohibit building in buffer zones around wetlands may not be cumbersome municipality-wide, depending on the distribution of wetlands throughout the municipality. For certain sites, local wetlands regulations may limit the scale of a project, thereby impinging on developer profits. Developers may use Chapter 40B to override local wetlands regulations when they expect the value generated from higher density to exceed the costs of providing affordable units.

Because exclusionary zoning reflects decisions made at the municipal level, we examine the number of newly developed housing units permitted using Chapter 40B, relative to the sum of all Chapter 40B and Chapter 40A development in a municipality. Higher proportions of Chapter 40B development are hypothesized to be associated with more restrictive local by-laws and ordinances (authorized by Chapter 40A).

For our sample of 129 Boston-area municipalities (Figure 1), we compare the number of units permitted through the main Chapter 40B process to the total amount of permitted development, including that which the municipalities formally invite. The proportions for municipality i are (1) $r_i = \left(\frac{40B\_Rental\_Units}{Total\_Rental\_Units}\right)_i$ and (2) $c_i = \left(\frac{40B\_Condo\_Units}{Total\_Condo\_Units}\right)_i$, where *40B_Rental_Units* equals the number of multifamily rental units that were proposed by for-profit developers under the main Chapter 40B permitting process from 1999-2005 and received a building permit, *Total_Rental_Units* equals the total number of multifamily rental units built from 2000-2006 according to local tax assessor data, *40B_Condo_Units* equals the number of condominium units that were proposed by for-profit developers under the main Chapter 40B permitting process from 1999-2005 and received a building permit, and *Total_Condo_Units* equals the total number of condominium units built from 2000-2006 according to local tax

assessor data. Summary statistics for these measures are found in Table 1 and are discussed in

more detail below.

[INSERT FIGURE 1 HERE]

Because the numerators are intended to measure housing units that a municipality would

not have voluntarily allowed, units built by for-profit developers through a variant of the Chapter

40B process known as the Local Initiative Program, along with all units developed by non-profit

organizations or public agencies, are only counted in the denominators. (The Local Initiative

Program provides procedural mechanisms and technical support for municipalities to fulfill their

obligations under Chapter 40B by collaborating with developers.)

Four considerations lead us to differentiate between rental and condominium units in our

dependent variables. First, renters are more racially diverse than homeowners and, on average,

less wealthy (Wachter and Megbolugbe 1992; U.S. Census Bureau 2000). Due to fiscal concerns

or racial prejudice, municipalities may therefore be more willing to accommodate condominium

development than rental development. Second, rental developments in Massachusetts during our

study period were much denser than condominium projects (Table 1). The resulting difference in

potential environmental harms and infrastructural demands may lead municipalities to prefer

condominium to rental development. Third, while condominium development occurred in 125 of

the 129 municipalities in our sample, multifamily rental development occurred in only 68 (Table

3). This gives rise to selection bias concerns in the case of multifamily rental development,

which we address with the selection model described in section 3.2. Fourth, the location of rental

development in the Boston area differs systematically from that of condominium development

with respect to variables including job accessibility and infrastructural capacity (Table 4).

[INSERT TABLE 4 HERE]

3.2   Multifamily rental model

We confront two main problems when modeling the use of Chapter 40B to develop multifamily rental housing.   First, in any given municipality with multifamily rental development, most (or all) such development occurs under a single permitting process. In other words, in only a few municipalities are multifamily rental units developed in roughly equal numbers under Chapter 40A and Chapter 40B. Chapter 40B was not used for multifamily rental development in 26 of the 68 municipalities with such development, but was used for more than 90% of multifamily rental units in 31 of the other 42 municipalities with multifamily rental development. Second, only 68 of the 129 municipalities in our sample had any multifamily rental development at all during our study period. Because these are suburban communities, this is not surprising. Nevertheless, for 61 municipalities, the proportion of interest is undefined, requiring us to drop these observations.

In order to avoid the bias that could result from such sample selection, we use a bivariate probit selection model. First, we model whether or not a municipality had *any* multifamily rental development during our sample period. Second, conditional on multifamily rental development occurring, we model whether any such development was permitted under the main Chapter 40B process.

Specifically, let y_{1i} be equal to one if municipality i had any multifamily rental development during the sample period, and zero otherwise. Then the first stage model of development for municipality i is: $P(y_{1i} = 1|x_i) = x_i\beta + \varepsilon_i$, where x_i is a vector of municipality-specific demographic and locational attributes expected to affect the development of multifamily rental projects, $\varepsilon \sim N(0, \sigma^2)$. (Section 3.4, below, describes all variables included in the models.)

In the second stage, we characterize municipalities depending on the proportion of multifamily rental units built by for-profit developers under the main Chapter 40B permitting process. Let y_{2i} be equal to one if any multifamily rental units permitted in municipality i were built by for-profit developers under the main Chapter 40B process and zero otherwise.[4] Then the second stage model is: $P(y_{2i} = 1|z_i) = z_i\gamma + u_i$, where z_i is a vector of municipality-specific attributes expected to affect the proportion of multifamily rental projects built by for-profit developers under the main Chapter 40B process, $u \sim N(0, \sigma^2)$. Explanatory variables on the right hand side of the second stage model include measures of municipal regulatory restrictions, municipal demographic characteristics, and physical attributes such as developable land and natural resources.

For identification of the first stage, some variable in the vector x_i must act as an instrument. Such an instrument must be correlated with whether or not a municipality receives multifamily rental development, but not with for-profit developers' systematic choice to use the main Chapter 40B process for such development. We conjecture that multifamily projects require access to a public sewer, which is not uniformly distributed among the municipalities surrounding Boston (Table 4). Inadequate sewer infrastructure may substantially increase the cost of new multifamily development or thwart such development entirely. But it should not affect whether for-profit developers of multifamily rental housing choose to use the main Chapter 40B permitting process instead of Chapter 40A or the Local Initiative Program.

3.3 Condominium model

The rationale for our two-stage multifamily rental model does not apply to condominium development. Only four municipalities in our sample did not receive any condominium

development during our study period. Because the proportion of interest is defined for 125 of the

129 municipalities in our sample, selection bias is not a concern and we use single-stage models.

Because the main Chapter 40B permitting process was used in only 65 of the 125

municipalities with condominium development, however, we investigate both the continuous

proportion and a dichotomous representation of our dependent variable. We estimate a Tobit

model due to the mass of proportions at zero. We also estimate a probit model to assess whether

the 65 municipalities with condominiums permitted under Chapter 40B differ systematically

from the other 60 municipalities in our sample with condominium development. In this case, for

each municipality *j*, let: $d_j = \begin{cases} 1 \text{ if } c_j > 0 \\ 0 \text{ if } c_j = 0 \end{cases}$. Therefore our probit specification is based on: $P(d_j =$

$1|s_j) = s_j\delta + e_j$, where s_j is a vector of municipal characteristics, and e_j is a municipality-specific

error term with $e \sim N(0, \sigma^2)$. The results from these two models are similar, and we report the

results from the probit model in order to maintain consistency of interpretation alongside the

rental models.

3.4   Sample and Data Description

Our data on Chapter 40B development come from a survey of officials in 144 municipalities

surrounding Boston, Massachusetts, conducted by the MIT/CRE Housing Affordability Initiative

(Fisher 2013). (Boston itself is omitted, because the analysis is focused on the suburbs.)

Questionnaires were sent by mail in 2007. Researchers then confirmed responses and collected

additional data by phone and with visits to local government offices. Follow-up collection of

data in 2008 and 2011 completed the data concerning permit approvals. Our final sample

consists of 129 municipalities (Figure 1). This excludes 4 of the 144 municipalities initially

contacted, for which relevant follow-up data were unavailable. Eleven of the remaining 140

municipalities fulfilled their affordable housing obligations by 2001,[5] and we exclude them from

our sample because they systematically differ from the remainder of the sample, as discussed

above in section 3.1.

We analyze data concerning development under both Chapter 40B and Chapter 40A (Table

1). For projects that received a building permit, the data collected by the MIT/CRE Housing

Affordability Initiative include the tenure type of each project (condominium or rental) and the

number of units.[6] For 119 of the 129 towns in our sample, we also have property assessors' data

compiled by the Warren Group, indicating the tenure and number of units for all residential

development built from 2000 through 2006. (We stagger the time frame to better align Chapter

40B permits with assessor observations of completed housing.) In order to distinguish Chapter

40A development from Chapter 40B development, we match the two datasets.[7] Properties in the

Warren Group data for which we do not have a matching Chapter 40B project are assumed to

have been permitted through Chapter 40A. For the 10 towns missing assessors' data, we imputed

the assessor unit counts using a Poisson regression of the non-missing assessor unit counts (net

of units built by for-profit developers under the main Chapter 40B process) on U.S. Census

building permit data and a vector of other municipal attributes. In Table 1, we observe that only

27.2% of condominium units were permitted during this period through the main Chapter 40B

process, compared with 65.5% of rental units.

The right-hand side variables include regulatory constraints on housing development, along

with several standard municipality-level measures of housing demand and non-regulatory supply

constraints (Evenson and Wheaton 2003; Glaeser and Ward 2009). Our demand characteristics

include the percentage of the population under 18 and the percentage of the population with a

bachelor's degree, both from the 2000 U.S. Census. To control for proximity to employment, we

use a gravity index, standardized across 144 geographically contiguous municipalities
surrounding Boston, which measures access to employment as a function of commuting time
(Fisher, Pollakowski, and Zabel 2009). We also considered other standard demographic variables
for the municipalities in our sample, such as population density, median household income, and
the percentage of the population identified as white in the 2000 Census, but exclude them from
presentation here because they are strongly correlated with the other variables included.

We control for supply constraints with variables measuring the amount of land net of
physically undevelopable areas and the capacity of existing infrastructure. Using data from the
Massachusetts Office of Geographic Information (MassGIS) and the methodology of Saiz
(2010), we derive the following measure of developable land area N in municipality i: $N_i = G_i -
F_i - W_i - H_i - O_i - S_i$, where G equals gross land area, F equals the area of FEMA-designated 100-
year flood zones, W equals the area of wetlands designated under the Massachusetts Wetlands
Protection Act (net of F), H equals the area of major hydrological features (net of F and W), O
equals the area of protected open space designated in 1999 or earlier as "in perpetuity," "term
limited," "limited," or of unknown status (net of F, W, and H), and S equals the area of slopes of
at least 15% (net of F, W, H, and O).[8] Because infrastructure capacity varies significantly across
our sample, we include a variable based on the percentage of residences with access to a public
sewer. We recode this variable, which comes from the Local Housing Regulation Database
assembled for the Pioneer Institute for Public Policy Research (*see* Schuetz 2006, 47), to equal
one if less than 25% of the housing stock has public sewer access and zero otherwise.

As measures of zoning stringency, we use both the percentage of total land area for which
each municipality allows new multifamily development by right (*i.e.*, without special approval)
and, separately, the percentage of total land area where new multifamily development is allowed

by special permit. These measures combine data from the Local Housing Regulation Database,

assembled in 2004, with data collected by MassGIS from 1999-2000 (Schuetz 2008, 565).

Schuetz (2008) argues that the original passage of Chapter 40B influenced the nature of zoning

subsequently adopted by Massachusetts municipalities to control multifamily development. She

shows that, following the enactment of Chapter 40B, municipalities with a smaller stock of

multifamily housing were more likely to adopt special-use zoning provisions for multifamily

development under Chapter 40A. Such an approach provides greater local discretion over

development outcomes, which we interpret as more restrictive than by-right zoning. Within both

the sample of 129 municipalities and the sub-sample of 68 municipalities with multifamily rental

development, our variables for by-right and special permit zoning are not correlated at standard

levels of significance.

As a general measure of local attitudes toward development in suburban areas, we also use

the assessor data to calculate the median lot size of single-family homes built in 1998 and 1999

in each municipality. This variable captures the actual lot size of recent single-family

developments, in contrast to the measure of average minimum single-family lot requirements

used by Evenson and Wheaton (2003) and Glaeser and Ward (2009), which may include land not

available for development.

Municipalities surrounding Boston contain varying quantities of wetlands and place

different restrictions on development in buffer areas around these resources. To control for land

area around wetlands resources subject to local regulation, we include a variable measuring the

proportion of a municipality's net land area that is within a 100-foot buffer zone surrounding

wetlands. Using GIS, we generated 100-foot buffers around areas protected under the

Massachusetts Wetlands Protection Act (MassGIS DEP Wetlands (1:12,000)). For each town, we

divided the buffer zone area by our measure of net land area, described above. Many local

wetlands bylaws exceed the stringency of the Massachusetts Wetlands Protection Act (MWPA),

prohibiting development in the buffer areas surrounding wetlands (*see* Meyer and Konisky 2007,

12). Unlike the requirements of the MWPA, such local regulations are subject to override under

Chapter 40B. To create a measure of local restrictions that exceed state regulations, we include a

dichotomous variable, from the Local Housing Regulation Database discussed above, equal to

one if a town's wetlands bylaw (as adopted or amended by the end of the study period)

prohibited "building," "disturbance," "clearing," or "cutting" in wetlands buffer areas (Schuetz

2006, 41–42). We scale this dichotomous variable by the width (in feet) of the protected area, to

create a continuous variable from 0 to 100. (Our findings are robust to alternative specifications,

not reported here, including a dummy variable equal to one if a municipality adopted or amended

its wetlands bylaw from 2000 through 2005.) Our measure of wetlands buffer area (resources) is

positively but insignificantly correlated with our measure of the stringency of local wetlands

regulations.

In our condominium models, we also consider a dichotomous variable equal to 1 if more

than 0.1% of a municipality's land area consists of coastal wetlands as defined by Massachusetts

law.[9] Land in such municipalities may be especially attractive for condominium development

and is frequently subject to additional state-level regulation. This dichotomous variable is

uncorrelated with the municipal measures of wetlands resources and restrictiveness.

4. Findings

This section discusses the results of our regression models.

4.1 Multifamily Rental Development

Table 5 presents the results of our bivariate probit model with selection, concerning the use

of Chapter 40B to develop multifamily rental housing. In the first stage, the dependent variable is

equal to one if at least one multifamily rental project proposed for local approval under Chapter

40A or Chapter 40B from 1999 through 2005 received a building permit. In the second stage, the

dependent variable is equal to one if any of the permitted rental projects were built by for-profit

developers under the main Chapter 40B permitting process. Despite our concerns about selection

bias, the Wald test for each of the three specifications does not reject the hypothesis that the two

equations are independent.

[INSERT TABLE 5 HERE]

In all three specifications, the coefficients for the first-stage right-hand side variables have

signs in the expected directions. Holding other plausibly relevant variables equal, multifamily

rental development is more likely in municipalities with more developable land, better access to

employment, and more sewer infrastructure. Consistent with Glaeser and Ward (2009), we find a

negative correlation with the percentage of the population with a bachelor's degree, although this

correlation is only marginally significant (at the 10% level) in all three specifications.

The second stage of the model indicates that for-profit developers use Chapter 40B for

rental housing when local zoning restrictions on multifamily development are more stringent. In

all three specifications, the percentage of land area zoned for the by-right development of new

multifamily housing is negatively correlated with the use of Chapter 40B for such development,

significant at the 5% level. (Specifications not reported here, which include this variable in the

first-stage equation, indicate that it does not help to explain the location of multifamily rental

housing development among the municipalities in the sample.) The percentage of land area

zoned for the development of new multifamily housing by special permit is positively correlated

with the use of Chapter 40B for such development. Our measure of wetlands regulation

stringency, included in specification B, was not different from zero at standard levels of

significance. In specifications not reported here, the job accessibility and infrastructure variables

were not statistically significant in the second stage.

We compute marginal effects by setting the model variables equal to their median values

and separately calculating the response to changes in each of our multifamily zoning variables in

specification C. An increase from the median value of the percentage of land area zoned for new

multifamily development by-right (0%) to the 75th percentile (0.89%) correlates with an 8%

decrease in the likelihood that any multifamily rental projects were built by for-profit developers

under Chapter 40B. An increase from the median to the 90th percentile (3.54%) correlates with a

32% decrease in such a likelihood. With respect to the percentage of municipal land area where

new multifamily development is allowed by special permit, a decrease from the median value

(2.11%) to the 25th percentile (0%) correlates with a 1% decrease in the likelihood that any

multifamily rental projects were built by for-profit developers under Chapter 40B. An increase

from the median to the 75th percentile (13.69%) correlates with a 6% increase in this likelihood,

and an increase from the median to the 90th percentile (80.51%) correlates with a 43% increase in

this likelihood.

These results are consistent with summary comparisons of municipalities that allow

multifamily development by right and those that do not. Twenty-six of the 68 municipalities with

multifamily rental development contained districts where multifamily development was allowed

by right. In these 26 municipalities, for-profit developers used the main Chapter 40B permitting

process for 36.1% of multifamily rental units, on average. In the remaining forty two

municipalities, 62.6% of multifamily rental units were built by for-profit developers under

Chapter 40B.

Our results suggest that Chapter 40B has two significant direct effects on rental

development. First, holding other variables equal, municipalities that allow more multifamily

development by right are less likely to receive rental development under Chapter 40B. An

increase of less than one percent in the proportion of land area zoned for by right multifamily use

is associated with a nearly ten percent decrease in the likelihood that a rental project is permitted

under Chapter 40B. Second, on the margin, more stringent local zoning pushes developers of

rental housing toward greater use of Chapter 40B. We interpret the positive coefficient on the

percentage of land requiring a special permit for multifamily development as indicating a more

restrictive regulatory environment. More stringent local wetlands protection is not associated

with greater use of Chapter 40B for rental development.

4.2 Condominium Development

Table 6 presents the results of a probit model concerning the use of Chapter 40B in the

125 municipalities with any condominium development permitted during the study period. The

dependent variable equals one if at least one permitted condominium unit was developed by a

for-profit developer under the main Chapter 40B permitting process. Our measures of

multifamily zoning, included in specification B, are not statistically significant in this model. We

find a negative correlation between median single-family lot size and the dependent variable,

significant at the 5% level in specifications C and F, and significant at the 10% level in

specification G. Consistent with our expectation, the stringency of local wetlands regulation is

positively correlated with the dependent variable, significant at the 5% level in specifications E

and F, and at the 1% level in specification G.[10] Our dichotomous variable for municipalities with

coastal wetlands, which may impound both amenity value and relevant additional state

regulations, is negatively correlated with the dependent variable, but this correlation is

statistically significant only in specification F (at the 5% level) and specifications C and G (at the

10% level). Net land area is consistently positively correlated with the dependent variable. The

size of the coefficients on the median lot size and coastal wetlands variables are sensitive to the

inclusion of other variables, but the signs on all coefficients are consistent across specifications.

We also note that job accessibility is well-correlated with almost all of the variables in the

model, resulting in its lack of significance.

[INSERT TABLE 6 HERE]

Taken together, our estimates show that larger municipalities with relatively poor access to

the region's jobs, but with smaller single family lot sizes and more restrictive regulations

regarding wetlands, were more likely to receive at least one condominium development under

Chapter 40B during our sample period. This is consistent with summary statistics concerning our

job accessibility variable, which has a mean of 0.08 for the 60 municipalities with condominium

development under Chapter 40A only and a mean of -0.17 for the 65 municipalities with some

condominium development under Chapter 40B. These findings indicate that, while Chapter 40B

was used for rental development with relatively high job accessibility, it was used to develop

condominiums that are relatively remote from jobs. The lack of statistical significance for the

multifamily zoning variables suggests a more idiosyncratic use of Chapter 40B by developers for

condominiums than for rental projects.

Our initial motivation for the use of median single family lot size was as a control for local

attitudes towards development. In the results for condominiums, however, we think that after

controlling for net land area and the presence of coastal wetlands within a jurisdiction, the lot

size measure indicates that condominium development under Chapter 40B is more likely to

occur in places with relatively dense single-family development. Given the higher density of

condominium developments under Chapter 40B (as compared with condominium developments

under Chapter 40A), these results suggest that some existing density near local amenities or

transit stops may be important for the financial viability of condominium projects.

5. Conclusion

Our study indicates that states can combat exclusionary zoning, while suggesting that

Chapter 40B has been more clearly successful with respect to rental development than

condominium development. We find that the majority of rental housing units in our sample were

built though Chapter 40B. For-profit developers systematically use Chapter 40B to build rental

units in municipalities with the most stringent restrictions on multifamily residential

development, while using Chapter 40A to build rental housing in municipalities that

accommodate more multifamily development by right. Consistent with Schuetz (2008), our

findings also point to a pattern of municipal special-use permitting that provides local discretion

over multifamily projects, perhaps favoring for-sale products over rental housing.[11] The evidence

concerning developers' use of Chapter 40B to overcome exclusionary barriers to condominiums

is less clear. First, condominiums in the region are mainly produced under Chapter 40A. Second,

our measures of by-right and special permit multifamily zoning are not associated with the use of

Chapter 40B for condominium development. Holding other variables equal, however,

municipalities with more restrictive wetlands regulations were more likely to receive a Chapter

40B condominium development.

The different characteristics of rental and condominium projects also suggest that Chapter

40B (and housing appeals regimes generally) might be more effectively targeted to rental

development. Demand for rental projects is greater in municipalities with better access to jobs.

When these municipalities have relatively restrictive multifamily zoning, Chapter 40B enables

developers to gain entrance. Because rental projects are typically quite dense, they are generally

located in areas with substantial existing development. Such areas may have relatively few

ecological resources of the kind protected by local wetlands regulation.

Condominium development, by contrast, is more widespread throughout our study area, and

our measures of multifamily zoning are not systematically related to the use of Chapter 40B.

Municipalities with more restrictive wetlands regulation, however, were more likely to have

Chapter 40B condominium development during our sample period. While municipalities may

use environmental ordinances as mechanisms of fiscal (or exclusionary) land-use regulation,

suburban municipalities around Boston have a sensitive ecological environment that may deserve

more stringent regulation (Meyer and Konisky 2007). Explicit coordination between regulations

in these two areas is an important and on-going challenge for policy-makers.

Notes

[1] M.G.L. ch. 40B, ss. 20-23; 760 C.M.R. 56.03(3).

[2] Chapter 40B also allows developers to instead provide a larger subsidy for a lower percentage of units.

[3] For surveys of the descriptive literature, see Ellickson and Been (2005, 760–787) and Cowan (2006, 300–301).

[4] Our results are not sensitive to the exact cut-off: Specifications not reported here, with the dependent variable equal to one for proportions greater than or equal to one-half and zero otherwise, yield results substantively similar to those reported in Table 5.

[5] The 2001 subsidized housing inventory is a proxy for the 1999 inventory, because 1999 and 2000 data were not consistently available from the Massachusetts Department of Housing and Community Development (DHCD). DHCD measures the 2001 inventory relative to the 2000 Census housing stock.

[6] Mixed condominium-rental developments are also permitted; because such projects are rare and contain a large majority of rental units, we have coded these projects as rentals.

[7] Only 26% of the 40B projects confirmed to have obtained a building permit are observable in the Warren Group data. This difference may be explained by the fact that it is a considerable challenge to match this data, since street addresses often do not exist at the outset for new development, and we are working with approximate addresses. In addition, we believe that because many projects received comprehensive permits late in our sample period (often due to delays resulting from appeals of local zoning decisions or other legal action), they were not captured by the assessor data, which may lag updating by one to two years.

[8] The percent rise in slope was calculated by processing a digital elevation map raster using the Slope tool in the ArcMap Spatial Analyst Toolbox. Slope values were reclassified as 0 (if less than 15%) and 1 (if greater than or

equal to 15%). The raster was then converted to a shapefile; attributes with a slope dummy variable value of 1 were subtracted from the land area.

[9] 310 CMR 10.21 - 10.37.

[10] Due to collinearity among the right-hand side variables, we do not estimate a specification including both wetlands regulation and resources simultaneously.

[11] A municipal bias against rental housing is also evident in individual Chapter 40B permitting decisions. Fisher (2013) finds that local authorities are more likely to deny rental projects as compared to condominium projects.

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Figure 1: Sample of 129 Municipalities near Boston, Massachusetts, USA
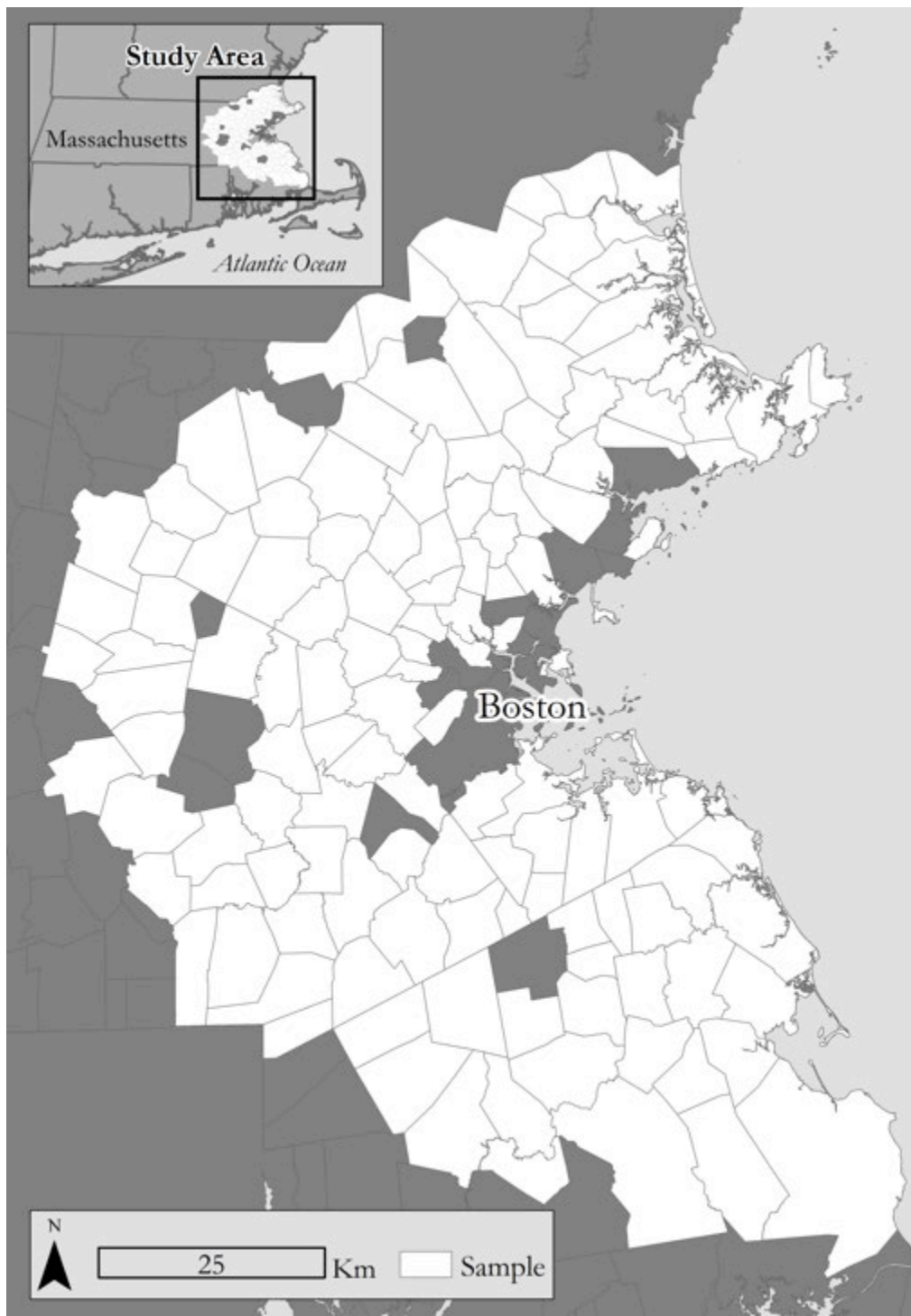
Source: MassGIS.

Table 1: Residential Development from Permits Requested 1999-2005 in Sample of 129 Boston-Area Municipalities

	Single Family	Condominium			Rental		
	40A	*40A*	*40B*	*% 40B*	*40A*	*40B*	*% 40B*
Total Buildings		1,476	125	7.8%	104	55	34.6%
Total Units	26,846	15,609	5,832	27.2%	4,744	8,996	65.5%
Avg. Units per Project	n/a	11	47		46	164	

Notes: Chapter 40A condominium and rental counts include Local Initiative Projects using a comprehensive permit authorized under Chapter 40B and all units developed by non-profit organizations and public agencies; Chapter 40A counts imputed for 10 municipalities, as described in the text.

Sources: Warren Group; MIT/CRE Housing Affordability Initiative

Table 2: Variable Names, Definitions, and Sources

Variable	Definition
(1) Rental	= 1 if any multifamily rental development occurred during study period
(2) 40B Rental Proportion	Proportion of all multifamily rental units built by for-profit developers under the main Chapter 40B permitting process
(3) 40B Rental	= 1 if any multifamily rental units were built by for-profit developers under the main Chapter 40B permitting process
(4) 40B Condo Proportion	Proportion of all condominium units built by for-profit developers under the main Chapter 40B permitting process
(5) 40B Condo	= 1 if any condominium units were built by for-profit developers under the main Chapter 40B permitting process
(6) Net Land Area	Land area (sq. mi.) net of physical impediments to development and legally protected open space
(7) Coastal	= 1 if at least 0.1% of municipal land area consists of coastal wetlands
(8) Job Accessibility	Standardized gravity index based on commuting data
(9) Minimal Public Sewer	= 1 if < 25% of housing stock has public sewer access
(10) % under 18	% of population less than 18 years old
(11) % BA	% of population with a bachelor's degree
(12) Med. SF Lot Size	Median lot size (acres) of single-family homes built in 1998 and 1999
(13) % MF by Right	% of land area in which new multifamily development is permitted by right
(14) % MF by SP	% of land area in which new multifamily development is permitted by special permit
(15) Wetlands Resources	% of net land area consisting of 100-ft. buffer zones surrounding state-designated wetlands
(16) Wetlands Regulation	Width (in feet) of buffer zone in which local law prohibits development

Sources (1), (2), (3), (4), (5) MIT/CRE Housing Affordability Initiative, Warren Group; (6), (7), (15) MassGIS; (8) Fisher, Pollakowski and Zabel (2009); (9), (16) Local Housing Regulation Database (2005); (10), (11) U.S. Census (2000); (12) Warren Group; (13), (14) Schuetz (2008).

Table 3: Summary Statistics

	Median*	Min	Max	SD	N
Net Land Area (sq. mi.)	8.86	0.54	52.94	6.83	129
Job Accessibility (std. index)	-0.41	-1.33	3.23	0.97	129
Coastal (dichotomous)	0.24	0.00	1.00	0.43	129
Minimal Public Sewer (dichotomous)	0.38	0.00	1.00	0.49	129
% BA	25.54	10.06	44.34	7.61	129
% under 18	25.73	14.19	33.72	3.92	129
Med. SF Lot Size (acres)	0.92	0.06	4.18	0.68	129
% MF by Right	0.00	0.00	49.72	6.84	129
% MF by SP	2.11	0.00	100.00	30.59	129
Wetlands Regulation (index)	25.00	0.00	100.00	27.23	129
Wetlands Resources (proportion)	0.14	0.00	0.29	0.06	129
40B Rental Proportion**	0.60	0.00	1.00	0.46	68
40B Rental (dichotomous)**	0.62	0.00	1.00	0.49	68
40B Condo Proportion**	0.06	0.00	1.00	0.29	125
40B Condo (dichotomous)**	0.52	0.00	1.00	0.50	125

* Means reported for dichotomous variables.
** Proportions and derived dichotomous variables defined only for subsamples with multifamily rental development
(N=68) and condominium development (N=125).
For variable definitions, see Table 2.

Table 4: Subsample Means of Selected Variables

	Subsample Attribute		
	No Multifamily Rental Development	**Some Multifamily Rental Development**	**Some Condominium Development**
	(N=61)	(N=68)	(N=125)
Net Land Area (sq. mi.)	8.97	11.44	10.27
Job Accessibility (std. index)	-0.32	0.17	-0.05
Minimal Public Sewer (dichotomous)	0.59	0.19	0.37
% BA	26.75	23.60	25.16
% under 18	26.52	24.67	25.50

Table 5: Regression Model for Multifamily Rental Units

	(A)		(B)		(C)	
	Rental	40B Rental	Rental	40B Rental	Rental	40B Rental
Net Land Area (log)	0.775***	1.068***	0.780***	1.116***	0.795***	1.126***
	(0.253)	(0.309)	(0.256)	(0.343)	(0.260)	(0.295)
% MF by Right		-0.253**		-0.240**		-0.238**
		(0.122)		(0.115)		(0.110)
% MF by SP		0.0149*		0.0145*		0.0144**
		(0.00791)		(0.00822)		(0.00649)
% under 18		-0.132**		-0.118**		-0.114*
		(0.0603)		(0.0592)		(0.0591)
Job Accessibility	0.422***		0.430***		0.455***	
	(0.155)		(0.156)		(0.159)	
Minimal Public Sewer[+]	-0.956***		-0.946***		-0.906**	
	(0.324)		(0.300)		(0.359)	
% BA	-0.0292*		-0.0306*		-0.0282*	
	(0.0177)		(0.0179)		(0.0156)	
Wetlands Regulation				-0.00674		
				(0.00653)		
Wetlands Resources						-2.679
						(2.793)
Constant	-0.462	0.886	-0.442	0.605	-0.545	0.536
	(0.647)	(1.182)	(0.648)	(1.152)	(0.635)	(1.122)
Rho	0.749		0.767		0.892	
Observations	129		129		129	
Censored Observations	61		61		61	
Log-likelihood	-101.5		-100.8		-101.1	
Wald test *p*-value	0.440		0.283		0.484	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
[+] Dichotomous variable

This table reports the coefficients and robust standard errors of a bivariate probit estimation with sample selection. The first-stage dependent variable is a dichotomous variable equal to one if a building permit was issued for any multifamily rental project for which the developer requested local approval under Chapter 40A or Chapter 40B from 1999 through 2005. The second-stage dependent variable is a dichotomous variable equal to one if any of these multifamily rental units were developed by for-profit developers under the main Chapter 40B permitting process. The Wald test is for the independence of the two equations (rho = 0).

Table 6: Regression Model for Condominium Units

	(A)	(B)	(C)	(D)	(E)	(F)	(G)
Net Land Area (log)	0.378*	0.363*	0.378*	0.377*	0.319	0.315	0.440**
	(0.198)	(0.199)	(0.203)	(0.198)	(0.203)	(0.209)	(0.202)
Job Accessibility	-0.133	-0.101	-0.260*	-0.124	-0.0914	-0.228	
	(0.133)	(0.143)	(0.146)	(0.200)	(0.136)	(0.152)	
Coastal (dichotomous)	-0.436	-0.430	-0.566*	-0.429	-0.471	-0.616**	-0.445*
	(0.298)	(0.308)	(0.307)	(0.306)	(0.291)	(0.306)	(0.268)
% MF by Right		-0.00765					
		(0.0243)					
% MF by SP		0.00191					
		(0.00408)					
Med. SF Lot Size			-0.373**			-0.419**	-0.286*
			(0.175)			(0.184)	(0.172)
Wetlands Resources				0.190			
				(2.924)			
Wetlands Regulation					0.0105**	0.0115**	0.0121***
					(0.00458)	(0.00467)	(0.00464)
Constant	-0.662	-0.648	-0.285	-0.689	-0.813*	-0.407	-0.849*
	(0.465)	(0.464)	(0.511)	(0.594)	(0.472)	(0.527)	(0.466)
Observations	125	125	125	125	125	125	125
Log-likelihood	-81.59	-81.38	-79.84	-81.59	-79.01	-76.85	-77.96

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

This table reports the coefficients and robust standard errors of a probit estimation. The dependent variable is a dichotomous variable equal to one if at least one permitted condominium unit was developed by a for-profit developer under the main Chapter 40B permitting process. Four municipalities without any condominium development are excluded from the model.