A New Measure of the Local Regulatory Environment for Housing Markets: The Wharton Residential Land Use Regulatory Index

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[Paper first received, December 2006; in final form, March 2007]

Abstract

A new survey of over 2000 jurisdictions across all major housing markets in the US documents how regulation of residential building varies across space. New evidence on what a 'typical' degree of local regulation entails is provided. In addition, data on how the stringency of land use control varies across markets are analysed. Coastal markets tend to be more highly regulated, with communities in the Northeast region of America being the most highly regulated on average, followed by those in the West region (California especially).

1. Introduction

Land use regulations in the US are widespread, largely under local control and may be a major factor accounting for why housing appears to be in inelastic supply in many of our larger coastal markets. Understanding this inelasticity is a subject in urgent need of research because of its potentially large effects both on house prices and the amount of building activity. Unfortunately, we have relatively little direct knowledge of the nature of local regulatory environments pertaining to land use or housing. Naturally, this means we do not fully understand how the regulatory environment might constrain the quantity of housing built or affect prices in the market.[1]

To help remedy these shortcomings, we conducted a nation-wide survey of local land use control environments. Local regulation can affect building in myriad ways. The most transparent way is to prohibit a project. However, regulation also can affect costs by delay, design restriction or the ease with which court suits can be used to challenge development rights, all without formally

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banning construction. The proliferation of barriers and hurdles to development has made the local regulatory environment so complex that it is now virtually impossible to describe or map in its entirety.[2] Consequently, we decided to ask a series of questions that focused on processes and outcomes, not the specifics of constraints, in our survey.

The questions asked can be divided into three categories. The first set elicited information on the general characteristics of the regulatory process. These questions dealt with who is involved in the process (states, localities, councils, legislatures, courts, etc.) and who has to approve or can veto zoning or rezoning requests. We also asked for an evaluation of the importance of various factors in influencing the regulatory process in each community. Our second set of questions pertained to the rules of local residential land use regulation. These included queries as to whether the community had any binding limits on new constructions, as well as information on the presence of minimum lot size requirements, affordable housing requirements, open space dedications and requirements to pay for infrastructure. Our third and final set of questions asked about outcomes of the regulatory process. What happened to the cost of lot development over the past decade? How did the review time for a standard project change? If the review time increased, by how much?

The information from our national survey was supplemented by two specialised sources of data: a state-level analysis of the legal, legislative and executive actions regarding land use policies, with each state rated on a common scale in terms of its activity (Foster and Summers, 2005); and, the development of measures of community pressure using information on environmental and open-space-related ballot initiatives.

The data were then used to create a summary measure of the stringency of the local regulatory environment in each community—

more formally, the Wharton Residential Land Use Regulation Index (WRLURI, hereafter). This aggregate measure is comprised of 11 sub-indexes that summarise information on the different aspects of the regulatory environment. Nine pertain to local characteristics, while two reflect state court and state legislative/executive branch behaviour. Each index is designed so that a low value indicates a less restrictive or more *laissez faire* approach to regulating the local housing market. Factor analysis is used to create the aggregate index, which then is standardised so that the sample mean is zero and the standard deviation equals one.

Ours is the most recent survey, but it is not the first. Previous efforts along this line include Linneman *et al.* (1990) and Glickfield and Levine (1992). More recently, Pendall *et al.* (2006) also surveyed a cross-section of communities. We were unaware of their effort while conducting our survey, so it is not surprising that there are many differences and some similarities between their work and ours. At this stage in the literature on differences in supply inelasticity across housing markets, we do not think it is possible to tell *a priori* whether one survey conclusively is better than another. Our knowledge-base is so limited at this point in time that we strongly suspect more data are better.

While one immediate goal of our work is to provide a current ranking of communities in terms of the stringency of land use regulatory environments, another important mission is to provide the research community with the underlying data that comprise our measure of regulation so they can be used in analyses of supply inelasticity or in studies of the impacts of regulation on house prices and construction intensity.[3]

A number of noteworthy patterns are evident in the data. Not surprisingly, communities in metropolitan areas tend to be more highly regulated than are those outside metropolitan areas. A comparison of the most

highly regulated communities from the top quartile of index values with the most lightly regulated communities with WRLURI values from the bottom quartile of the distribution finds much more intensely involved local and state pressure-groups in the more highly regulated places. There also is a big difference in the nature of density restrictions as reflected in minimum lot size requirements across these two groups. For example, there is a better than 50 per cent chance that the most highly regulated communities have a one-acre minimum lot size rule for at least one of their neighbourhoods. However, there is less than a 1-in-20 chance that such a rule exists in the most lightly regulated places. There also are large differences in the fraction of communities that have open space requirements and formal exactions policies. They are nearly omnipresent among the more highly regulated communities. Finally, the average delay time between application and approval for a standard project is three times longer in the most highly regulated places versus the least regulated places.

Statistically speaking, there is a strong positive correlation across the component indexes that make up the aggregate WRLURI. Practically, this implies that, if the community is rated as highly regulated on one of the dimensions by which we measure regulatory stringency, it is very likely to be highly regulated along the other dimensions, too. Thus, there is little evidence of targeted regulation at the local level. The data are more consistent with communities deciding on the degree of regulation they want and then imposing that desire across the board.

Another important stylised fact is that community wealth is strongly positively correlated with the degree of local land use regulation. The higher the median family income, median house value or the share of adults with college degrees, the greater is the community's WRLURI value. There also is a weakly negative correlation of our regulatory index with population density. That the highest-density communities tend not to be the most highly regulated does not imply that the motivation for strict land use controls never is a fundamental scarcity arising from places 'running out of land'. However, the fact that many very low-density towns have some of the most strictly regulated environments suggests that land scarcity is not the primary motivation in many cases. The strong correlation with community wealth proxies suggests that researchers and policy-makers should seriously consider exclusionary desires as a motivation in many instances.

There is much heterogeneity in land use regulatory environments across geographical regions, too. While Hawaii is the most heavily regulated state in our sample, that is exclusively a Honolulu effect. Among states with relatively large numbers of communities in our sample, the Northeast dominates the most highly regulated slots, with Massachusetts, Rhode Island and New Hampshire having WRLURI values that are about 1.5 standard deviations above the national average. The communities in the mid-Atlantic states of New Jersey and Maryland are the next most heavily regulated on average according to our overall index measure, with Washington state, Maine, California and Arizona rounding out the top 10. The bottom 10 states with the least regulated communities on average are all from the south or Midwest (plus Alaska).

At the metropolitan area level, the two New England areas of Providence and Boston are the only ones with WRLURI values at least 1.5 standard deviations above the national mean. Four other metropolitan areas—Monmouth-Ocean in suburban New Jersey, Philadelphia, San Francisco and Seattle—each have communities that average one standard deviation about the sample mean. Once again, the least regulated metropolitan areas are in the Midwest and the south. Chicago and Atlanta are typical of markets right near the

national average in terms of land use control regulatory environments.

We recognise that people with different political views or economic interests can differ in their opinions about whether a given local regulatory climate is unduly burdensome or lenient. We leave that debate to others, as our purpose here is to provide a new measure of the land use regulatory environment and to document how it varies across places. We hope this spurs future work that analyses whether prices or quantities in housing markets are materially influenced by the local land use regulatory regime. In turn, those results should serve as the foundation for a broader welfare analysis that can help to guide policy recommendations regarding the efficiency of these regulations.

The plan of the paper is as follows. In section 2, we describe the sampling process and the survey instrument. Section 3 describes in detail the process of the creation of the sub-indexes. In section 4, we describe the aggregate Wharton index and provide summary statistics for the index and its components for the full sample and various subsets of communities. Section 5 then reports on how regulatory strictness varies spatially across states and metropolitan areas. There is a brief summary and statement of general conclusions.

2. The Wharton Survey on Residential Land Use Regulation

Fifteen specific questions were asked in the survey, with a complete copy of the survey provided in Appendix 1. Summary statistics and analysis of the responses to the individual questions can be found in Gyourko and Summers (2006a). We use them to create a series of sub-indexes that summarise different aspects of the diverse landscape characterising the local regulatory environment. Before getting to those component indexes, we turn first to the sampling procedure and

identification of sample selection bias in the response to our questionnaire.

The survey instrument was mailed out to 6896 municipalities across the country. The mailing list was obtained from the International City Managers Association (ICMA) and, for a detailed survey of the Philadelphia metropolitan statistical area (MSA), from the Delaware Valley Regional Planning Commission. The survey was mailed to the Planning Director, where there was such an office. Where none existed, the survey was sent to the Chief Administrative Officer of the municipality.

The overall response rate was 38 per cent, with 2649 surveys returned, representing 60 per cent of the population surveyed. Table 1 reports the response rates by size of locality. The response rate is highest in larger cities, but there are large samples available for all but the smallest communities with less than 2500 residents.[4] While communities with at least 2500 residents are well represented in the sample, it still is the case that the typical city in our sample is not the average city in the country.

One reason is that not all localities belong to ICMA, as indicated by the very small number of places with populations below 2500 in their data file (see column two of the first row in Table 1). Another reason is that the decision to answer the survey was not random. In a truly random sample of (say) K municipalities out of a universe of N, each city would have a K/N probability of making it to the final

Table 1.   Response rate by size of locality

Population	Response rate (percentage)	Number in ICMA list
Less than 2500	29.4	17
2500 to 5000	28.3	1952
5000 to 10 000	35.3	1840
10 000 to 50 000	41.7	2557
50 000 to 100 000	49.5	402
100 000 and over	62.2	241

sample. In that case, all the observations should be weighted identically. In practice, it is likely that certain types of communities have different response rates to our survey. Consequently, logit models of the probability of selection into the survey were estimated to identify the magnitude of the sample selection coefficients.

To begin this process, we constructed a master file of all US localities from census-designated place definition files and then created a sample selection dummy variable. A value of one was assigned to each municipality that also was in our ICMA-based sample, with all other localities being assigned a value of zero for this variable. A logit specification regressing the sample selection dummy on a variety of community traits was then estimated, with the results being used to construct sampling weights for use in statistical analyses.

Table 2 reports the results of those estimations for two samples of communities: for all census-designated places within the US; and, for all such places within metropolitan areas as defined by the census. Separate results are provided because we suspect that many researchers are more interested in residential land regulation in metropolitan areas because they contain the vast majority (about 4/5ths) of the country's population. Table 2's findings show that the probability of a city being included in the sample increases with the population of the locality, with the share of elderly (those 65 or older) in the community, with the share of children in the community (those 18 or younger), with median house value and with educational achievement (as defined by the share of those with college degrees); the probability of being in our sample is decreasing in the share of the community made up of owner-occupiers and in the share of non-Hispanic Whites.[5]

Estimating this model allows us to calculate sample weights based on the inverse of the probability of selection. Two sets of weights

Table 2. Logit estimation results: probability of selection for the national and metropolitan area samples

	(1) All (N = 55 397)	(2) Metropolitan areas (N = 20 945)
Population[a]	0.222 (0.029)***	0.154 (0.025)***
Share owner-occupied households	−4.191 (0.139)***	−3.366 (0.170)***
Share ages 65 and above	1.79 (0.349)***	2.051 (0.457)***
Share ages 18 and below	2.426 (0.414)***	3.562 (0.586)***
Share non-Hispanic White	−0.308 (0.102)***	−0.045 (0.129)
Log median house value	0.686 (0.046)***	0.195 (0.064)***
Share with bachelor's degree	2.601 (0.180)***	2.7 (0.220)***
Constant	−8.937 (0.548)***	−3.951 (0.752)***

[a]Population divided by 100 000 for better result exposition.
Notes: Standard errors in parentheses. *significant at 10 per cent; **significant at 5 per cent; *** significant at 1 per cent.

are created. The first, based on the results from column (1) of Table 2, is relevant for making inferences about the universe of American cities and towns. The second, based on the results from column (2) of Table 2, should be used to make inferences conditional on being in a metropolitan area. Stated differently, they should be used to help make the sample representative of the universe of localities in metropolitan areas. Figure 1 graphs the distribution of the weights for the metropolitan sample. In practice, our estimated probability weights appear log-normal and are heavily clustered around eight. However, there are observations with significantly larger weights and those are the small, lower house value communities.
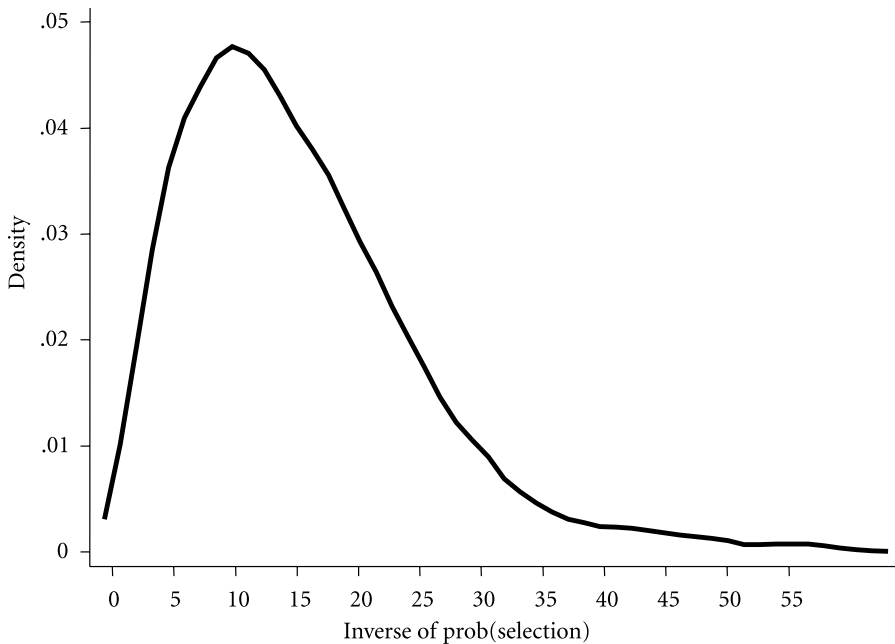
Figure 1.   Distribution of sample weights (kernel density)

3. The Eleven Sub-indexes Comprising the WRLURI

3.1 Sub-index Descriptions

The local political pressure index (LPPI). The first component of the overall index reflects the degree of involvement by various local actors in the development process. The first question in our survey asked respondents to rank the importance of a number of local entities or stakeholders (on a scale of 1 to 5, with one being low and five being high) in affecting residential building activities or the growth management process in general. The local groups listed here include the following: local council, managers, or commissioners; community pressure groups; and, county commissions or legislature. Another question (no. 4) asked about the importance of certain policy matters in affecting the rate of residential development, also on a 1–5 scale. The policy or political issues included the following: school crowding concerns; city budget constraints; council opposition to growth; and, citizen opposition to growth.[6]

The first component of the LPPI is based on the sum of the individual responses, which was then standardised so that it has a mean of zero and a standard deviation of one.[7] The second component used to create the LPPI is the standardised number of land preservation and conservation-related initiatives put on the ballot by communities from 1996 to 2005. This variable is based on information provided by the LandVote™ database of The Trust for Public Land.[8]

More formally, the LPPI sub-index is the standardised sum of the two components as described next

$$
\begin{aligned}
LPPI = STD\{STD[&localcouncil \quad\quad (1)\\
&+ pressuregroup\\
&+ countyleg\\
&+ (sfubudget + mfubudget)/2\\
&+ (sfucouncil + mfucouncil)/2\\
&+ (sfucitizen + mfucitizen)/2\\
&+ (sfuschool + mfuschool)/2]\\
&+ STD[totinitiatives]\}
\end{aligned}
$$

where STD refers to a standardardised variable with a mean of zero and standard deviation of one; *sf* and *mf* refer to single-family and multifamily housing respectively; and the different variable abbreviations correspond to the underlying variables from the questionnaire. Appendix 2 provides added detail on each component, as well as the sub-index itself.

The state political involvement index (SPII). The state political involvement index also is formed as the standardised sum of two components. The first is based on the 50 state profiles of state-level legislative and executive branch activity pertaining to land use regulation developed by Foster and Summers (2005). Those authors ranked states by the degree to which each state's executive and legislative branches facilitated the adoption of greater state-wide land use restrictions. States were given a ranking of 1, 2 or 3 depending upon how active they had been on this issue over the past decade. A score of 1 indicates that there had been little recent activity towards fostering such restrictions, with a 3 indicating that state government has exhibited a high level of activity, not only studying the issue via commissions and like, but also acting on it with laws or executive orders. A score of 2 was achieved if a state was in between dormancy and intense activity on land use issues.[9]

The second component of this sub-index is based on the answers to the survey question (no. 1) on 'How involved is the state legislature in affecting residential building activities and/or growth management procedures?'. The answers take on values from 1 to 5, with a higher score indicating a greater role and influence for the state legislature. We average the local responses within each state and then apply that average to each jurisdiction in the state. This is done to make it more compatible with the other component of this sub-index and to ensure fuller coverage of

the available information on state behaviour. For example, survey respondents in declining towns may misperceive a low level of state interest or regulation because it is not binding in their community. Averaging at the state level helps to deal with this problem. In fact, the correlation between the two index components is a relatively strong 0.41. This also suggests that averaging the two helps to reduce measurement error that remains in each individual component.

Thus, the SPII sub-index is the standardised sum of the two standardised components as reflected in the equation (2)

$$SPII = STD\{STD[execrating] + STD[STATE\_MEAN\{stateleg\}]\} \quad (2)$$

with lower values of this index implying less activity towards more general state land use control. See Appendix 2 for all underlying variable definitions.

The state court involvement index (SCII). The state court involvement index (SCII) is based on another 50 state profile reported in Foster and Summers (2005). The judicial environment was assessed based on the tendency of appellate courts to uphold or restrain four types of municipal land use regulations—impact fees and exactions, fair-share development requirements, building moratoria and spot or exclusionary zoning. The state score here reflects the degree of deference to municipal control, with a score of 1 implying that the courts have been highly restrictive regarding their localities' use of these particular municipal land use tools. A typical example of a state receiving a score of 1 involves the majority of appellate decisions having invalidated spot zoning and the imposition of impact fees, or having placed a relatively high standard for local governments to meet in implementing these land use regulations. On the other end of the spectrum, a score of 3 is given if the courts

have been strongly supportive of municipal regulation. A score of 2 is given if the courts have been neither highly restrictive nor highly supportive of municipal regulation. A typical example here would be for a state in which the majority of appellate decisions have struck down impact fees, but upheld spot zoning cases.[10]

The formula of the index is straightforward,[11] as described in equation (3)

$$SCII = judicialrating \quad (3)$$

Local zoning approval index (LZAI).   The local zoning approval index is based on the answers to survey question no. 2 regarding which organisations or regulatory bodies (denoted as *organisationD* in the formula that follows) have to approve any request for a zoning change. The question listed six groups ranging from a local planning commission to an environmental review board. The LZAI is the simple sum of the number of entities whose approval is required. The more groups with approval rights, the more potential veto points for any given development proposal, so we interpret a larger value for this sub-index as reflecting a more stringent and less *laissez faire* local regulatory environment. The formula used to calculate the LZAI is as follows

$$LZAI = commissionD + loczoningD \quad (4)$$
$$+councilD + cntyboardD$$
$$+cntyzoningD + envboardD$$
$$+zonvote$$

Local project approval index (LPAI).   Our survey also asked which local entities had to approve a project that did not require any zoning change (question no. 3). As with the zoning approval question, six groups or entities were listed and this sub-index value is the simple sum of the number of organisations that must approve a project that does not need any change to current zoning (*norezD*).

Thus, the formula used to calculate the LPAI is as follows

$$LPAI = commission\_norezD \quad (5)$$
$$+council\_norezD$$
$$+cntyboard\_norezD$$
$$+envboard\_norezD$$
$$+publhlth\_norezD$$
$$+d\,\text{sgn}\,rev\_norezD$$

As always, precise definitions for the different variables used to construct the sub-indexes are available in Appendix 2.

Local assembly index (LAI).   The local assembly index is a measure of direct democracy and captures whether there is a community meeting or assembly before which any zoning or rezoning request must be presented and voted up or down. Such assemblies exist in a number of New England communities that have town meetings. We did not ask about this feature in our survey, but many New England jurisdictions noted it in their survey responses. Consequently, we supplemented that self-reported information by a second smaller survey. Specifically, we called every New England-based jurisdiction in our sample and asked two questions: whether they held town meetings; and, whether it was required that any zoning change had to be put to a popular vote at an open town meeting. We would expect the true regulatory environment to be stricter in places where all zoning changes must be voted on by the community. This sub-index takes on a value of 1 if the community both has a regular town meeting and a requirement for a popular vote in order to approve changes to zoning regulations, and is zero otherwise.

Supply restrictions index (SRI).   The supply restrictions index (SRI) reflects the extent to which there are explicit constraints or caps on supplying new units to the market. Our

survey question no. 5 asked whether there were any statutory limits on the number of building permits for single-family and multi-family production, on the number of single-family or multifamily units authorised for construction in any given year, on the number of multifamily dwellings (not units) permitted in the community and on the number of units allowed in any given multifamily building (*limit*). The SRI is the simple sum of the number of 'yes' answers to each of these questions. More formally

$$
\begin{aligned}
SRI = \; &sfupermitlimit + mfupermitlimit \quad (6)\\
&+ sfuconstrlimit + mfuconstrlimit\\
&+ mfudwelllimit + mfuunitlimit
\end{aligned}
$$

with all variables described in Appendix 2.

Density restrictions index (DRI).   Our survey also asked a series of questions about density restrictions in the form of minimum lot size requirements. The data show that over four-fifths of all communities have a mandated minimum in at least some of their neighbourhoods, with many communities reporting different minimums in different parts of their jurisdictions. We transformed the responses to create a dichotomous dummy variable that takes on a value of 1 if the locality has at least a one-acre minimum lot size requirement somewhere within its jurisdiction and a zero if it has no minimums or a less restrictive one.[12] We do this because communities with a one-acre minimum clearly care about (low) density. Thus, the DRI is defined as in equation (7)

$$
\begin{aligned}
DRI = \; &1 \; \text{if } minlotsize\_oneacre \quad (7)\\
&= 1 \text{ or } minlotsize\_twoacres\\
&= 1; \text{ and } DRI = 0 \text{ otherwise}
\end{aligned}
$$

Open space index (OSI).   A separate sub-index reflects whether home-builders in the community are subject to open space requirements or have to pay fees in lieu of such

dedications. Over half (54 per cent) of the communities in our sample report such a requirement. This sub-index is a standard dummy variable that takes on a value of 1 if such requirements are in place and is zero otherwise. Thus, OSI = 1 if the community imposes such regulation and equals zero otherwise.

Exactions index (EI).   Another potentially important facet of the local regulatory environment involves requiring developers to pay their allocable share of costs of any infrastructure improvement associated with new development. This so-called exaction forms the basis of the exactions index. This index is a dummy variable that takes on a value of 1 if exactions for associated infrastructure improvements are mandated by the locality and is zero otherwise. Thus, EI = 1 if developers must pay allocable shares of infrastructure improvement costs and is zero otherwise.[13]

Approval delay index (ADI).   Our survey asked respondents about the average duration of the review process (question no. 10), the typical amount of time between application for rezoning and issuance of a building permit for hypothetical projects (question no. 12) and the typical amount of time between application for sub-division approval and the issuance of a building permit conditional on proper zoning being in place (question no. 13, again for hypothetical projects). More specifically, respondents were asked to reply to the first of these three questions with the number of months for the review process. The latter two questions provided ranges of possible answers (also in months) and we use the mid-point of the relevant interval to reflect the expected delay. In addition, we averaged the answers across the three hypothetical projects described in the questions: a relatively small, single-family project involving fewer than 50 units; a larger single-family development with more

than 50 units; and a multifamily project of indeterminate size.

This sub-index can be interpreted as the average time lag in months and is calculated as follows

$$
\begin{aligned}
\mathrm{ADI} = [&(time\_sfu + time\_mfu)/2 \qquad (8) \\
&+(time1\_l50sfu \\
&+time1\_m50sfu \\
&+time1\_mfu)/3 \\
&+(time2\_l50sfu \\
&+ time2\_m50sfu \\
&+time2\_mfu)/3]/3
\end{aligned}
$$

where, *time_sfu* is the number of months specified in the answer to question 10 about the typical review time for single-family projects; *time_mfu* is the typical review time for a multifamily project; *time1_l50sfu* is the number of months between application for rezoning and building permit issuance for development of a single-family project with less than 50 units; *time1_m50sfu* is the analogous number of months for a larger single-family project with more than 50 units, *time1_mfu* is the lag for a multifamily project; *time2_l50sfu* is the number of months between application for sub-division approval and building permit issuance (assuming proper zoning in place) for the relatively small single-family project; *time2_m50sfu* is the analogous time delay for the larger single-family development; and *time2_mfu* represents the multifamily project for which zoning is already in place.[14]

3.2 Other Data Issues

Dealing with missing data.   It is not un-common for a municipality to have complete data for most survey questions, but missing data for one or two variables. In cases where there is missing information for one of the nearly 50 variables used to create the different sub-indexes, we had to decide whether to drop the city from the sample or try to impute the missing data point. To keep the sample as large as possible, we decided to impute some of the missing values using predictions with maximum likelihood techniques based on other variables used in the indexes.

The ADI and LPPI sub-indexes were most affected by missing data because they are comprised of the most underlying component variables. For example, if the LPPI index for a given locality was missing information on one of its 12 component variables, dropping that observation also eliminates the valu-able information contained in the other 11 variables included in the sub-index. One potential solution is to replace the missing variable with its average value, but a better approach is to calculate the expected value of the variable conditional on the values of the other components of the sub-index under consideration. We used the programme ICE (Royston, 2005) to make the data imputation.[15]

A good heuristic check on the quality of the imputations is to compare the correlations between the indexes in the case of imputed observations with the correlations in the case of the observations that did not require imputations.[16] The results from that exercise are displayed in Table 3. The correlations between the imputed indexes in the cases

Table 3.   Correlations: imputed and non-imputed approval delay index (ADI) and local political presssure index (LPPI) values

	ADI	Imputed ADI	LPPI	Imputed LPPI
ADI	1.00	1.00	0.27	0.27
LPPI	0.25	0.32	1.00	1.00
SPII	0.29	0.28	0.11	0.26
SCII	−0.04	0.06	−0.08	−0.10
LZAI	−0.12	−0.07	0.06	−0.12
LPAI	0.12	0.18	0.19	0.16
SRI	0.14	0.09	0.14	−0.01
DRI	0.15	0.23	0.11	0.27
OSI	0.17	0.16	0.17	0.14
EI	0.04	0.04	0.09	−0.03
N	2085	528	2456	157

where we do not have complete observations are similar to the correlations whenever we did not have to impute the ADI or LPPI component variables.

Given that this process is successful in generating indexes that are consistent with the underlying information in the sample data, the benefits of imputation clearly outweigh the costs because a much larger and broader database is available to researchers. Table 4 documents the importance of the imputation mechanism in terms of the final data sample size. If no imputations are made, 26 per cent of the sample's observations would be lost. Given that the missing variables typically represent a very small fraction of the information contained in the index, and that many of the component variables are strongly correlated, we use our imputation procedure on LPPI and ADI to reduce the loss factor to 4.3 per cent of the initial sample.[17]

Table 4. The impact of imputations on sample size

	Observations	Loss factor (percentage)
Municipalities in the sample	2729	0
Available Wharton index (imputations)	2612	4.3
Available Wharton index (no imputations)	2002	26.6

Correlations across the sub-indexes. Table 5 reports simple correlations across the 11 sub-indexes. Seventy-five per cent of the cross-correlations are positive, which suggests that localities which are restrictive in one aspect of the regulatory process tend not to be lenient in another. This is an important stylised fact about the nature of the local

Table 5. Subindex correlation matrix

	LPPI	SPII	SCII	LZAI	LPAI	LAI	DRI	OSI	EI	SRI
LPPI	1									
SPII	0.12	1								
	0.00									
SCII	−0.08	−0.07	1							
	0.00	0.00								
LZAI	0.07	−0.16	0.05	1						
	0.00	0.00	0.01							
LPAI	0.19	0.03	−0.06	0.28	1					
	0.00	0.18	0.00	0.00						
LAI	0.04	0.20	0.12	−0.04	0.01	1				
	0.06	0.00	0.00	0.04	0.71					
DRI	0.13	0.14	−0.03	−0.03	0.15	0.23	1			
	0.00	0.00	0.14	0.13	0.00	0.00				
OSI	0.17	0.09	0.01	0.02	0.13	−0.06	0.08	1		
	0.00	0.00	0.66	0.36	0.00	0.00	0.00			
EI	0.08	−0.03	0.09	0.10	0.07	−0.14	−0.07	0.26	1	
	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00		
SRI	0.12	0.04	0.03	0.00	0.05	0.11	0.04	0.01	−0.02	1
	0.00	0.02	0.08	0.97	0.01	0.00	0.05	0.51	0.40	
ADI	0.27	0.29	−0.03	−0.12	0.13	0.10	0.17	0.17	0.02	0.12
	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.25	0.00

regulatory environment that will be examined and confirmed in more detail later.

4. Creation and Analysis of the Wharton Residential Land Use Regulatory Index

4.1 Factor Analysis

Factor analysis of the sub-indexes is employed to create the Wharton Residential Land Use Regulatory Index (WRLURI) and we select the first factor as the WRLURI.[18] This strategy is adopted because we wish to capture a single dimension of the data and rank localities according to whether they have a more or less restrictive regulatory environment regarding housing development. Moreover, there seems little need to create additional factors given that the sub-indexes already condense the survey information into a limited number of regulatory dimensions.[19]

In practical terms, the outcome of the factor analysis is not all that dissimilar to the results obtained from simply adding the standardised sum of the component indexes. Figure 2 illustrates this by plotting the actual WRLURI against the sum of the sub-indexes. The correlation between the WRLURI and the sum of the standardised component indexes is 0.81, suggesting that the final index value is not particularly sensitive to the factor analysis weights of the component indexes.

The factor loadings for each standardised component index as well as the correlation of the WRLURI with its component indexes are reported in Table 6. The factor loadings are the weights that are used when multiplying by each of the standardised component indexes to obtain the WRLURI as a linear combination of the sub-indexes. The aggregate index loads positively on 9 of the 11 sub-indexes. It loads most heavily on the average delay index (ADI),
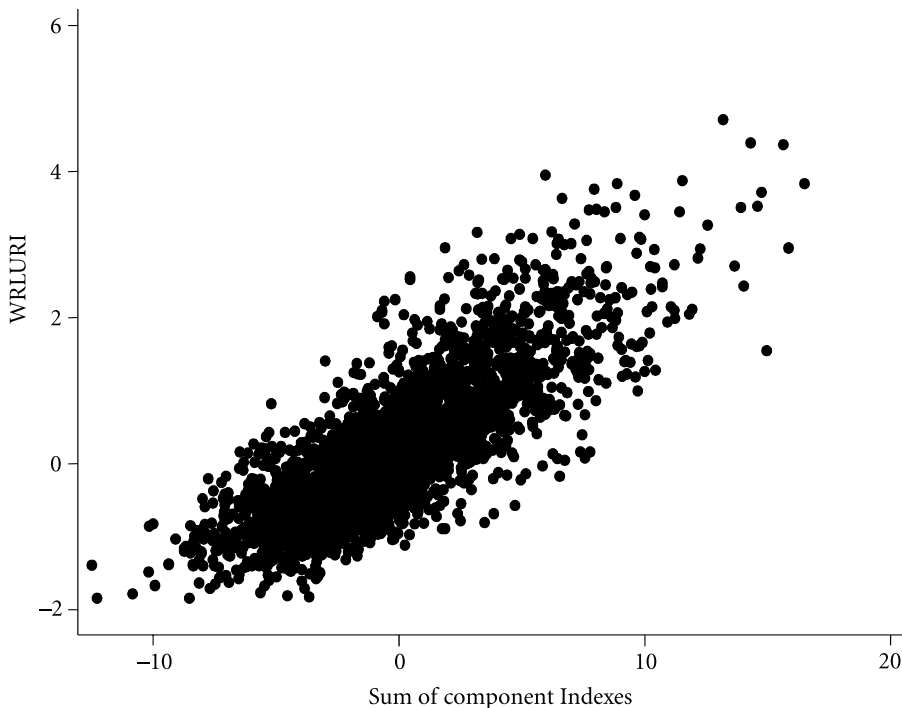
Figure 2. Factor analysis weights are less critical

Table 6. The WRLURI and its components

|	Factor loadings	Correlation with WRLRI
ADI	0.30	0.73
LPPI	0.22	0.56
SPII	0.22	0.57
DRI	0.19	0.53
LPAI	0.15	0.37
OSI	0.14	0.38
LAI	0.14	0.32
SRI	0.09	0.25
EI	0.02	0.05
SCII	−0.03	−0.18
LZAI	−0.04	−0.10

with the state and local political involvement indexes (SPII and LPII) also being relatively influential. The exactions index (EI), the state courts involvement index (SCII) and the local zoning approval index (LZAI) have very small factor loadings, with the latter being very slightly negative. The correlations of WRLURI

with the component indexes provide a sense of what information contained in the sub-indexes did or did not 'make it through' to the WRLURI. The WRLURI is very highly correlated with the average delay index (ADI), but also clearly is being influenced by many other components.

The distribution of the index, which is standardised to have a mean of zero and standard deviation of one, looks distinctively Gausian as the kernel density graph in Figure 3 illustrates. However, we do reject normality due to the presence of skewness and kurtosis in a standard test.

4.2 Analysis of the WRLURI: What Does It Mean to Be Below Average, Average or Above Average in Terms of the Local Regulatory Environment?

Table 7 reports summary statistics on the distribution of the WRLURI. The first column uses the full national, unweighted sample. There are 2611 communities in this sample,
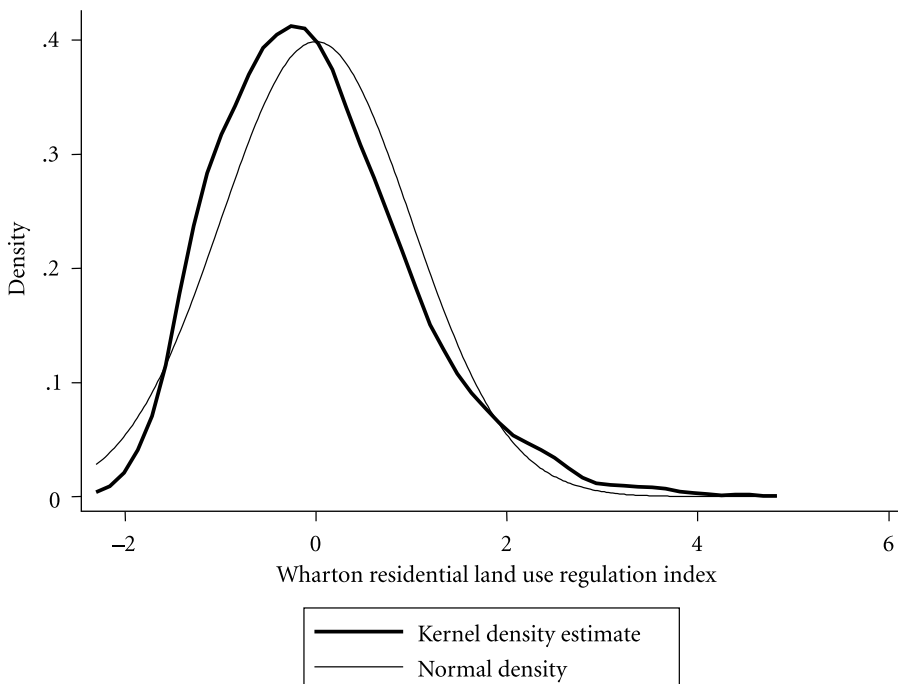
Figure 3. WRLURI looks approximately Gausian (kernel density)

73 per cent (or 1904) of which are in metropolitan areas as defined by the US Bureau of the Census. By construction, the mean of this index is zero and the standard deviation is one. The second column uses the national weights, created as described in section 2. The impact of weighting is fairly modest, but the mean now is slightly negative, indicating that the less regulated places are underweighted in our sample. Overall, the distribution is not much affected, as a quick comparison of the WRLURI values for the 10th and 90th percentile communities shows.

Much of the description that follows focuses on the responses from the 1904 communities in metropolitan areas because they are where the bulk of the population lives. These places are spread across all 50 states and 293 distinct metropolitan areas.[20] The third and fourth columns of Table 7 report index values at the mean and across the distribution of communities within metropolitan areas, both with and without weighting.[21] Weighting itself has little impact on the distribution of WRLURI values, but the average community within a metropolitan area is between 0.1 and 0.2 standard deviations more regulated than the average community in the nation. This suggests that there could be a fairly large gap in the degree of regulation between places in metropolitan areas and those outside

them. The fifth and final column of Table 7 confirms this. Less than one-quarter of the 707 jurisdictions outside metropolitan areas have measures of regulatory strictness that are greater than the national average. The mean index value of -0.46 for this group implies that the typical community within a metropolitan area is about 0.6 standard deviations less regulated than the typical community not located in a metropolitan area $(0.14 - (-0.46) \sim 0.60)$. As the subsequent analysis shows, this is a meaningfully large gap.

Before getting to that material, we first analyse what it means to be average in terms of local land use regulation. To do so, we look at the 164 communities with WRLURI values within one-tenth of a standard deviation of the metropolitan area mean of 0.14 (i.e. 0.05 <WRLURI< 0.24, given the weighted mean of WRLURI = 0.14 in the metropolitan area sample; see column 4 of Table 7). These places are not concentrated in only a few states or areas. Rather, they span 30 states and 89 metropolitan areas. Given the narrowness of our definition of average, this strikes us as a lot of geographical variation and emphasises the point that 'average' places in terms of land use regulatory strictness are spread throughout much of the nation.

Table 7.   Summary statistics for the WRLURI for different samples

	Full sample (N = 2611)		Metro area sample (n = 1904)		Non-metro area sample (n = 707)
	No weighting	National weights	No weighting	Metro weights	No weighting
Mean	0.00	−0.13	0.17	0.14	−0.46
Standard deviation	1.00	0.98	1.00	1.00	0.86
10th percentile	−1.18	−1.25	−1.03	−1.06	−1.42
25th percentile	−0.72	−0.84	−0.55	−0.57	−1.10
50th percentile	−0.10	−0.25	0.06	0.02	−0.56
75th percentile	0.59	0.44	0.74	0.71	−0.00
90th percentile	1.29	1.22	1.50	1.50	0.6

Table 8 then reports the values of the 11 component indexes for these 164 places (column 1) and allows us to compare them with the average values for the metropolitan area sample (column 2). The mean values of the sub-components of our regulatory index tend to be quite close to the metropolitan area means. The same is true for the income, house value and demographic variables reported in the bottom panel of this table. Thus, there does not appear to be anything that is special or abnormal about places that have the typical land use regulatory environment in the country.[22]

While our measure is constructed to rank localities in terms of the degree of strictness of the land use regulatory environment, these data also allow us to say something about what it means to be 'average' in absolute terms. The community with the typical land use regulatory environment in our sample has the following traits: two entities, be they a zoning commission, city council or environmental review board, are required to approve any project requiring a zoning change; more than one entity also is required to approve any project, even if it does not involve a zoning change; it is highly unlikely that any form of direct democracy is practised in which land use issues and projects must be put to a popular vote; there probably is no onerous density restriction such as a one-acre lot size minimum anywhere in the community, although some less stringent minimum constraint generally is in place; some type of exactions and open space requirement probably

Table 8. What does it mean to be average? (means)

	164 communities with 0.04 < WRLURI < 0.024	Full metro sample (n = 1904)
Sub-indexes		
Local political pressure index (LPPI)	−0.03	0.11
State political involvement index (SPII)	0.27	0.05
State court involvement index (SCII)	2.00	2.04
Local zoning approval index (LZAI)	1.94	2.04
Local project approval index (LPAI)	1.73	1.64
Local assembly index (LAI)	0.00	0.03
Supply restrictions index (SRI)	0.19	0.23
Density restrictions index (DRI)	0.16	0.26
Open space index (OSI)	0.72	0.60
Exactions index (EI)	0.73	0.75
Approval delay index (ADI)	6.03	6.09
Local traits		
Median family income (2000)	57 486	57 610
Median house value (2000)	136 017	136 790
Percentage college graduates (2000)	22.4	24.3
Percentage poverty (2000)	6.1	6.5
Percentage White (2000)	79.4	81.0
Population (2000)	27 283	27 924
Land area in square miles (2000)	14.8	17.9
Density of population per square mile (2000)	2 545	2 211

Notes: All community trait data are from the 2000 census. All monetary variables are reported in $2000.

exist, even though they are not as omnipresent as is the case in the more highly regulated places; and, there is about a six-month lag (on average) between the submission of an application for a permit and permit issuance for a standard project.

Table 9's data allow us to contrast places across the full distribution of WRLURI values. Here, we divide the sample into three groups of lightly, modestly and heavily regulated places within metropolitan areas. Lightly regulated places are those in the bottom quartile of the distribution of WRLURI values (WRLURI <–0.55 in this case); modestly regulated places are those spanning the interquartile range of the data (0.55 <WRLURI <0.74); and highly regulated places are defined as those with WRLURI index values above 0.74 which is the boundary for the top quartile of jurisdictions in our metropolitan area sample. The top panel of Table 9 lists the average sub-index values for each group, with the bottom panel providing community income, house value and demographic descriptors.

The differences between lightly and highly regulated places are fairly large for most of the sub-indexes making up the WRLURI. The only exceptions are the State Court Involvement Index (SCII) and the Local Zoning Approval Index (LZAI). For the Local Political Pressure Index (LPPI), there is a 1.5 standard deviation difference between the means of the places in the top and bottom quartiles of the WRLURI distribution ($0.93 - (-0.46) \sim 1.5$). There is similarly large 1.4 standard deviation gap for the state political involvement index (SPII) in row 2 of Table 9 ($0.74 - (-0.68) \sim 1.4$). The results for the local project approval index (LPAI, row 5) indicate that highly regulated places tend to have about one more entity that is required to approve a project, even if that project does not require a zoning change ($1.99 - 1.16 \sim 0.83$). Having multiple approval (and, thus, rejection) points must make the regulatory environment more

burdensome for those wanting to supply new product to the market.

There literally are no lightly regulated places with direct democracy requirements that zoning changes have to be approved by popular vote at an announced meeting (LAI = 0.00; see column 1, row 6 of Table 9). While this type of requirement is relatively rare throughout the sample, 12 per cent of the highly regulated places have it and they are concentrated in three states—Massachusetts, Maine and New Hampshire. We would expect it to be easier to block projects in such situations.[23] There also are very few explicit restrictions on new supply in our communities, but those who have them are much more likely to be in the top quartile of the WRLURI distribution as indicated by the results in the next row for the supply restrictions index (SRI). Density restrictions as reflected in one-acre minimum lot sizes are more widespread, but they still are much more heavily concentrated in places that are highly restrictive on average. The data in row 8 show that 57 per cent of the most highly regulated places have a one-acre minimum lot size requirement in at least one neighbourhood, while only 4 per cent of the most lightly regulated places have such a minimum.

Open space requirements are even more omnipresent, but there still is a meaningful gap between highly and lightly regulated places. Seventy-five per cent of the top quartile of the WRLURI distribution have an open space requirement (i.e. OSI = 1) versus only 26 per cent of the bottom quartile of the WRLURI distribution. Even with respect to exactions, which are the most widespread local regulatory feature, there is a difference across highly versus lightly regulated places. Seventy-five per cent of the former have some type of exactions requirement (i.e. EI = 1) versus only 66 per cent for the bottom quartile of the most lightly regulated communities. Finally, the average project delay time is more

Table 9. Comparing communities with different degrees of local land use regulation (means)

	Lightly regulated (n = 476) (bottom quartile of WRLURI distribution; WRLURI <−0.55)	Average regulated (n = 952) (interquartile range of WRLURI distribution; −0.55 <WRLURI <0.74)	Highly regulated (n = 476) (top quartile of WRLURI distribution; WRLURI >0.74)
The 11 sub-indexes			
Local political pressure index (LPPI)	−0.46	0.07	0.93
State political involvement index (SPII)	−0.68	0.17	0.74
State court involvement index (SCII)	2.15	2.04	2.03
Local zoning approval index (LZAI)	2.13	1.99	1.91
Local project approval index (LPAI)	1.16	1.67	1.99
Local assembly index (LAI)	0.00	0.002	0.12
Supply restrictions index (SRI)	0.03	0.18	0.53
Density restrictions index (DRI)	0.04	0.18	0.57
Open space index (OSI)	0.26	0.68	0.75
Exactions index (EI)	0.66	0.79	0.75
Approval delay index (ADI)	3.2	5.7	10.5
Local traits			
Median family income (2000)	50 742	58 641	72 576
Median house value (2000)	110 926	150 576	216 748
Percentage college graduates (2000)	23.6	27.0	35.4
Percentage poverty (2000)	8.5	7.0	4.8
Percentage White (2000)	78.6	76.9	81.1
Population (2000)	62 760	43 408	51 567
Land area in square miles (2000)	21.0	18.4	31.1
Density of population per square mile (2000)	2 599	2 886	2 046

Notes: All community trait data are from the 2000 census. All monetary variables are reported in $2000.

than three times longer in the highly regulated places versus the most lightly regulated places. More specifically, the approval delay index (ADI) indicates a mean delay of 10.5 months in the more regulated areas versus 3.2 months in the less regulated areas.

In sum, highly regulated places tend to be so almost across the board. The top quartile of places in terms of WRLURI values tends to be communities with more intensely involved local political environments relating to land use regulation. They also tend to be in states whose executive and legislative branches are facilitating the adoption of state-wide land use rules. However, their courts may or may not be adding to this process. Highly regulated places also tend to have multiple veto points for project approval, although there is no apparent difference in this dimension for project-level zoning approval. Direct democracy in terms of requiring a popular vote for zoning changes is almost exclusively a characteristic of highly regulated places. And, the most highly regulated quarter of the metropolitan sample is disproportionately likely to have some type of formal restriction on new supply, a relatively onerous one-acre lot size minimum, as well as open space and exaction requirements. Finally, these places have by far the highest average project delay times.

The bottom panel of Table 9 documents that highly regulated places also are richer, much more highly educated and have substantially higher house values than the most lightly regulated places in terms the WRLURI distribution. Median family income is more than $20 000 greater in the most highly regulated prices and has a simple correlation coefficient of 0.35 with our regulation index. Median house value in highly regulated places is nearly double that in lightly regulated places and has a 0.33 correlation with WRLURI. The 12 percentage point gap in the fraction of households headed by college graduates is quite large considering that the sample

average is 28 per cent. Its simple correlation with the degree of local land use regulation is 28 per cent. The most highly regulated areas by our measure have a greater fraction of White households, but the difference with the most lightly regulated areas is modest. The same holds for average population across these places. However, the most highly regulated areas are physically larger and they are 25 per cent less densely populated.

While nothing causal about income, education or house value determining the degree of local land use regulation can be inferred from the data presented in the bottom panel of Table 9, the density result is strongly suggestive. If regulation were being driven primarily by the fact that places literally were running out of land, then we would expect the most highly regulated places to be the most densely populated. That the reverse is true strongly suggests that this is not a primary motivation for more intense regulation in many places (see Gyourko and Summers, 2006a, for more analysis of this issue).

5. Analysis of the WRLURI: Variation across States and Metropolitan Areas

Table 10 reports average WRLURI values by state in descending order. Hawaii is the most intensely regulated state by our measure, being 2.3 standard deviations above the national mean. However, this is based on a single response from the city of Honolulu for that state. The other states in the top 10 are dominated by those on the coasts, especially those in the east. The second, third and fourth slots are occupied by Rhode Island, Massachusetts and New Hampshire respectively, with each being well over one standard deviation more highly regulated than the average. New Jersey and Maryland from the Mid-Atlantic region occupy the fifth and sixth places, each being about four-fifths of a standard deviation more high regulated

Table 10. Average WRLURI values by state

State	WRLURI	Number of observations	State	WRLURI	Number of observations
1. Hawaii	2.32	1	26. Georgia	−0.21	56
2. Rhode Island	1.58	17	27. North Carolina	−0.35	64
3. Massachusetts	1.56	79	28. Montana	−0.36	6
4. New Hampshire	1.36	32	29. Ohio	−0.36	135
5. New Jersey	0.88	104	30. Texas	−0.45	165
6. Maryland	0.79	18	31. Nevada	−0.45	7
7. Washington	0.74	49	32. Wyoming	−0.45	7
8. Maine	0.68	44	33. North Dakota	−0.54	8
9. California	0.59	182	34. Kentucky	−0.57	28
10. Arizona	0.58	40	35. Idaho	−0.63	19
11. Colorado	0.48	48	36. Tennessee	−0.68	41
12. Delaware	0.48	5	37. Nebraska	−0.68	22
13. Connecticut	0.38	65	38. Oklahoma	−0.70	36
14. Pennsylvania	0.37	182	39. South Carolina	−0.76	30
15. Florida	0.37	97	40. Mississippi	−0.82	21
16. Vermont	0.35	24	41. Arkansas	−0.86	23
17. Minnesota	0.08	80	42. West Virginia	−0.90	15
18. Oregon	0.08	42	43. Alabama	−0.94	37
19. Wisconsin	0.07	93	44. Iowa	−0.99	59
20. Michigan	0.02	111	45. Indiana	−1.01	47
21. New York	−0.01	93	46. Missouri	−1.03	67
22. Utah	−0.07	41	47. South Dakota	−1.04	11
23. New Mexico	−0.11	16	48. Louisiana	−1.06	19
24. Illinois	−0.19	139	49. Alaska	−1.07	7
25. Virginia	−0.19	35	50. Kansas	−1.13	46

than the national average. Washington (state), Maine, California and Arizona round out the top 10, and bring the coastal western states into the picture.

Moving down the rankings, the eleventh and twelfth places (Colorado and Delaware respectively) are about one-half standard deviation more heavily regulated than the mean. The communities in the next four states of Connecticut, Florida, Pennsylvania and Vermont have WRLURI values that average about one-third of a standard deviation higher than the national mean.

There are then 10 states ranging from Minnesota (no. 17) to Georgia (no. 26), whose community's index values average within 0.2 standard deviations of the national mean. In

this sense, these states are the most typical of local land use regulation in the nation.

This leaves 24 states with average community WRLURI scores that are at least one-third of a standard deviation below the national mean, with three-quarters of these having mean index values more than one-half standard deviation below the national mean. These are primarily southern and Midwestern states, with South Dakota, Alaska, Indiana, Missouri, Montana, Louisiana and Kansas each being a full standard deviation below the national mean. These results emphasise that local land use regulation is not uniform across space, nor uniformly high. Moreover, there are at least a few fast-growing states (such as North Carolina, South Carolina and Texas)

that were lightly regulated on average at the time of our survey.

It is also the case that there always is some heterogeneity across communities even in the most highly or lightly regulated state. For example, in Massachusetts which has a state average that is 1.56 standard deviations above the national mean, 10 per cent of the communities (8 out of 79) still have WRLURI values below zero and thus are more lightly regulated than the average place in the country. On the other end of the spectrum, 9 per cent of the 67 communities in Missouri are more highly regulated than average (one place is 0.90 standard deviations above the mean) even though the average across all places in the state is a standard deviation below the national mean. In addition, there is substantial variation across places in an 'average' state such as Michigan (mean WRLURI value of 0.03). The distribution in that state is symmetrical, with the tenth percentile community having a WRLURI value of –0.75 and the ninetieth percentile community having a WRLURI value of 0.79.

This type of variation naturally leads us to look across metropolitan areas, although we do so only for those labour market areas for which we have more than 10 responses to our survey. There are 47 such areas and they are listed in descending order of the WRLURI in Table 11. Like the state-level distribution, this one is skewed, with the most highly regulated metro areas having WRLURI values more in excess of the mean than the index values of the most lightly regulated areas are below the mean.

Given the state-level data just presented, it is no surprise to see two New-England-based metropolitan areas, Providence, RI, and Boston, MA, at the top of the list. These areas are at least 1.5 standard deviations more heavily regulated than the average place in the US. Part of the reason they rank so highly is that some of their smaller communities have the requirement that zoning changes be put

to a popular vote but, as the previous discussion implies, that is not the only reason. The communities in these metropolitan areas tend to be relatively more intensely regulated on almost all the dimensions we measure.

Four other areas have average WRLURI values that are about one standard deviation above the national mean. These include Monmouth–Ocean, NJ, Philadelphia, PA, San Francisco, CA, and Seattle, WA. Philadelphia's presence in this group is another indicator of the heterogeneity across places within states, as its mean is significantly higher than that for Pennsylvania as a whole.[24] Another 13 metropolitan areas have WRLURI values that are about one-half to three-quarters of a standard deviation about the national average. This is a wide-ranging group that includes many of the most expensive and highest growth markets in the country. Some of these markets such as Phoenix have been associated with fairly easy supply conditions in the past that allowed plentiful new supply. How the present local regulatory environment will affect the supply side of that market in the future is an interesting issue to watch.

The Chicago, IL, and Atlanta, GA, markets stand out among the average-group with WRLURI values near zero. The bottom 10 markets with index values of a fifth of a standard deviation or more below average are dominated by relatively slowly growing Midwestern metropolitan areas such as Kansas City, Indianapolis and St Louis, but they also include the burgeoning Texas markets of Houston and Fort Worth.

6. Summary and Conclusions

We developed a new measure, the Wharton Residential Land Use Regulatory Index, of differences in the local land use regulatory climate across more than 2600 communities nation-wide based on the results of a 2005 survey and a separate study of state executive, legislative and court activity. The WRLURI

Table 11. Average WRLURI values by metropolitan areas with 10 or more observations

Metropolitan area	WRLURI	Number of observations
1. Providence–Fall River–Warwick, RI–MA	1.79	16
2. Boston, MA–NH	1.54	41
3. Monmouth–Ocean, NJ	1.21	15
4. Philadelphia, PA	1.03	55
5. Seattle–Bellevue–Everett, WA	1.01	21
6. San Francisco, CA	0.90	13
7. Denver, CO	0.85	13
8. Nassau–Suffolk, NY	0.80	14
9. Bergen–Passaic, NJ	0.71	21
10. Fort Lauderdale, FL	0.70	16
11. Phoenix–Mesa, AZ	0.70	18
12. New York, NY	0.63	19
13. Riverside–San Bernardino, CA	0.61	20
14. Newark, NJ	0.60	25
15. Springfield, MA	0.58	13
16. Harrisburg–Lebanon–Carlise, PA	0.55	15
17. Oakland, CA	0.52	12
18. Los Angeles–Long Beach, CA	0.51	32
19. Hartford, CT	0.50	28
20. San Diego, CA	0.48	11
21. Orange County, CA	0.39	14
22. Minneapolis–St Paul, MN–WI	0.34	48
23. Washington, DC–MD–VA–WV	0.33	12
24. Portland–Vancouver, OR–WA	0.29	20
25. Milwaukee–Waukesha, WI	0.25	21
26. Akron, OH	0.15	11
27. Detroit, MI	0.12	46
28. Allentown–Bethlehem–Easton, PA	0.10	14
29. Chicago, IL	0.06	95
30. Pittsburgh, PA	0.06	44
31. Atlanta, GA	0.04	26
32. Scranton–Wilkes–Barre–Hazelton, PA	0.03	11
33. Salt Lake City–Ogden, UT	−0.10	19
34. Grand Rapids–Muskegon–Holland, MI	−0.15	16
35. Cleveland–Lorain–Elyria, OH	−0.16	31
36. Rochester, NY	−0.17	12
37. Tampa–St Petersburg–Clearwater, FL	−0.17	12
38. Houston, TX	−0.19	13
39. San Antonio, TX	−0.24	12
40. Fort Worth–Arlington, TX	−0.27	15
41. Dallas, TX	−0.35	31
42. Oklahoma City, OK	−0.41	12
43. Dayton–Springfield, OH	−0.50	17
44. Cincinnati, OH–KY–IN	−0.56	27
45. St Louis, MO–IL	−0.72	27
46. Indianapolis, IN	−0.76	12
47. Kansas City, MO–KS	−0.80	29

Notes: Metropolitan area definitions are based on 1999 boundaries. Consolidated metropolitan statistical areas (CMSAs) are disaggregated into primary metropolitan statistical areas wherever relevant.

is based on a single factor extracted from 11 sub-indexes that measure various facets of the local regulatory environment. Our focus in this paper is on that single factor, with other work (see Gyourko and Summers, 2006a) delving in more detail into the sub-components of the index.

Our results confirm some of the popular wisdom and implications of previous research that there are some very highly regulated markets. However, the broader picture is one of spatial heterogeneity, with substantial variation across metropolitan areas and somewhat less variability across communities within a given market area. At the state level, the north-east dominates the top slots (after Hawaii), with Massachusetts, Rhode Island and New Hampshire having WRLURI values that are about 1.5 standard deviations above the national average. The practice of direct democracy in the form of town meetings that require land use issues to be put to popular vote, especially in their smaller communities, appears to be an important part of the explanation of why such a large fraction of localities in these states are measured as heavily regulated. The communities in the mid-Atlantic states of New Jersey and Maryland are the next most heavily regulated according to our measure, followed by Washington state, Maine, California and Arizona to round out the top 10. The bottom 10 states with the least regulated communities on average are all from the south or Midwest (plus Alaska).

At the metropolitan area level, the two New England areas of Providence and Boston are the only ones with WRLURI values at least 1.5 standard deviations above the national mean. Monmouth–Ocean in suburban New Jersey, Philadelphia, San Francisco and Seattle each have communities that average one standard deviation about the sample mean. Once again, the least regulated metropolitan areas are in the Midwest and the south.

Chicago and Atlanta are typical of markets right near the national average in terms of land use control regulatory environments.

Another noteworthy stylised fact is that the most highly (lightly) regulated communities tend to be relatively more (less) restrictive on most of the dimensions we measure. Thus, heavily regulated places with high WRLURI values well above the sample mean are those with multiple local pressure groups interested in land use control or growth management, with stringent density restrictions as reflected in a one-acre lot size minimum somewhere within the community, a high probability of exactions and open space requirements on new development and a relatively slow project application and approval process. The converse holds for the less regulated places with negative WRLURI values well below zero. They have relatively few groups interested in the growth management process, there is a low probability that a density restriction along the lines of a one-acre minimum exists, open space and exactions regulations are less prevalent and the project approval process is a speedy one. Statistically, this means that there is a fairly strong positive average correlation across the different components comprising the WRLURI.

Community wealth is strongly positively correlated with the degree of local land use regulation. That is, the higher the median family income, median house value or the share of adults with college degrees, the greater is the community's WRLURI value. While causality cannot be inferred from this correlation, more telling about the likely motivation for stricter land use controls is the weak, slightly negative, correlation of our regulatory measure with density. That many very low density towns have the most stringent regulatory environments indicates that land scarcity is not a primary motivation for their behaviour.

Notes

1. There is a growing literature in the area. Fischel (1985) initially outlined many of the major conceptual issues and Quigley (2007) provides a valuable update on recent developments. Empirical studies into the links between the stringency of the local regulatory environment and house prices or new construction include Noam (1983), Katz and Rosen (1987), Pollakowski and Wachter (2000), Malpezzi (1996), Levine (1996), Mayer and Somerville (2000), Glaeser and Gyourko (2003), Quigley and Raphael (2004), Glaeser *et al.* (2005a, 2005b), Quigley and Rosenthal (2005), Glaeser *et al.* (2006), Saks (2005) and Ihlanfeldt (2007).

2. Glaeser *et al.* (2006) come closest to doing so. For a subset of the Boston metropolitan area, they conducted a detailed analysis of local zoning codes, permitting precise calculations of potential housing supply across communities. However, the enormity of that effort prevents it from being replicated in other markets by a single research team.

3. We suspect those studies will find that certain features of the data are better than others in explaining outcomes across housing markets. That is why we believe it is important to generate different types of data so that researchers can then determine which are more valuable in answering different types of questions. A longer-run goal probably should be to merge survey efforts into a single, well-designed questionnaire that would be institutionalised and conducted at regular intervals. However, it is premature to follow that path for the reasons discussed just above. For example, one important difference between our survey and that of Pendall *et al.* (2006) is that we included questions on approval delays for hypothetical projects. As we document later, our index loads heavily on this information and we believe it is an important local trait. However, it is for future research to determine conclusively whether this attribute is critical in defining the local regulatory environment and whether it can account for patterns in price differences and construction activity across places. To facilitate that research, the full set of responses to the Wharton Survey on Residential Land-Use Regulation may be downloaded in Stata format at the following URL: http://real.wharton.upenn.edu/~gyourko/.

4. Surveys were also mailed to 3003 counties, 32 per cent of whom responded. Those data are not used here.

5. These latter two effects are the result of a very high response rate among larger cities which tend to have a higher fraction of renters and non-White residents.

6. Question 4 from our survey also asked about the importance of issues such as school crowding in affecting the rate of both single-family and multifamily development. We always use the average of the responses for single-family and multifamily sectors.

7. We equally weight each response because we do not have strong priors about which elements are likely to be more important. Moreover, experimentation with factor analysis to determine relative weights for each component yielded very similar results in the sense that the correlation between the simple sum used here and the linear combination obtained using factor analysis weights was 0.94. This pattern holds throughout the data, so we generally report results for the sub-indexes based on simple sums. We do use factor analysis to construct the main regulation index. See later for more on that, as well as for discussion of its robustness to assuming equal weights for the 11 sub-indexes.

8. About 14 per cent of the responding communities had at least one such ballot proposal, with less than 1 per cent having two or more (see The Trust for Public Land website at http://www.tpl.org/tier2_kad.cfm?content_item_id=0andfolder_id=2607 for more detail).

9. The authors used information from a variety of sources including reviews of executive orders on state websites, analyses by the American Planning Association, case law, journal articles, publications by environmental pressure groups, state commission reports and telephone conversations with state officials (see Foster and Summers, 2005, for the details).

10. In a very few cases (Alaska, Georgia, Hawaii and Oklahoma), there was insufficient case

law to make a determination. That situation arises either because there is a statutory framework that makes the appeal of trial court decisions unlikely or because there are relatively few municipal land use restrictions in the first place. Such states are coded 2—neither highly restrictive nor permissive. Our results are not sensitive to these particular assignments of values (see Foster and Summers, 2005, for the details).

11. We do not standardise here (or elsewhere) when there is no need to compare variables measured with different metrics.

12. Thirty-six per cent of the respondents reporting some type of minimum lot size restriction have a half-acre minimum. Of this group, about 90 per cent have at least some part of their community with a one-acre or more minimum. Thus, one-acre minimums are not the norm, but if a community is going to have a binding restriction of at least a half-acre, it is highly likely to have even more stringent constraints of one acre or more.

13. Recent research by Ihlanfeldt and Burge (2006a, 2006b) suggests that how impact fees affect regulatory stringency can depend upon their levels and uses, not just their existence. Our survey only asked whether communities used them. Future efforts probably should include questions on their levels and uses.

14. If the responding community indicated that multifamily development was banned by rule, we assigned them the topcode for the variable or the maximum value reported in the sample if the variable was not topcoded. In a sense, restrictiveness is infinitely high when a product is not allowed, so we wish the variable to have a value indicating stringency.

15. We iterate ICE's imputation procedure 10 times.

16. Note that this is not a true out-of-sample test, because we did not use the component variables in the other indexes to impute the values of the LPPI and ADI indexes.

17. We recognised that other researchers could come to a different conclusion. Hence, in the data being made available, an allocation flag is included in all instances in which a variable has been imputed.

18. Version 9.1 of the statistical programme Stata is used to perform the factor analysis. Factors are not rotated in our analysis.

19. That said, researchers certainly can utilise the sub-indexes to explore the impacts of different dimensions of the regulatory space.

20. Metropolitan areas are defined based on 1999 boundaries and primary metropolitan statistical areas (PMSAs) within a consolidated metropolitan statistical area (CMSA) are considered distinct areas. There were 337 PMSAs and MSAs combined in 1999, so our sample includes communities in 87 per cent of such areas. The tables provide information on the number of observations by metro area and state.

21. Whenever the sample is restricted to places within metropolitan areas, we use the metropolitan-area-specific weights which make the sample representative of metropolitan America.

22. Another interesting feature of the data is that they show the regulatory climate in central cities tends to be less strict according to our data. The mean WRLURI value for central cities in our sample is –0.14, with the median being –0.25. There is considerable heterogeneity across central cities, but they have a less restrictive land use regulatory environment on average than their suburbs. The gap between their mean and that for the suburbs is about one-third of a standard deviation (see Gyourko and Summers, 2006a, for more detail).

23. The standard economic reasoning pertaining to concentrated benefits and dispersed costs underpins this point.

24. The Philadelphia metropolitan area sample used here is a 20 per cent random draw from a special dataset that included 271 communities—virtually every jurisdiction within that metropolitan area. The results are not materially different if we use every observation from that special survey. However, we did not want to distort the national sample by including so many observations from one area (see Gyourko and Summers, 2006b, for more on the Philadelphia area analysis).

Acknowledgements

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Appendix 1. The Survey Instrument

<div align="center">

Zell/Lurie Real Estate Center
Wharton School, University of Pennsylvania

SURVEY ON RESIDENTIAL LAND-USE REGULATION

</div>

JURISDICTION

Name of Jurisdiction _____ Zip Code _____

Type of Jurisdiction _____

_____

<div align="center">(City, County, Township, Town, Village, Borough)</div>

Size of Jurisdiction _____ square miles

Population
   Current population estimate _____
   Population growth: Past 5 years _____ %   Projected next 5 years _____ %

GENERAL CHARACTERISTICS OF LAND REGULATORY PROCESS

1.   In your community, how involved are the following organizations in affecting residential building activities and/or growth management procedures? Please rate the importance of each on a scale of 1 to 5 by circling the appropiate number (1 = not at all involved; 5 = very involved).

- Local Council, Managers, Commissioners	1	2	3	4	5
- Community pressure	1	2	3	4	5
- County legislature	1	2	3	4	5
- State legislature	1	2	3	4	5
- Local courts	1	2	3	4	5
- State courts	1	2	3	4	5

2.   Which of the following are required to approve zoning changes, and by what vote?

	Yes	Yes, by simple majority	Yes, by more than simple majority	No
- Local Planning commission				
- Local Zoning Board				
- Local Council, Managers, Commissioners				
- County Board of Commissioners				
- County Zoning Board				
- Environmental Review Board				

3. Which of the following are required to approve a new project that does not need rezoning, and by what vote?

	Yes	Yes, by simple majority	Yes, by more than simple majority	No
- Planning Commission				
- Local Council, Managers, Commissioners				
- County Board				
- Environmental Review Board				
- Public Health Office				
- Design Review Board				

4. On a scale of 1 to 5, please rate the importance of each of the following factors in regulating the rate of residential development in your community (1 = not at all important; 5 = very important). Please circle the appropriate number.

	Single family units					Multi family units				
- Supply of land	1	2	3	4	5	1	2	3	4	5
- Cost of new infrastructure	1	2	3	4	5	1	2	3	4	5
- Density restrictions	1	2	3	4	5	1	2	3	4	5
- Impact fees/exactions	1	2	3	4	5	1	2	3	4	5
- City budget constraints	1	2	3	4	5	1	2	3	4	5
- City Council opposition to growth	1	2	3	4	5	1	2	3	4	5
- Citizen opposition to growth	1	2	3	4	5	1	2	3	4	5
- School crowding	1	2	3	4	5	1	2	3	4	5
- Length of review process for zoning	1	2	3	4	5	1	2	3	4	5
- Length of review process for building permits	1	2	3	4	5	1	2	3	4	5
- Length of review process for land development plan	1	2	3	4	5	1	2	3	4	5

RULES OF RESIDENTIAL LAND USE REGULATION

5. Does your community place annual limits on the total allowable:

	Yes	No
- No. of building permits – single family?		
- No. of building permits – multi-family?		
- No. of residential units authorized for construction – single family?		
- No. of residential units authorized for construction – multi-family?		
- No. of multi-family dwellings?		
- No. of units in multi-family dwellings?		

6. To build, do developers have to meet these requirements?

	Yes	No

- Meet the minimum lot size requirement?
    If yes: ½ acre or more _____   ½ acre or less _____
         1 acre or more _____ 2 acres or more _____		

- Include "affordable housing" (however defined)?		
- Supply mandatory dedication of space or open space (or fee in lieu of dedication)?		
- Pay allocable share of costs of infrastructure improvement?		

SPECIFIC CHARACTERISTICS

7. How does the acreage of land zoned for the following land uses compare to demand?

	Far more than demanded	More than demanded	About right	Less than demanded	Far less than demanded
- Single-family					
- Multi-family					
- Commercial					
- Industrial					

8. How much has the cost of lot development, including subdivisions, increased in the last 10 years?   Please circle the appropriate category.

0–20%   21–40%   41–60%   61–80%   81–100%   >100%

9. How much has the cost of a single family lot increased in the last 10 years?
Please circle the appropriate category.

0–20%   21–40%   41–60%   61–80%   81–100%   >100%

10. What is the current length of time required to complete the review of residential projects in your community?

For single-family units: _____ months   For multi-family units: _____ months

11. Over the last 10 years, how did the length of time required to complete the review and approval of residential projects in your community change?

	no change	somewhat longer	considerably longer
- Single-family units			
- Multi-family units			

12. What is the typical amount of time between application for rezoning and issuance of a building permit for development of:

	Less than 3 mos.	3 to 6 mos.	7 to 12 mos.	13 to 24 mos.	If above 24, How long?
- Less than 50 single family units					
- 50 or more single family units					
- Multi-family units					

13. What is the typical amount of time between application for subdivision approval and the issuance of a building permit (assume proper zoning is already in place) for the development of:

	Less than 3 mos.	3 to 6 mos.	7 to 12 mos.	13 to 24 mos.	If above 24, How long?
- Less than 50 single family units					
- 50 or more single family units					
- Multi-family units					

14. How many applications for zoning changes were <u>submitted</u> in your community in the last 12 months?

—————————————

15. How many applications for zoning changes were <u>approved</u> in your community in the last 12 months?

—————————————

In the event we might need to clarify any of the answers to the above questions, we would appreciate the following information, which will be held in total confidence.

Name ——————————————————————————————————
Title ———————————————————————————————————
Organization ————————————————————————————————
Address ——————————————————————————————————

————————————————————————————————————

Phone ————————————————————————
Fax ——————————————————————————
E-mail ————————————————————————

Please check this box if you would like to receive the results of this survey. ☐

Thank you very much for taking the time to complete this survey.

June 2004

Table A1. Index construction details

Index	Component	Variable long name	Definition	Code	Source
LPPI	*local*	Local council, managers, commissioners Involvement	The degree of involvement of the local council, managers and commissioners in affecting the residential building activities and/or growth management procedures of a jurisdiction	1 = not at all involved; 5 = very involved	Line item 1 of survey question 1
LPPI	*pressure*	Community pressure involvement	The degree of involvement of community pressure in affecting the residential building activities and/or growth management procedures of a jurisdiction	1 = not at all involved; 5 = very involved	Line item 2 of survey question 1
LPPI	*sfubudget*	Importance of city budget constraints, single-family	The importance placed on how a jurisdiction's budget constraints affect the rate of single-family residential development	1 = not at all important; 5 = very important	Line item 5 of survey question 4
LPPI	*mfubudget*	Importance of city budget constraints, multifamily	The importance placed on how a jurisdiction's budget constraints affect the rate of multifamily residential development	1 = not at all important; 5 = very important	Line item 5 of survey question 4
LPPI	*sfucouncil*	City council opposition to growth important, single-family	The importance of a jurisdiction's city council opposing growth, to the amount that it affects the rate of single-family residential development in that jurisdiction	1 = not at all important; 5 = very important	Line item 6 of survey question 4
LPPI	*mfucouncil*	Importance of city council opposition to growth, multifamily	The importance of a jurisdiction's city council opposing growth, to the amount that it affects the rate of multifamily residential development in that jurisdiction	1 = not at all important; 5 = very important	Line item 6 of survey question 4
LPPI	*sfucitizen*	Importance of citizen opposition to growth, single-family	The importance placed on how citizen opposition to growth affects the rate of single-family residential development in each jurisdiction	1 = not at all important; 5 = very important	Line item 7 of survey question 4

(Table A1 continued)

(Table A1 continued)

Index	Component	Variable long name	Definition	Code	Source
LPPI	*mfucitizen*	Importance of citizen opposition to growth, multifamily	The importance placed on how citizen opposition to growth affects the rate of multifamily residential development in each jurisdiction	1 = not at all important; 5 = very important	Line item 7 of survey question 4
LPPI	*sfuschool*	Importance of school crowding, single-family	The importance of a jurisdiction's school crowding in regulating the rate of single-family residential development	1 = not at all important; 5 = very important	Line item 8 of survey question 4
LPPI	*mfuschool*	Importance of school crowding, multifamily	The importance of a jurisdiction's school crowding in regulating the rate of multifamily residential development	1 = not at all important; 5 = very important	Line item 8 of survey question 4
LPPI	*totinitiatives*	Total number of conservation initiatives approved	Number of ballot initiative passed by the jurisdiction from 1996 to 2005		Trust for the Public Land, Landvote database http://www.tpl.org/ tier2_kad.cfm?content_ item_id = 0&folder_id = 2607; Accessed on July 26, 2005

LPPI = Standardised{Standardised [local + pressure + countyleg + (sfubudget + mfubudget)/2 + (sfucouncil + mfucouncil)/2 + (sfucitizen+mfucitizen)/2 + (sfuschool+mfuschool)/2] + Standardised[totinitiatives]}

Index	Component	Variable long name	Definition	Code	Source
SPII	*stateleg*	State legislature involvement (state average)	The degree of involvement of the state legislature in affecting the residential building activities and/or growth management procedures of a jurisdiction	1 = not at all involved; 5 = very involved	Line item 4 of survey question 1
SPII	*execrating*	Executive and legislative rating	The level of activity in the executive and legislative branches over the past 10 years that is directed toward enacting greater state-wide land use restrictions	1 = little recent activity; 2 = moderate activity; 3 = high level of activity	Foster and Summers (2005)

SII = Standardised{Standardised[State Average {$stateleg$}] + Standardised [$execrating$]}

					Foster and Summers (2005)
CII	*judicialrating*	Judicial rating	The tendency of appellate courts to uphold or restrain municipal land use regulation	1 = restricts local regulation; 2 = neutral; 3 = supports local regulation	
LZAI	*commissionD*	Local planning commission required to approve zoning changes	The requirement that a local planning commission review and approve a new project that entails rezoning	0 = not required; 1 = required	Line item 1 of survey question 2
LZAI	*loczoningD*	Local zoning board required to approve zoning changes	The requirement that a local zoning board review and approve a new project that entails rezoning	0 = not required; 1 = required	Line item 2 of survey question 2
LZAI	*councilD*	Local council, managers, commissioners required to approve zoning changes	The requirement that local council, managers, or commissioners review and approve a new project that entails rezoning	0 = not required; 1 = required	Line item 3 of survey question 2
LZAI	*cntyboarD*	County board of commissioners required to approve zoning changes	The requirement that the county board of commissioners review and approve a new project that entails rezoning	0 = not required; 1 = required	Line item 4 of survey question 2
LZAI	*cntyzoning*	County zoning board required to approve zoning changes	The requirement that the county zoning board review and approve a new project that entails rezoning	0 = not required; 1 = required	Line item 5 of survey question 2
LZAI	*envboarD*	Environmental review board required to approve zoning changes	The requirement that an environmental review board approve a new project that entails rezoning	0 = not required; 1 = required	Line item 6 of survey question 2

(Table A1 continued)

(Table A1 continued)

Index	Component	Variable long name	Definition	Code	Source
LZAI	*zonevote*	Town meeting vote required to approve zoning changes	The requirement that all new projects that entail rezoning be voted on at a meeting of the jurisdiction's citizens	0 = not required; 1 = required	Survey response write-in for question 2

$$LZAI = commissionD + loczoningD + councilD + cntyboardD + cntyzoningD + envboardD + zonevote$$

Index	Component	Variable long name	Definition	Code	Source
LPAI	*commission_norezD*	Local planning commission required to approve new projects	The requirement that a local planning commission review and approve a new project that does not need rezoning	0 = not required; 1 = required	Line item 1 of survey question 3
LPAI	*council_norezD*	Local council, managers, commissioners required to approve new projects	The requirement that local council, managers, or commissioners review and approve a new project that does not need rezoning	0 = not required; 1 = required	Line item 2 of survey question 3
LPAI	*cntyboard_norezD*	County board of commissioners required to approve new projects	The requirement that the county board review and approve a new project that does not need rezoning	0 = not required; 1 = required	Line item 3 of survey question 3
LPAI	*envboard_norezD*	Environmental review board required to approve new projects	The requirement that an environmental review board approve a new project that does not need rezoning	0 = not required; 1 = required	Line item 4 of survey question 3
LPAI	*publhlth_norezD*	Public health office required to approve new projects	The requirement that the public health office review and approve a new project that does not need rezoning	0 = not required; 1 = required	Line item 5 of survey question 3
LPAI	*dsgnrev_norezD*	Design review board required to approve new projects	The requirement that a design review board approve a new project that does not need rezoning	0 = not required; 1 = required	Line item 6 of survey question 3

$$LPAI = commission\_norezD + council\_norezD + cntyboard\_norezD + envboard\_norezD + publhlth\_norezD + dsgnrev\_norezD$$

SRI	*sfupermitlimit*	Limits on building permits, single-family	Annual limit on the total allowable number of building permits for single-family homes	0 = no; 1 = yes	Line item 1 of survey question 5
SRI	*mfupermitlimit*	Limits on building permits, multifamily	Annual limit on the total allowable number of building permits for multifamily homes	0 = no; 1 = yes	Line item 2 of survey question 5
SRI	*sfuconstrlimit*	Limits on residential units for construction, single-family	Annual limit on the total allowable number of single-family residential units authorized for construction	0 = no; 1 = yes	Line item 3 of survey question 5
SRI	*mfuconstrlimit*	Limits on residential units for construction, multifamily	Annual limit on the total allowable number of multifamily residential units authorized for construction	0 = no; 1 = yes	Line item 4 of survey question 5
SRI	*sfudwelllimit*	Limits on number of units in multifamily dwellings	Annual limit on the number of single-family dwellings	0 = no; 1 = yes	Line item 5 of survey question 5
SRI	*mfudwelllimit*	Limits on multifamily dwellings	Annual limit on the number of multifamily dwellings	0 = no; 1 = yes	Line item 6 of survey question 5

$$SRI = sfupermitlimit + mfupermitlimit + sfuconstrlimit + mfuconstrlimit + sfudwelllimit + mfudwelllimit + mfudwellunitlimit$$

DRI	*minlotsize_oneacre*	Minimum lot size 1 acre or more	The requirement that developers build on lots no smaller than an area of 1 acre to 2 acres	0 = no; 1 = yes	Line item 1 of survey question 6
DRI	*minlotsize_twoacres*	Minimum lot size 2 acres or more	The requirement that developers build on lots no smaller than an area of 2 acres or more	0 = no; 1 = yes	Line item 1 of survey question 6

(Table A1 continued)

(Table A1 continued)

DRI = 1 if minlotsize_oneacre = 1 or minlotsize_twoacres == 1

DRI = 0 otherwise

Index	Component	Variable long name	Definition	Code	Source
LAI	LAI	Local assembly index	Dummy variable indicating if a local assembly (Town Meeting) is involved in land regulation process	1 = Town Meeting required to approve zoning changes; 0 = otherwise	Post-survey phone interviews to all municipalities in our sample located in New England
OSI	OSI	Supply open space	Response indicating that developers are required to supply mandatory dedication of open space, or open space, or a fee in lieu of dedication in order to build	0 = no; 1 = yes	Line item 3 of survey question 6
EI	EI	Pay costs of improvement	Response indicating that developers are required to pay allocable share of costs of infrastructure improvement in order to build	0 = no; 1 = yes	Line item 4 of survey question 6
ADI	time_sfu	Length of residential review, single-family	The average length of time required to complete the review of single-family residential projects in a jurisdiction		Line item 1 of survey question 11
ADI	time_mfu	Length of residential review, multifamily	The average length of time required to complete the review of multifamily residential projects in a jurisdiction		Line item 2 of survey question 11
ADI	time1_150sfu	Rezoning application time, less than 50 single-family units	The typical amount of time between application for rezoning and issuance of a building permit for a project with less than 50 single-family units	1.5 = less than 3 months; 4.5 = 3 to 6 months; 9.5 = 7 to 12 months; 18.5 = 13 to 24 months; 24 = more than 24 months	Line item 1 of survey question 12

ADI	time1_m50sfu	Rezoning application time, more than 50 single-family units	The typical amount of time between application for rezoning and issuance of a building permit for a project with more than 50 single-family units	1.5 = less than 3 months; 4.5 = 3 to 6 months; 9.5 = 7 to 12 months; 18.5 = 13 to 24 months; 24 = more than 24 months	Line item 2 of survey question 12
ADI	time1_mfu	Rezoning application time, multifamily units	The typical amount of time between application for rezoning and issuance of a building permit for a project with multifamily units	1.5 = less than 3 months; 4.5 = 3 to 6 months; 9.5 = 7 to 12 months; 18.5 = 13 to 24 months; 24 = more than 24 months	Line item 3 of survey question 12
ADI	time2_l50sfu	Sub-division approval time, less than 50 single-family units	The typical amount of time between application for sub-division approval and the issuance of a building permit for a project with less than 50 single-family units	1.5 = less than 3 months; 4.5 = 3 to 6 months; 9.5 = 7 to 12 months; 18.5 = 13 to 24 months; 24 = more than 24 months	Line item 1 of survey question 13
ADI	time2_m50sfu	Sub-division approval time, more than 50 single-family units	The typical amount of time between application for sub-division approval and the issuance of a building permit for a project with more than 50 single-family units	1.5 = less than 3 months; 4.5 = 3 to 6 months; 9.5 = 7 to 12 months; 18.5 = 13 to 24 months; 24 = more than 24 months	Line item 2 of survey question 13
ADI	time2_mfu	Sub-division approval time, multifamily units	The typical amount of time between application for sub-division approval and the issuance of a building permit for a project with multifamily units	1.5 = less than 3 months; 4.5 = 3 to 6 months; 9.5 = 7 to 12 months; 18.5 = 13 to 24 months; 24 = more than 24 months	Line item 3 of survey question 13

$$ADI = [(time\_sfu + time\_mfu)/2 + (time1\_l50sfu + time1\_m50sfu + time1\_mfu)/3 + (time2\_l50sfu + time2\_m50sfu + time2\_mfu)/3]/3$$