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The Incidence of the Land Use Regulatory Tax

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Land use regulation has been found to impose a substantial tax on housing within select U.S. metropolitan areas. In this article, we develop hypotheses regarding the incidence of this tax by income class and racial group within these areas. Parcel-level data from Miami-Dade County, Florida, are used to test our hypotheses. We find that, while the tax rises with a household's permanent income, this rise is less than proportional, making it a regressive tax. We also find, controlling for household permanent income, that the tax is a higher percentage of the price of homes located in black neighborhoods in comparison to those located in white or Hispanic neighborhoods.

The recent rapid rise in housing prices within many local housing markets in the United States has rekindled interest in the effect that land use regulation has on residential developers' costs. This issue has been difficult to study because the regulatory environments of local housing markets are complex, idiosyncratic and can be greatly affected by planners' administrative discretion, which in turn is affected by local politics and "NIMBYism."[1] Within these environments, the lion's share of developers' regulatory costs, which anecdotal evidence suggests can be quite substantial, is best characterized as the outcome of case-by-case bargaining sessions between the developer and a planner (or planners). These costs are myriad in nature and consist of (1) permit fees; (2) compliance costs incurred in the preparation of various reports required for project approval; (3) exactions, which can take several forms, including impact fees and payments-in-kind made by the developer to improve the community's public infrastructure; and (4) project approval time costs. With the exception of statutorily defined permit fees, all of the other costs, which are generally much

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[1] The acronym "NIMBY" stands for Not In My Backyard. The term has been used frequently to describe neighborhood resistance to unwanted development.

larger than permit fees, are subject to negotiation. The direct measurement of these costs therefore requires a project-based accounting strategy, the success of which would hinge upon the willingness of developers to open their books. Obviously, such data would be difficult to obtain.[2]

Our need to know more about land use regulatory costs stems from two concerns. First, we want to know the contribution that these costs make to the high price of housing observed within many metropolitan areas in the United States. Second, in order to judge the fairness of these costs, we need to know whether they cause differences in housing prices paid by different groups of households, defined by income level and race. The highly discretionary nature of regulatory costs opens the door for discriminatory treatment. In addition, according to developers, these costs unfairly burden lower-income households, a group whose relatively low homeownership rate has long been considered a major social concern. Hence, it is possible that land use regulation contributes to the large racial and income disparities that exist in the rate of homeownership (Quigley and Raphael 2004). Reinforcing this concern is evidence suggesting that the difficulty of obtaining regulatory approval for building new homes has increased steadily over time (Glaeser, Gyourko and Saks [GGS] 2005).

While the incidence of regulatory costs has not been studied, Glaeser and Gyourko (GG 2003a,b) and (2005) have estimated for select markets the portion of house price that can be attributed to regulatory costs. They call this portion the "regulatory tax," and they find that in high-priced markets the regulatory tax accounts for a significant portion (as much as 53%) of the average price of housing. We recognize that the use of the term regulatory tax may be misleading because the effects that regulatory costs have on housing prices are not actually the result of a tax that is levied by local governments. However, because our methodology builds upon GG and GGS, we have chosen for convenience to stick with their terminology. Regardless of nomenclature, the issue is the same: Are regulatory costs more burdensome to lower-income and minority households?

[2] Due to the difficulty of directly measuring regulatory costs, the stringency of local land use regulations has been proxied by simply counting the number of regulations. Weights are sometimes used to give selected regulations more importance than others. Ihlanfeldt (2007), Quigley and Raphael (2005), Malpezzi (1996), Pollakowski and Wachter (1990), Cho and Linneman (1993), Brueckner (1998), Levine (1999) and Mayer and Somerville (2000) all construct indexes of this type. While these count-based indexes of regulatory stringency are typically positive and statistically significant in estimated house price equations, they are clearly limited in what we can learn from them. Because they can only be constructed at the jurisdictional level (and not the neighborhood level), they are of no use to us in analyzing the incidence of regulatory costs.

While the findings of GG and GGS are important, our greater interest here is in the method they developed for measuring the costs of regulation. As suggested earlier, the direct measurement of these costs would be a daunting task. Hence, GG and GGS calculate their regulatory tax as a residual. The basic idea underlying their method is that, in equilibrium, the value of a home can be decomposed into three distinct components: Land costs, construction costs and regulatory costs. After estimating the value of land and structural improvements, GG and GGS calculate the regulatory tax as the difference between these two components and the total value of the home.

GG and GGS estimate their regulatory tax only for the average priced house located within a particular metropolitan statistical area (MSA). However, with the right data, which admittedly must be far more refined than those employed by GG and GGS, there is no reason that the tax cannot be estimated for individual homes. This is the approach we take in this article. Using parcel-level data, we can investigate the incidence of the tax by income class (*i.e.*, is the tax regressive or progressive) and by racial group (non-Hispanic whites, non-Hispanic blacks and Hispanics).

Because we follow GG and GGS and estimate the tax as a residual, it is imperative that we have accurate construction cost and land cost data. In addition, in order to study the incidence of the tax across racial groups, we need a racially diverse metropolitan area. Finally, as noted by GG and GGS, the regulatory tax is not omnipresent. It exists where housing demand is expanding and housing supply is constrained by government regulation. Fortunately, we were able to obtain parcel-level data for Miami-Dade County, Florida, which satisfy all of the above needs. Miami-Dade County, which contains the central city of Miami, is one of the most racially mixed metropolitan areas in the United States.[3] Miami-Dade County has also been growing rapidly in population and has relatively stringent land use regulation. In addition, the county property appraiser uses a replacement cost methodology in assessing the taxable value of real estate; hence, Miami-Dade's tax roll contains estimates of each parcel's construction costs, including the cost of building special features, such as pools and tennis courts, which are relatively common in South Florida.[4]

[3] As of the 2000 Census, 20.7% of the residents of Miami-Dade County were non-Hispanic white, 19% were non-Hispanic African American and 57.3% were of Hispanic origin. The national prevalence of these ethnic groups in 2000 was 69.1%, 12.1% and 12.5%, respectively.

[4] A number of reasons suggest that the appraiser's construction cost estimates are accurate. First, the Florida Department of Revenue annually audits each county's tax roll for accuracy. Second, the recorded improvements to the property are based on a triennial physical inspection. Third, the cost estimates are based on commercially provided data that are widely used in the construction industry for budgeting purposes.

Our results show that, while the regulatory tax rises with the level of the household's permanent income, the increase is much less than proportional, making the tax regressive. In addition, the results suggest that the tax is a higher percentage of the price of homes located in neighborhoods where blacks are the dominant population group. Hence, the tax appears to be inequitable on two accounts: It unfairly burdens lower-income households, and it is discriminatory toward black households.

Neighborhood Variation in the Regulatory Tax

As noted earlier, obtaining local government approval for a residential development is complex, time consuming and costly to the developer. To illustrate this process, consider the requirements that must be satisfied by a land developer to obtain approval for a limited-partition subdivision in unincorporated Leon County, the central county of the Tallahassee, Florida, MSA. Similar requirements must be satisfied in Miami-Dade County, but we use Leon County as our example because we were able to obtain estimates of compliance costs in the latter case from a consulting firm. As shown in Table 1, there are seven major requirements, with all but the first requirement necessitating a significant time investment and monetary outlay from the developer.[5,6] Each requirement has a permit fee and compliance costs. The compliance costs represent payments to surveyors, arborists, engineers and lawyers for professional services a developer must commission to satisfy the seven requirements. The compliance costs reported in Table 1 are the consulting firm's ballpark estimates, and the firm emphasizes that there is considerable variation in these costs from project to project. Nevertheless, they do serve to illustrate that compliance costs are many times larger than fees. In addition to permit fees and compliance costs, there are other costs that vary across projects that can be quite substantial. These include exactions and costs that arise from time delays within the project approval review process. Because these costs vary so widely, the consulting firm could not provide average estimates that could meaningfully be interpreted as typical amounts. But anecdotal evidence suggests that

[5] A limited partition subdivision is a subdivision of ten lots or less. Our example assumes that the land to be platted is zoned for residential use. The permit and compliance costs reported in Table 1 were provided by a major engineering/consulting firm in Tallahassee (Moore Bass Consulting, Inc.) that assists developers through the project approval process.

[6] While the developers may bear the burden of the costs of regulations (in excess of the benefits of regulation) in the short run, in the long run these costs are shifted forward to homebuyers or backward to landowners. The portion that is shifted forward to homebuyers, in the form of a higher housing price, is what we have defined as the regulatory tax on housing consumption.

Table 1 ■ Leon County requirements for limited partition subdivision.

Fees and Compliance Costs	Permit Fee	Compliance Costs
(1) Permit Use/Land Use Verification	$202	$500
(2) Pre-Application Meeting	$500	$2,500
(3) Natural Features Inventory	$1,975	$5,000
(4) Environmental Impact Analysis	$859	$5,000
(5) Concurrency*	$280	$5,000
(6) Environmental Permitting	$1,680	$10,000
(7) Limited Partition Fee	$2,547	$10,000

*The compliance cost for concurrency only includes the cost of the traffic study. Required cost of transportation improvements to satisfy concurrency vary widely and could not be estimated.

Description of requirements:

(1) Permit Use/Land Use Verification: Outlines the project and identifies the parcel where the platting will take place. Ensures the parcel is properly zoned for the intended project.

(2) Pre-Application Meeting: The developer introduces the project to the planner and the planner provides guidelines on submitting the application.

(3) Natural Features Inventory: Charts all of the environmental features, including trees and animal features, of the project site. Used to determine environmentally sensitive areas on the site that cannot be developed.

(4) Environmental Impact Analysis: Depicts how the proposed development will affect the environment.

(5) Concurrency: Involves conducting a traffic study to assess the impact of the development on automobile congestion.

(6) Environmental Permitting: Includes permits for tree removal, landscaping, storm water and driveway connections.

(7) Limited Partition Fee: Fee covers the cost of putting lines on the property, dividing the vacant land into separate parcels.

they are nontrivial and may exceed the sum of permit fees and compliance costs.[7]

To further understand the discretionary nature of land use regulatory costs, we recently surveyed the chief planner of each of Florida's 462 city and county planning departments. Of the 462 instruments distributed throughout the state, 276 surveys were completed. One of the survey questions illustrates the extent

[7] Two attempts at direct estimation of total regulatory costs are Seidel (1978) and Luger and Temkin (2000). Because many of these costs are undocumented, these studies rely heavily on survey data and case studies. Much more is known about one specific exaction: impact fees. Jurisdictions having impact fees publish fee schedules, which list the type of fees that have been adopted (*e.g.*, roads, schools, libraries) and for each type of land use (residential, commercial and industrial) the formula used to calculate the fee. What is not known is the frequency or the conditions under which impact fees are exempted by local government.

Table 2 ■ Frequency that the aspect of the development approval process is negotiated between the developer and the local government.

	Frequently (%)[a]	Sometimes (%)	Rarely (%)	Never (%)	Lead to Delay (%)[b]
Streetscape (Roadside Landscaping)	23	40	22	15	29
Site Design/Building Design	35	43	14	9	53
Sidewalks/Gutters/Curbs	14	37	33	17	23
School Concurrency	13	20	30	38	28
Transportation Concurrency	22	33	20	25	52
Water/Sewer Concurrency	20	27	24	29	37
Storm Sewers	12	22	37	29	23
Off-Site Transportation Improvements	12	33	30	24	40
Developer Agreements	19	40	28	13	60
Parking Facilities	14	33	35	19	31
Open Space	16	32	34	18	28
Environmental Mitigation	8	35	35	22	39
Land Dedication (Parks/School)	6	26	36	33	27
Fees in Lieu of Land Dedication	3	19	33	45	20
Impact Fee Payments	16	15	27	43	17

[a]Percentages are based on a 2006 survey of the chief planner of 274 Florida local governments.
[b]This column reports the percentage of respondents that answered yes to the question "On average, do negotiations [on this aspect] lead to delays of at least one month?"

to which these costs represent negotiated outcomes: "How frequently are each of the following aspects of the development approval process a source of negotiation between the developer and the local government?" Table 2 lists the 15 aspects that the planner was asked to evaluate. For 10 of the 15 aspects, more than 40% of the planners indicated that negotiation occurred either frequently or some of the time. As shown in the last column of Table 2, these negotiations frequently caused delays of more than 1 month in the project approval process. These results confirm that the regulatory costs incurred by developers are largely outcomes of bargaining sessions between themselves and local planners. With such a large portion of the regulatory process subject to negotiation, the possibility of personal and community prejudices exerting some influence looms large. Such prejudices could easily result, for example, in longer time delays or greater exactions imposed on developers whose projects are targeted for members of a minority group or low-income households.

Local political opposition introduces another layer of complexity into the project approval process. Prior to issuance of a decision on the suitability of a new development, planners and politicians register citizen input that can have an important effect on negotiated outcomes. Fearing that development and its concomitant negative externalities (*e.g.*, road congestion, loss of open space and school crowding) may have detrimental effects on property values, incumbent citizens, especially nearby homeowners, have strong incentives to oppose new projects. Our survey also asked planners the extent to which local-resident NIMBY opposition is a constraint on residential development, using a scale of 1 (does not constrain development) to 5 (severely constrains development). Of the responding planners, 56% (37%) answered with a 3 (4) or higher, substantiating the nontrivial influence that local opposition exerts on land use planning decisions and concomitant regulatory costs.

In order to appease this opposition to new development, developers often provide concessions that can substantially increase the average cost of home production. Examples include public land dedications, off-site transportation and parking improvements and public service provision. Because the negotiating process takes time, local opposition can also increase a developer's carrying costs, driving the opportunity cost of home construction even higher. Rational builders are willing to navigate this regulatory maze so long as the market price of housing less the regulatory and construction costs allows for a normal rate of return.

Opposition to new residential development is expected to rise with neighborhood income level. In more affluent neighborhoods, households more frequently own their homes, and these homes tend to be of higher value. Hence, in these neighborhoods there is a greater potential loss in homeowner property value from the externalities emitted by new development. Moreover, the residents of higher-income neighborhoods may possess more political power, which means that local government will be more responsive to their concerns. To mitigate externalities or compensate nearby homeowners for their losses, developers wishing to build in higher-income neighborhoods may more frequently be asked, for example, to lower density, provide additional infrastructure, preserve trees, create buffer zones or build retention ponds.

Regulatory costs may also differ among neighborhoods with different racial compositions. This, however, is a complex issue. Consider neighborhoods where blacks are the dominant racial group. On the one hand, due to the discretionary nature of the project approval process, racial prejudice lying somewhere within this typically Byzantine process may result in a higher regulatory tax within black neighborhoods.[8] On the other hand, a number of reasons suggest that regulatory costs are less inflated by NIMBY opposition in black than in non-black neighborhoods. First, there is evidence that suggests that the utility levels of black households are less affected by the negative externalities emitted by surrounding land uses (Boehm and Ihlanfeldt 1991). Race affects consumer preferences, including those that define a desirable neighborhood; these preference differences may manifest themselves in differing levels of development opposition. Second, there has long been a concern (that has precipitated substantial litigation) that black neighborhoods are short changed in the provision of public services by local government (Rubinfeld 1979). One explanation for this inequity is that blacks have less political clout with local government, especially within jurisdictions where city councilors are elected at large rather than by district, as is common within the state of Florida. Hence, even if NIMBY opposition to new development is similar between white and black neighborhoods, local governments may require less from developers building in black neighborhoods. Because discrimination and NIMBY opposition have countervailing effects, *a priori*, it is not clear whether the regulatory tax is higher or lower in black neighborhoods. Of course, discrimination and differences in NIMBY opposition may also cause the tax to be higher or lower in Hispanic or white neighborhoods. It is therefore important to empirically investigate differences in the regulatory tax across all three types of racially defined neighborhoods (white, black and Hispanic).

The aforementioned discussion suggests that land use regulations create higher costs for developers building homes in higher-income neighborhoods and that regulatory costs may vary across neighborhoods where the dominant population group differs by race. Whether these differences in costs cause variation in regulatory taxes (*i.e.*, housing prices) within a metropolitan area depends on how mobile households are across these different types of neighborhoods. For example, assume that regulatory costs are higher in black than in white neighborhoods. If blacks can move freely between these two types of neighborhoods, then these cost differences will not be shifted forward to homebuyers but instead will be shifted backward to landowners. Hence, differences in regulatory taxes can arise only if black and white neighborhoods represent separate submarkets. However, there are reasons to believe that there is sufficient immobility

[8] A referee of this paper noted that developers may also be prejudiced and asked whether they therefore may also be implicated in any discrimination. Prejudiced developers may avoid building housing that is targeted for black residents. In most markets, especially in large markets like Miami-Dade County, competition in housing construction appears to be a reasonable assumption. This industry is dominated by small firms and entry and exit are relativity easy. Hence, the expectation is that, unless all developers are prejudiced, new construction targeted for black residents would not be affected by the possible prejudice of developers.

to segment metropolitan housing markets by both the race and income level of neighborhoods. In the case of race, housing market discrimination may restrict the freedom of one racial group to enter neighborhoods dominated by other racial groups. Evidence that this is the case in Miami-Dade County comes from both the 1989 and 2000 Housing Discrimination Studies, conducted by the U.S. Department of Housing and Urban Development.[9] In the case of neighborhood income level, submarkets are expected because the homes found within high- and low-income neighborhoods are generally poor substitutes for one another.

The most common procedure for testing for submarket existence was introduced by Schnare and Struyk (1976) and has been subsequently used in many studies (see Watkins (2001) for a review). The test involves two steps. First, hedonic price functions are estimated for each potential market segment in order to compare the submarket price for a standard dwelling unit. Second, a Chow test is computed to establish whether significant differences exist between the submarket-specific prices. We used this test to determine whether neighborhoods within the Miami-Dade housing market are divided into black/white/Hispanic submarkets and low/median/high-income submarkets.[10] The results strongly confirm that this is the case. Hence, if regulatory costs do vary across neighborhoods as hypothesized, we expect that this causes a corresponding spatial variation in the regulatory tax. Our purpose is to

[9] Using the audit data from the 1989 study, Page (1995) finds that realtors in Miami-Dade show both blacks and Hispanics significantly fewer sales units than are shown to whites. The results from the 2000 study show that blacks in Miami-Dade, in comparison to whites, were less likely to inspect similar units and be offered help with financing and were more often told that prequalification was required before they could see units. Hispanics, in comparison to whites, were less likely to be prequalified by the realtor and to be told they were qualified to purchase a unit. More information on the 2000 study can be found at http://www.huduser.org/publications/hsgfin/hds.html. Another finding consistent with housing market discrimination and the existence of separate racial submarkets within the Miami-Dade area is reported by Glaeser and Vigdor (2001). They report that the black/non-black dissimilarly index (DI) for the Miami-Dade metropolitan area was 0.668 in 2000, which is only slightly smaller than the 1990 value of 0.703. A DI of greater than 0.6 is considered to represent hypersegregation. Hence, Miami-Dade is a highly segregated place that is showing little movement over time toward greater integration.

[10] Our parcel-level data (described later) are divided into black, white and Hispanic neighborhoods, where, for example, a black neighborhood is defined as a block group that contains more blacks than whites and more blacks than Hispanics. The neighborhood income subsamples are obtained by stratifying neighborhoods into those block groups falling within the top third, middle third and lower third of the median income distribution. The hedonic models involved regressing sales price on an extensive set of structural and locational variables that explained between 70% and 80% of the variation in price within each subsample. These variables included building age, living area, lots size, jurisdictional dummy variables and the neighborhood and locational variables listed in Table 3. Tests of functional form indicated that the linear model provided the best fit.

investigate this issue with our Miami-Dade County parcel-level data. These data are described in the following section.

Parcel Data

Florida statutes require that all counties annually submit their property tax rolls in a standardized format to the Florida Department of Revenue (FDOR) for auditing purposes. From FDOR we obtained the Miami-Dade County tax rolls for the years 2004–2006. Each roll identifies the properties that were sold during the previous year. From the rolls we extracted all single-family home sales that occurred over the years 2003–2005 that satisfied the following conditions—the sale is arm's length as determined by the local property appraiser, complete data are available on all of the variables we use in our analysis, no variables have extremely large or small values (suggestive of coding errors), lot size is less than or equal to two acres and the property is found on a digitized parcel identification map.[11] We used these maps to make precise geographical information system measurements of distances and accurate lot size measurements and make accurate assignments of parcels to neighborhoods and jurisdictions. Roughly 70% (34,581 sales) of the universe of arm's-length sales satisfy the aforementioned criteria.

Variable definitions, their sources and mean values are provided in Table 3. The data on each parcel include property characteristics (lot size and structure replacement cost), neighborhood characteristics (the median income of the block group, the block group's dominant racial group and the percentage of the block group's occupied housing units that are renter occupied) and location descriptors (distance to the center of the central business district [CBD], distance to coast and a jurisdictional identifier).[12]

As noted earlier and discussed more fully later, an accurate estimate of the cost of construction is central to our analysis. The Miami-Dade County tax rolls include the appraiser's estimate of the cost of replacing all of the current improvements on the property (house, pool, deck, etc.). Properties are physically inspected every 3 years, and the type of improvements, their size, age and

[11] The tax rolls also identified which properties had their assessed values adjusted as a result of experiencing hurricane damage. These properties equaled 2.4% of our total sales sample. Including or excluding these properties had no effect on our results; therefore, they are retained in our sample.

[12] We use the block group rather than the census tract as the neighborhood unit because the former variables better explain the variation in house price. In addition, in analyzing the incidence of the regulatory tax across racial groups we want to use the areal unit that is most racially homogenous, which is the block group. Block groups never cross census tract boundaries and generally contain between 250 and 550 housing units. Typically, there are three or four block groups that make up a census tract.

Table 3 ■ Variable descriptions, sources and means.

Variables	Source	Mean
Property Characteristics		
House Price	Tax Roll	276,841
Replacement Cost	Tax Roll	119,055
Sq. Ft. Lot	GIS Map	9,499
Location Variables		
Coastal Property = 1	GIS Map	0.01
Distance CBD, Miles	GIS Map	5.87
Distance Coast, Miles	GIS Map	13.09
Neighborhood Variables		
Median Income	2000 Census	50,065
Black = 1	2000 Census	0.22
Hispanic = 1	2000 Census	0.63
% Renter	2000 Census	22
Year of Sale		
2003 (%)	Tax Roll	28
2004 (%)	Tax Roll	36
2005 (%)	Tax Roll	36
Observations	34,581	

CBD = central business district.

quality of construction are recorded. Appraisers employ commercially provided construction cost manuals and other sources of information to determine the replacement cost of each improvement, accounting for depreciation.[13]

The Regulatory Tax

GG and GGS calculate their regulatory tax (*RTAX*) for the mean valued house within a particular metropolitan housing market as

$$RTAX = EM * L - IM * L \tag{1}$$

[13] Information on the data can be found at http://dor.myflorida.com/dor/property/appraisers.html. The detail involved in generating these replacement values is substantial. After physically inspecting the property, the appraisers use a combination of information on national and local construction costs in order to estimate the cost of replacing all of the improvements on the property. For the main structure, these cost estimates reflect the quality and size of construction, the type of exterior used and as special features. This improvement value reflects the replacement cost under current factor input cost conditions for each year on the tax roll. The total improvement value for the property is then adjusted to reflect structural depreciation. Depreciation rates are based on the actual age of construction for each individual improvement. For instance, suppose there are two improvements on a parcel: a house that is 10 years old and a swimming pool that is 2 years old. The depreciated value of the total improvement value of the property reflects the fact that the improvements are of different ages.

where *EM* and *IM* are the values of a unit of land at the extensive and intensive margins, respectively, and *L* is mean lot size. *EM* equals the unit value of the land upon which the house sits. This value reflects the consumption value of the land, which can be thought of as the value of additional yard space plus the value associated with the right to build. *IM* reflects only the consumption value of the land. As GG (2003a, p. 3) note absent regulation, *EM* should equal *IM*, resulting in no regulatory tax:

> In an unregulated market, permission to build would be freely available, and land price increases would quickly lead many owners to subdivide their property. So the cost per acre of land with building permission would be roughly the same as that of land desired simply to extend one's yard.

When markets are regulated, binding restrictions on the supply of housing generate a wedge between *IM* and *EM*. The more restrictive (and thereby costly) the regulations, the larger the wedge and the greater the regulatory tax.

GG and GGS obtain *EM* by subtracting structure costs from the average market value of homes (after inflating the latter value to account for depreciation) and then dividing by mean lot size. *IM* is obtained by estimating the implicit price of land, using a standard hedonic price model.

Calculating *RTAX* for individual homes is more complicated than calculating it at the metropolitan level for the average valued house. This is illustrated in Figures 1 and 2. Figure 1 is drawn for land allocated to single-family homes (either built upon or ready to built upon) for two metropolitan areas, A and B, under the following assumptions: (1) B's land market is regulated, while A's is not; (2) *IM*, the consumption value of land, is the same in each market; and (3) in both areas the supply of land is perfectly elastic, based upon the assumption that metropolitan areas can expand outward at the fringe.[14]

Panel 1 of Figure 1 shows the equilibrium price of land with building permission. This price is higher in B (*EMR*) than in A (*EMF*) because the supply price of land is higher ($SB > SA$) where land developers incur regulatory costs. Panel 2 of Figure 1 shows the *EM* and *IM* price per acre of land as a function of lot size, under the assumption that the marginal value of additional yard space declines with the size of the lot. In area A the optimal lot size (*LE*) occurs

[14] The assumption that *IM* does not differ between A and B is equivalent to assuming identical preferences for yard space. In this diagram, for the sake of simplicity, *IM* is assumed independent of local amenities. However, in the estimation of the regulatory tax, we allow for the possibility that yard space and amenities may be either complements or substitutes.

Figure 1 ■ Metropolitan statisical area–level regulatory tax.

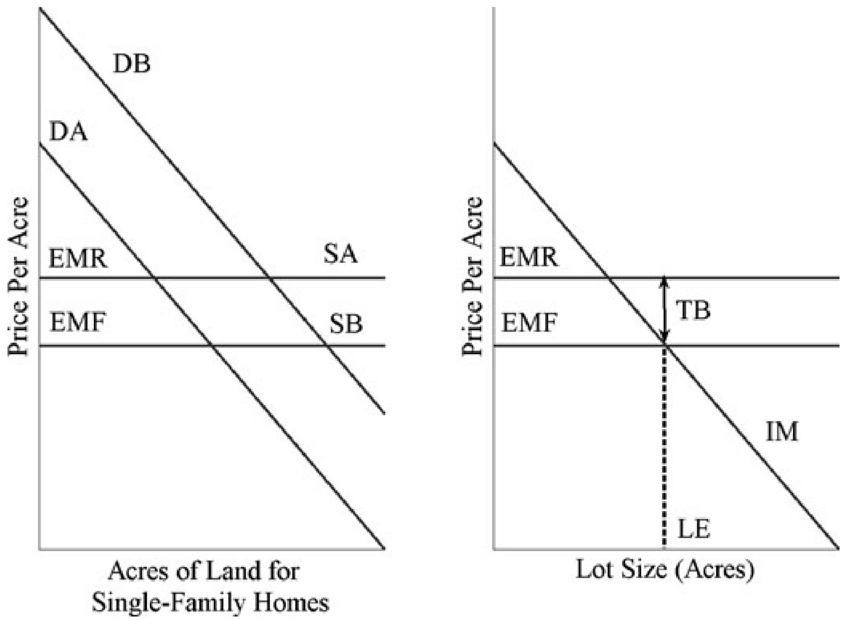
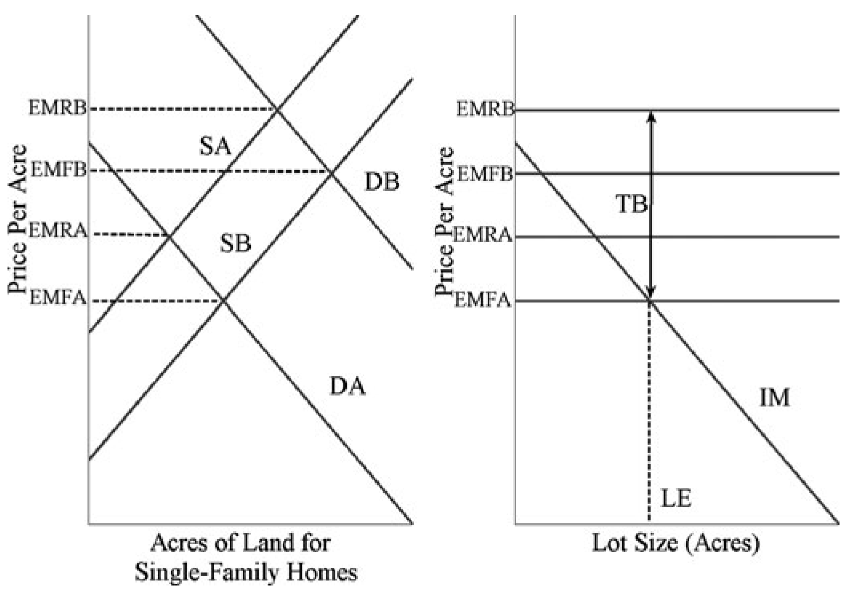


Figure 2 ■ Neighborhood-level regulatory tax.



where *IM* equals *EMF* (*i.e*., where the marginal benefit of a larger lot equals the marginal cost). Land use regulation almost always includes minimum lot size restrictions. For convenience, assume that the minimum lot size in B is the optimal lot size in A. The difference between *EMR* and *IM* at the *LE* lot size (*TB*) then equals the regulatory tax in B.

A key feature of Figure 1 is that differences in amenities between A and B have no effect on panel 2 and the calculation of the regulatory tax in B. In the figure, B has the amenity advantage, and therefore the demand for land in B *(DB*) exceeds that in A (*DA*), as shown in panel 1. Because the supply of land is perfectly elastic, the difference in demand will result in more development occurring in B than in A, with no amenity related price difference between the two areas.

Because GG and GGS make comparisons across metropolitan areas, Figure 1 is applicable in their case. In our case, A and B are two neighborhoods within the same metropolitan area. While it may be reasonable to assume that the supply of land is perfectly elastic at the metropolitan level, this assumption is untenable at the neighborhood level. If neighborhood B has better amenities than neighborhood A, B's amenity advantage will be capitalized into its land price. Figure 2 illustrates that, in our case, *EM–IM* no longer provides a reasonable estimate of the regulatory tax.[15] For area B the measured tax (*TB*) would be the vertical difference between *EMRB* and *IM* at *LE* acres, but this would overstate the true tax by the vertical difference between *EMFB* and *EMFA*, which equals the capitalized value of the amenity in neighborhood B. An obvious example would be where neighborhood B has better public schools than neighborhood A. This school quality difference will increase the value of land in B, so that the difference between *EM* and *IM* now reflects the regulatory tax in B as well as its greater amenity value. The fact that the supply of land is inelastic within neighborhoods implies that our strategy for estimating the regulatory tax at the parcel level must net out neighborhood differences in *EM* that arise from differences in amenities.

Our interest is in studying the incidence of land use regulatory costs across different income and racial groups. Presumably, regulation also yields benefits, and a complete assessment of the social welfare effects of regulation requires knowledge of both the distribution of costs and benefits across societal

[15] The supply and demand curve shifts in panel 1 of Figure 2 are made larger in order to make the differences shown in panel 1 larger and therefore easier to see.

groups.[16] Our goal here is to reliably estimate the former, leaving the latter for future research. However, the potential for regulation to not only reduce housing supply but also increase housing demand is another factor that must be accounted for by our estimation strategy.

Overview of the Estimation Strategy

In this section, we provide an overview of our strategy for estimating the incidence of the regulatory tax by income level and by racial group. Four steps are involved. Each step is described more fully in the following sections, along with the results obtained from its implementation. In brief, the steps are as follows:

1. Following GG and GGS, we estimate a hedonic price model to obtain the implicit price placed on an additional square foot of yard space (p).
2. Next, for each house we subtract the implicit value of land and the replacement cost of the structure to obtain an estimate of the sum of the regulatory tax (T) and amenity value (A):

   $$(T + A) = P - RC - pL \tag{2}$$

   where P is sales price, RC is replacement cost and L is lot size.[17]

3. We then regress $(T + A)$ on the instrumented value of P, dummy variables representing the race of the block group containing the parcel, and census tract fixed effects.[18] The estimated coefficient on P gives

   $$\frac{dA}{dP} + \frac{dA}{dT}\frac{dT}{dP} + \frac{dT}{dP} \tag{3}$$

   where dA/dP represents the tendency to find more expensive homes where locational amenities are more valuable. dA/dT measures the effect that regulations have on amenity levels. To the extent that

[16] See Cheshire and Sheppard (2002) for a welfare analysis of land use regulations in the British housing market.

[17] To be more precise, subtracting pL and RC from the value of the home gives an estimate of $T + A + S$, where S equals the costs of subdividing larger lots into smaller lots. Because there is no reason to believe that S varies with race or income level, ignoring it has no effect on our incidence analysis.

[18] The need for instrumenting P is explained further.

locational amenities vary across but not within census tracts, dA/dP and dA/dT are zero, and the estimated coefficient on P gives an estimate of dT/dP. The estimated coefficients on race (*e.g.*, black (B)) gives

$$\frac{dT}{dB} + \frac{dA}{dB} \tag{4}$$

which reveals whether the regulatory tax as a proportion of sales price is higher in black neighborhoods, assuming that A is constant between black and non-black block groups located within the same census tract.[19]

4. To assess the regressivity (progressivity) of the tax, we want to estimate dT/dY, where Y is the permanent income of the household. Because we do not know the characteristics of the households living in our sample of homes, we cannot directly estimate dT/dY. However, dT/dY equals dT/dP times dP/dY. Having obtained dT/dP in the third step, we obtain dP/dY by estimating a housing demand model for Miami-Dade County using data from the American Housing Survey (AHS).

Hedonic Model

Because we want to estimate T at the parcel level, our hedonic model is more complex than the one estimated by GG and GGS.[20] Sales price is regressed on lot size, lot size interacted with selected variables and an extensive set of control variables:

$$P = B_0 + B_1 Q + B_2 RC + B_3 N + B_4 G + B_5 J + B_6 L + B_7 L^2 + B_8 X * L + B_9 X * L^2 + \varepsilon \tag{5}$$

where

Q = 11 dummy variables representing the 12 quarterly time periods covered by our sales data (2003–2005),

RC = physical cost of replacing all improvements on the lot, accounting for their physical depreciation,

[19] Evidence provided below supports this assumption.

[20] Along with lot size, their models included only structural variables and one locational variable indicating whether the house is located in the central city. Other differences between their models and ours is that we allow the implicit price on lot size to vary within the metro area and we use sales price as the measure of housing value while they used owners' estimates.

N = neighborhood variables (black = 1 if the block group contains more blacks than whites and more blacks than Hispanics, Hispanic = 1 if the dominant population group within the block group is Hispanic, median income of the block group and percent renter of the block group, all measured for the year 2000),
G = location variables (linear distance in miles to the center of the CBD, a dummy variable for whether the property is coastal property[21] and linear distance to the coast),
J = dummy variables representing the jurisdiction in which the house is located,
L = lot size measured in square feet,
L^2 = lot size squared and
X = variables interacted with L and L^2: Median income, black, Hispanic and J.

The implicit price of land that we assign to each house is obtained by using the estimated coefficients on lot size and lot size squared and on their interactions with X to calculate a partial derivative of the sales price with respect to an additional square foot of land, evaluated at the variable values for the individual house. Recall that the implicit price of land measures the consumption value of additional yard space. Our hedonic specification allows this value to decline with the size of the lot and vary across jurisdictions, income level and the racial composition of the parcel's block group.[22] We allow consumption value to vary with income and race because the latter variables likely affect the demand for yard space. Yard space is expected to be a normal good and, controlling for income, race may affect lot-size preferences. The consumption value of yard space is allowed to vary across jurisdictions because public services and yard space may be related goods—that is, complements or substitutes. As an example of the former, in jurisdictions with good schools, larger lots may command a larger premium because families want both good schools and yard space for their children. As an example of the latter, households may attach a lower premium to larger lots in jurisdictions providing abundant park land.

[21] A home is considered coastal if it is located less than one-tenth of a mile from the coast.

[22] In his critique of GG's paper "The Impact of Zoning on Housing Affordability" (2003b), Somerville (2004) noted that GG did not allow the implicit price of land to vary with lot size, despite the fact that there is overwhelming evidence that the marginal value of an additional square foot of yard space declines with the size of the yard. This is another difference between our hedonic model and the models estimated by GG and GGS.

The results from estimating our hedonic price model are presented in Appendix Table A.1. The model explains 83% of the variation in sales price, a remarkably high percentage in comparison to the hedonic models estimated in prior studies, and the estimated coefficients on the control variables are generally statistically significant with the expected sign.[23] Because the model is quadratic in lot size and lot size is interacted with multiple controls, the factors affecting the implied price of yard space are hard to discern from the results presented in Appendix Table A.1. Hence, we report in Table 4 the results obtained from regressing the implicit price on those variables that we have hypothesized may affect the consumption value placed on additional yard space. Lot size, jurisdiction and the race of the block group, but not the median income of the block group, are found to matter.[24] The average and median values of the implied price equal \$5.68 and \$6.24, respectively. The implicit price ranges in value from \$0 to \$13.19. These estimates, which are consistent with those obtained by GGS, indicate that consumers place a relatively low value on land on the margin.[25]

Estimating the $(T + A)$ Models

Given the implicit price of land (p) that we have assigned to each property, we obtain our estimate of $(T + A)$ at the parcel level from Equation (2). However, before we describe the $(T + A)$ models estimated, we report the results obtained from estimating the regulatory-tax-to-mean-house-value ratio $(T/\bar{P})$ at the county level, using GGSs methodology. Their computation is described by the following equation:

$$\frac{T}{\bar{P}} = \frac{(\bar{P} - CC) - p\bar{L}}{\bar{P}} \qquad (6)$$

where CC equals construction cost per square foot times the square feet of living space of the average valued unit.[26] For Miami-Dade County this ratio equals 0.39, which suggests that Miami-Dade County is a relatively highly regulated place. Only seven of the 21 MSAs analyzed by GGS had tax-to-home-value ratios ranging between 0.20 and 0.50 (the highest value in their sample is 0.53

[23] We recognize, of course, that our model is not directly comparable to prior models because we substitute replacement cost for variables commonly used to describe the structural features of the home.

[24] In Miami-Dade County the premium attached to larger lots may not be higher in higher-income neighborhoods because many of these neighborhoods contain a high percentage of retirees, who may find a larger lot a burden to maintain.

[25] GGS report a single implicit price for each of 21 MSAs that range between \$0.13 for Birmingham and \$4.10 for San Francisco.

[26] Following GGS, we used construction cost data from root square means to estimate the GGS tax for Miami-Dade County. We also specified our hedonic model as closely as possible to the one they estimated in order to obtain an estimate of p.

Table 4 ■ Covariates of the implicit price of land per square foot.

Variables	Coefficient	*t* statistic[b]
Median Income ($1,000)	0.02	40.6
Black	−3.80**	292.3
White	−0.37**	17.4
Lotsize (1,000 Sq. Ft.)	0.10**	61.3
Jurisdictions[a]		
Biscayne Park	−0.02**	0.5
Coral Gables	5.39**	82.8
El Portal	1.98**	5.2
Florida City	−3.35**	111.7
Hialeah	−4.97**	46.0
Homestead	−5.44**	65.5
Miami	3.45**	78.4
Miami Beach	5.87**	51.1
Miami Shores	3.34**	15.2
Miami Springs	0.85**	10.9
North Bay Village	13.42**	9.7
North Miami	6.10**	217.8
North Miami Beach	−2.56**	95.5
Opa-locka	−3.15**	116.7
Pinecrest	6.15**	44.2
South Miami	4.29**	119.2
Sunny Isles Beach	23.17**	7.4
Surfside	−3.18**	13.2
Sweetwater	1.34**	7.5
Virginia Gardens	−2.65**	7.2
West Miami	3.95**	12.3
Aventura	14.26**	5.7
Observations	34,581	
R^2	0.857	

[a]Reference jurisdiction is unincorporated Miami-Dade County.
[b]Reported *t* statistics are robust to heteroskedasticity.
* and ** are statistically significant at the 0.05 and 0.01 levels (by a two-tailed test), respectively.

for San Francisco). It is not surprising that regulatory taxes are high in Miami-Dade County. It is rapidly growing in population (about 7% from 2000 to 2006) and Florida is a "growth managed" state that requires that each county and city have a comprehensive land use plan and a set of land development regulations that implement the plan.[27]

[27] We also calculated the GGS regulatory-tax-to-mean-house-value ratio for a number of other Florida counties: Brevard (0.24), Leon (0.23) and Palm Beach (0.34). These ratios suggest that in Florida, Miami-Dade County is not unique in the effects that land use regulatory costs have on the price of housing.

In order to estimate our $(T + A)$ models, a number of econometric issues must be addressed. First, $(T + A)$ is obtained from subtracting replacement and land cost from sales price. An ordinary least squares (OLS) regression of $(T + A)$ on P may therefore result in spurious correlation and an upwardly biased estimate of the coefficient on P if P is an errored measure of true market value. Indeed, P may diverge from market value for three reasons: (1) sales price may be misreported; (2) sales price may include the value of non-realty assets, such as furniture or appliances; and (3) the impatience of sellers or buyers may result in sales price underestimating or overestimating true market value. To obtain consistent estimates, an instrument for P is needed which is correlated with market value but uncorrelated with these three types of transaction related errors. We use the lagged value of the property appraiser's estimate of fair market value as our instrument for P.[28] Because the appraiser's estimate precedes in time the sales transaction, it should be uncorrelated with transaction-related errors that cause sales price to deviate from market value.

The other estimation issue was alluded to above. The estimated coefficient on P obtained from a regression of $(T + A)$ on P gives an upwardly biased estimate of dT/dP to the extent that dA/dP and dA/dT are likely nonzero. To minimize the values of these parameters, we alternatively include area fixed effects sequentially for smaller and smaller areas—jurisdictions, census tracts and block groups.[29]

Results are reported in Table 5.[30] In all cases the estimated P coefficients are larger in magnitude in the OLS in comparison to the two-stage least squares (TSLS) models. This is consistent with our expectation that spurious correlation biases upward the OLS estimates. Also as expected, the estimated P coefficients

[28] All houses are assigned a market value by the county property appraiser as of January 1 for the tax roll year. Hence, for sales occurring in 2003, we used the January 1, 2003, assessment as the instrumental variable value. For 2004 and 2005 sales, we used the January 1, 2004, and January 1, 2005, assessments, respectively.

[29] Our sample includes 24 jurisdictions, 306 census tracts and 996 block groups. The number of white, black and Hispanic block groups are 147, 288 and 560, respectively. Note that there is a difference between the percentage of block groups that are of a particular race (where the race of the block group is the race that has the plurality) and the percentage of the population of that race. In particular, the percentage of block groups that are black equals 28.9%, while blacks are only 19% of the population. This difference reflects the fact that blacks are more centrally located than whites or Hispanics within Miami-Dade County, and within these locations population density and the number of block groups is greater.

[30] The results reported in Table 5 are from a linear model based on the comparison of fits between the linear and log-linear models suggested by Wooldridge (2000). The standard errors reported in the table are robust to both heteroskedasticity and intra-area correlation, where the area is defined by the fixed effects.

Table 5 ■ Results from regressing $(T + A)$ on sales price, black block group and white block group.

	Ordinary least squares			Two-stage least squares[b]		
	Price	Black[a]	White	Price	Black	White
No Fixed Effects	0.49**			0.42**		
	(163.3)[c]			(105.0)		
	0.50**	11,702**	−293	0.40**	1,298*	17,134**
	(125.0)	(21.3)	(0.3)	(80.0)	(2.0)	(15.4)
Jurisdictional Fixed Effects	0.51**			0.42**		
	(72.9)			(30.0)		
	0.52**	21,026**	3641**	0.41**	9,030**	19,705**
	(65.0)	(12.2)	(3.1)	(58.9)	(4.4)	(16.5)
Census Tract Fixed Effects	0.52**			0.33**		
	(43.3)			(22.0)		
	0.53**	25,904**	1,855	0.33**	22,109**	6,097
	(44.2)	(8.8)	(0.5)	(22.0)	(7.4)	(1.6)
Block Group Fixed Effects	0.55**			0.3**		
	(68.8)			(22.1)		

[a]A Black (White) Block Group is a group containing more blacks (whites) than whites (blacks) or Hispanics. Hispanic Block Groups is the reference category.
[b]In the TSLS models *Price* is instrumented using the lagged value of the property tax appraisers' estimate of fair market value.
[c]The t statistics (in parentheses) in the no-fixed-effects case are robust to heteroskedasticity. In the remaining cases they are robust to both heteroskedasticity and intra-jurisdictional, intra-tract and intra-block group correlation, respectively.
* and ** are statistically significant at the 0.05 and 0.01 levels (by a two-tailed test), respectively.

get smaller as the areas of the fixed effects get smaller in size, because there is less variation in locational amenities within smaller areas. However, the estimated P coefficients are nearly identical between the tract and blocks group fixed effects models, which suggests that there is little additional bias associated with using tract in comparison to block group fixed effects. This suggests that there is little, if any, variance in amenity value within census tracts. Perhaps what is most noteworthy about the estimated P coefficients reported in Table 5 is not their differences in magnitude, but rather their similarity. Regardless of estimator, the inclusion or exclusion of fixed effects, the area level of the fixed effects or the addition of controls, all of the estimated P coefficients suggest that the regulatory tax increases with house value but falls as a proportion of house value as house value rises.

Next we turn to the issue of whether the regulatory tax varies across black, white and Hispanic block groups. The results obtained without any fixed effects or jurisdictional fixed effects show that $(T + A)$ is much higher (somewhat higher) in white (black) block groups, in comparison to Hispanic block groups. However, when fixed effects are included at the census-tract level, the results dramatically change: the estimated coefficient on the white block group dummy variable is small and statistically insignificant, while the estimated coefficient on the black block group dummy variable is large (22,109) and statistically significant at the 1% level. These results underscore the importance of controlling for differences in A across block groups in comparing racial differences in the regulatory tax. We focus on the models containing census tract fixed effects because these models effectively control for spatial variation in A and allow the inclusion of the block group dummy variables representing the race of the neighborhood. We set P and the census tract variables equal to their sample means and predicted $(T + A)$ for black and non-black block groups. The estimated $(T + \bar{A})/\bar{P}$ ratio is 0.46 and 0.38 for buyers purchasing in black and non-black groups, respectively. These results suggest that, on average, the regulatory tax is a larger proportion of the housing price paid by blacks in comparison to the price paid by non-blacks. We have hypothesized that a racial difference in the regulatory tax may arise given the discretionary nature of the project approval process. Developers building in black areas may encounter higher regulatory costs due to prejudice against blacks somewhere within this process. In light of the extensive statistical and audit evidence reported in the literature showing that blacks continue to experience discrimination in the housing market, we are not surprised by our finding that they also pay higher regulatory taxes.

We have suggested that regulatory costs reduce the supply of single-family homes more within the black submarket and that this accounts for the significance of the black block group dummy variable in our estimated $(T + A)$ equation. However, there are two alternative explanations for our results. First, even within the same census tract, black block groups may offer a locational amenity that is not shared by non-black groups (*i.e.*, it may be racial differences in A and not T that account for our results). This seems unlikely, and we cannot offer any examples that would lend support to this alternative explanation for our results. Second, our findings are similar to those reported in early studies of racial disparities in the price of housing based on data from the 1960s (Yinger 1979). Blacks were found to pay more than whites for equivalent housing, and this was attributed to inelastic housing supply within the black submarket. An alleged conspiracy among white home sellers, realtors and lenders confined blacks to inner city neighborhoods, where land for new housing was scarce. Moreover, black neighborhoods were unable to expand outward, because arbitrageurs (block busters) met resistance as they attempted to buy housing on the black/white neighborhood boundary from whites and sell to blacks. Over the years fair housing legislation and enforcement are thought to have broken the discriminatory conspiracy against blacks, resulting in much more elastic

Table 6 ■ Results from estimating the housing demand model.

	Coefficient	*t* statistic[b]	Coefficient	*t* statistic
Variables				
Permanent Income[a]	1.43**	4.2**	1.28**	3.9
Family Size			17,502*	2.1
Black Head			−72,576	1.8
Hispanic Head			−27,283	0.7
Female Head			−68,307**	2.7
Observations	327		327	
R^2	0.14		0.21	
Shea Partial R^2	0.30		0.27	
Hansen *J* Statistic (*p*-value)	11.19	0.26	9.83	0.36

Source: 2002 American Housing Survey for Miami-Dade County.
[a]Permanent income is obtained by instrumenting household income using interest income, whether the household owns stocks, whether the household owns a business, age of head and its square and a set of variables describing the head's education.
[b]*t* statistics are robust to heteroskedasticity.

housing supply within black submarkets (Follain and Malpezzi 1981). Nevertheless, we investigated the possibility that inelastic housing supply within the black submarket might account for the significance of the black block group dummy variable in our estimated $(T + A)$ equation. First, blacks are not confined to inner city neighborhoods in Miami-Dade County: 72% of the black block groups in our sample are located in the unincorporated portion of the county, where ample land is available for development and most new housing is being built. Second, when we estimate our $(T + A)$ equation for only the unincorporated area, the estimated coefficient on the dummy variable for a black block group hardly changes (from the 22,109 reported in Table 6 to 24,271 (t statistic $= 8.9$)).[31] These results suggest that it is not inelastic supply but rather the additional costs that regulation adds to the supply price that accounts for our finding that home buyers in black block groups get less housing for their housing dollar.

As noted earlier, our sample includes homes located in 24 different political jurisdictions. Each of these jurisdictions regulates land development within its own boundaries. Hence, our racial results should be interpreted as a general finding and not as specific to any particular jurisdiction. If racial prejudice

[31] We also estimated a model for the full sample of block groups that allowed the estimated coefficients on the race of the block group to vary between the unincorporated area and the incorporated areas. The null hypothesis that the inter-area difference in the estimated coefficients is equal to zero could not be rejected for either black or white block groups.

accounts for our results, it may be quite difficult to identify exactly where within the project approval process prejudice raises regulatory costs, given the complexity and discretionary nature of this process. Moreover, prejudice may register its effect on regulatory costs at different points in the process within different jurisdictions.[32]

Housing Demand Model

The final ingredient needed to estimate dT/dY, and thereby determine the progressivity or regressivity of the regulatory tax, is an estimate of dP/dY. To obtain our estimate we used 2002 AHS data for Miami-Dade County. The AHS includes 327 single-family homes that were purchased within the previous five years (1998–2002). We regressed house value in 2002, as estimated by the homeowner, on a measure of the household's permanent income. In a second model we included as controls family size and dummy variables for the race and gender of the household head.

The household's current income consists of transitory and permanent components. A common approach for estimating the effect of permanent income on housing consumption is to identify variables that are correlated with the permanent but not the transitory component. In a first-stage regression, current annual income is then regressed on these variables to obtain a predicted value of permanent income. This predicted value is then used in a second-stage regression explaining house value. This procedure is equivalent to estimating a TSLS model with the correlates of permanent income serving as instrumental variables for current income. We use the following variables as instruments: interest income, whether the household owns stocks, whether the household owns a business, age of head and its square and a set of variables describing the head's education. Test statistics indicate that these instruments satisfy the two conditions required of valid instruments: (1) they must be strongly correlated with the endogenous variable and (2) they must be uncorrelated with the error term and currently excluded from the estimated housing demand model.[33]

[32] One approach to the detection of discriminatory treatment would be to conduct an audit study. For example, two testers posing as developers could propose similar residential projects, one to be built on the black side of town and the other on the white side. By comparing the testers' experiences it may be possible to determine where within the approval process prejudice leads to discriminatory treatment.

[33] Shea's partial R^2 statistic, reported at the bottom of Table 6, shows that the chosen instruments are highly correlated with annual income. Hansen's J statistic, also reported at the bottom of Table 6, has a low value; hence, we are unable to reject the hypotheses that the instruments are uncorrelated with the error term and correctly excluded from the housing demand model. These test statistics are described by Baum, Schaffer and Stillman (2002).

The estimated coefficient on permanent income (1.4) is highly statistically significant and is unaffected by the inclusion of the control variables (see Table 6). The product of this estimate, which is our estimate of dP/dY and our best estimate of dT/dP (0.32), equals 0.45. This is our estimate of dT/dY. The 99% confidence interval around this estimate has an upper bound of 0.76, which allows us to solidly reject the null hypothesis that the regulatory tax is progressive and accept the alternative hypothesis that it is regressive.[34]

To further explore the magnitude of this regressivity, we divided the permanent income distribution of all homeowners into quartiles and then used the results obtained from estimating the housing demand model to predict house value at each quartile point. We then used the results obtained from estimating the $(T+A)$ models to compute the ratio $(T + \bar{A})/\hat{P}$ for each predicted house value. At the first quartile point ($Y = \$53{,}000$, $\hat{P} = \$75,660$) the ratio is 0.58; at the second quartile point ($Y = \$60{,}500$, $\hat{P} = \$86,367$) the ratio is 0.55; and at the third quartile point ($Y = \$91{,}000$, $\hat{P} = \$129,908$) the ratio equals 0.47. These ratios confirm that the regulatory tax is more burdensome for low- in comparison to high-income homebuyers.

Conclusion

This article has investigated how the costs imposed on residential developers by local governments' regulation of land use affect the price of housing paid by different groups living within the same metropolitan area. Because these costs are largely the result of developer/planner negotiations, only a small portion of them can be directly calculated. We therefore adopted the residual approach, the regulatory tax, in order to estimate the regulatory cost component of housing price at the parcel level.

As is true for any tax, in judging its fairness, we are interested in its incidence by income and racial group. This is especially true for the regulatory tax because it affects households' ability to obtain homeownership, the principal source of wealth accumulation for the average American family.

The evidence we have presented supports the following three conclusions: (1) Land use regulation substantially inflates the price of housing within

[34] Recall that if our methodology fails to set dA/dP or dA/dT equal to zero, then we will have underestimated the degree of regressivity. Hence, potential bias does not weaken the credibility of our conclusion that the tax is regressive. Moreover, there may be the concern that replacement cost (*RC* in Equation (2)) is underestimated for higher price homes, because the quality of improvements is underestimated by property appraisers. Again, however, this implies that, if anything, we have underestimated the degree of regressivity.

Miami-Dade County, Florida. (2) The regulatory tax, while greater in absolute magnitude at higher income levels, is regressive in its incidence. (3) The tax as a percentage of the price of the home is higher in neighborhoods where blacks are the dominant population group. These conclusions raise additional concern about local governments' regulation of the land within their jurisdictions because they suggest that this regulation contributes not only to high housing prices, but also to growing income and racial inequality within the United States. However, it is important to reiterate that we offer no evidence on the distribution of the benefits that may accrue to homeowners from land use regulation. It is possible that the higher regulatory tax burdens that we find borne by black and lower-income households are offset to some degree by regulatory benefits.[35] In addition, there is the concern of whether our results are unique to Miami-Dade County, Florida. We therefore recognize that our findings are best viewed as tentative in nature and that there is a clear need for more research on the intrametropolitan distributional effects of land use regulation.[36] Underscoring this need is the fact that state and local governments have been expanding their intervention into land and housing markets and that the discretionary nature of the project approval process provides opportunity for inconsistent and disparate treatment.

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[35] Of course, it is also possible that regulatory benefits are distributed in favor of higher-income households, making net costs an even greater burden for lower-income households.

[36] In particular, the effects of regulation on rental prices merit careful attention in future work. Also of interest would be an incidence analysis that covers the entire housing stock—single-family homes, condominiums, mobile homes and apartments. A final suggestion for future research comes from discussions we had with developers. Some of them stated that they opt in favor of building private neighborhoods (where, for example, the roads are maintained by the homeowners association) to avoid having to satisfy the local government's subdivision requirements. Documenting how widespread this practice is and its effects on regulatory costs and housing prices would be interesting future research.

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Appendix

Table A.1 ■ Hedonic price model results.

	Coefficient	*t* statistic[b]
Property Characteristics		
Replacement Cost	1.22**	41.1
Lot Size (1,000 Sq. Ft.)	10,883**	4.4
Lot Size Squared	168**	4.1
Location Variables		
Coast	47,866**	4.1
Distance CBD, Miles	−4,396**	10.2
Distance Coast, Miles	−1,837**	2.7
Neighborhood Variables		
Median Income ($1,000)	1,725**	7.4
Black	−32,881*	2.0
Hispanic	−11,994	0.9
% Renter	417**	5.3
Jurisdictions[a]		
2	−44,421	0.4
3	10,956	0.3
4	−25,807	0.5
5	72,049**	3.5
6	30,716**	3.7
7	93,934**	4.8
8	−9,618	0.6
9	14,064	0.1
10	67,737	1.6
11	−5,565	0.2
12	−317,157**	24.7
13	−34,481	0.9
14	−57,349**	2.7
15	−14,033	0.7
16	−94,345	1.7
17	−5,423	0.2
18	−51,390*	2.4
19	61,232	0.8
20	−2,479	0.2
21	28,901**	3.1
22	−44,342	0.3
23	−220,608	0.5

Table A.1 ■ continued

	Coefficient	t statistic[b]
Lot Size Interactions		
Median Income	−57*	2.2
Black	−5,316**	2.6
Hispanic	−0.305	0.2
Jurisdictions		
2	8,681	0.4
3	9,357	1.5
4	16,422	1.8
5	−3,866	0.8
6	−6,329**	4.2
7	−10,115**	5.0
8	−2,262	0.6
9	1,695	0.1
10	−11,029	1.6
11	−3,176	0.8
12	76,720**	22.0
13	2,969	0.5
14	10,276**	2.9
15	−2,161	0.3
16	14,209**	3.8
17	5,004*	1.9
18	151,157*	2.6
19	6,508	0.3
20	5,352	1.3
21	−8,069**	6.5
22	17,653	0.5
23	116	0.8
Lot Size Squared Interactions		
Median Income	1.50**	3.1
Black	91**	2.9
Hispanic	28	1.2
Jurisdictions		
2	−607	0.4
3	−209	1.1
4	−857**	2.6
5	13	0.1
6	79*	1.9
7	169**	3.9
8	413	1.8
9	261	0.3
10	708*	2.5
11	210	1.5
12	−4,273**	33.4
13	177	1.0
14	210**	2.8
15	−102	0.3
16	−212**	3.3
17	−27	0.5

Table A.1 ■ continued

	Coefficient	t statistic[b]
18	−9,020*	2.3
19	−863	1.2
20	−348	1.4
21	362**	13.8
22	−1,005	0.4
23	−9,378	0.9
Observations	34,581	
R^2	0.83[c]	

[a]Reference jurisdiction = unincorporated Dade County, J2 = Biscayne Park, J3 = Coral Gables, J4 = El Portal, J5 = Florida City, J6 = Hialeah, J7 = Homestead, J8 = Miami, J9 = Miami Beach, J10 = Miami Shores, J11 = Miami Springs, J12 = North Bay Village, J13 = North Miami, J14 = North Miami Beach, J15 = Opa-locka, J16 = Pinecrest, J17 = South Miami, J18 = Sunny Isles Beach, J19 = Surfside, J20 = Sweetwater, J21 = Virginia Gardens, J22 = West Miami and J23 = Aventura.

[b]Reported t-statistics are robust to both heteroskedasticity and intra-block group correlation.

[c]The model includes 11 dummy variables representing the quarters covered by the data years 2003–2005.

* and ** are statistically significant at the 0.05 and 0.01 levels (by a two-tailed test), respectively.