Ask and Ye Shall Receive?
Predicting the Successful Appeal of Property Tax Assessments

Lincoln Institute of Land Policy

Rachel N. Weber and Daniel P. McMillen

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Abstract

How does the relative lack of comparable sales in a neighborhood influence the frequency of property assessment appeal applications and their likelihood of success? Using a data set of appeals applications submitted and decided in Chicago during reassessment years 2000, 2003, and 2006, we estimate the probability of successful appeals for small residential properties as a function of market activity and relevant independent variables. Even though the appeals process is intended to improve valuation practices and enhance the perceived fairness of the system, it can exacerbate a lack of assessment uniformity if appeals activity and success are correlated with other neighborhood and site-specific attributes. We find that information-rich environments not only temper the perception of individual mistreatment, but they also improve the quality of assessor decision-making. As such thick markets account for both fewer appeals applications and few instances of success than thinner ones.

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Introduction

No one likes to pay property taxes. Property taxes are perceived as a highly visible nuisance, one that is assessed on what is typically a household's largest asset and that comprises one of the largest commercial operating costs. But despite the widespread distaste for the tax and the common sentiment that one's property taxes are "too high," only a small proportion of residential property owners take the time appeal their assessments. Who appeals their property tax assessments, and who is most likely to receive a reduction?

There has been little prior investigation into the motivations for appeals activity. This is unfortunate given how appeals have the potential to cause or exacerbate a lack of assessment uniformity within taxing districts. Of potentially most concern, the property tax could be made more regressive if applications and successful appeals were correlated with owners of higher-valued properties. In such cases, higher-valued properties would be assessed at lower proportion of their market value than lower-valued ones.

In previous work, we found that thin markets (i.e., those with a relatively small number of arms-length property sales) suffered from a higher degree of assessment variability where both extremely high and extremely low assessment-to-sales ratios were more common (McMillen and Weber 2005). We hypothesized that property owners in thin markets might be less likely to appeal because they had less information about the value of neighboring homes and therefore less basis for an appeal based on a lack of uniformity. Conversely, information-rich environments are likely to provide more knowledge and lead to potentially more appeals, the threat and actuality of which could lead to lower and more uniform assessments in such areas.

In this report, we explore whether property owners in thick markets have an advantage over those in thinner markets. It may be easier to win one's case on the basis of a lack of uniformity or over-assessment if the immediate neighborhood is rich with comparable properties. On the other hand, appeals may be easier to win on the basis of inaccurate recording of structural characteristics than for the more subjective finding of over-assessment. Is market activity even a strong predictor of appeals, given the likely importance of other factors -- such as the magnitude of prior increases in area land values? The relationships between market activity, administrative structures, and property tax uniformity are not clear *a priori* and, therefore, this research investigates them empirically.

Our research examines the residential property market of the city of Chicago, which is located within the second largest assessment region in the United States: Cook County. Commentators have observed that the share of residential owners appealing their tax bills is high in Cook County compared to comparable cities and that the amount of appeals activity has been increasing. The Cook County Assessor and Board of Review provided

us with data on appeals applications and adjudications for small (6 units or under) residential parcels over three reassessment years: 2000, 2003, and 2006. Our control group consisted of those parcels for which no appeals applications were filed in each of these years.

As the decision to appeal is a binary choice process (where the choice is between appealing and not appealing one's assessment the property), we use separate probit models to measure the probability that property owners appeal their assessments and, of this group of appeals applicants, that some property owners are successful in being granted a reduction. Because the errors terms on two models are correlated, we also run a more complex sequential model as a robustness check.

We find that information-rich environments not only temper the perception of individual mistreatment, but they also improve the quality of assessor decision-making. In other words, thick markets account for both fewer appeals applications and few instances of success than thinner ones. Applicants were more likely to come from census tracts with high median home values and assessments and those with a greater share of homeowners. They owned larger houses, were more likely to be white and educated, and were positively influenced by their neighbors' decisions to appeal. With the exception of 2003, their assessments increased steeply since the last reassessment year but their individual assessments were low relative to the median assessment in their census tract. In contrast, neither a high nor rapidly increasing assessed value assured a property owner of a reduction. Successful applicants were those that appealed on their own (without community support or legal representation) and were located in relatively stable real estate markets.

The Role of the Appeals Process

The appeals process is a formal feature of most legal and administrative systems as well as many private dispute resolution arrangements, so its relevance is broad (Shavell 2006). In general appeals processes are an important means of correcting for previous errors and improving decision-making on the part of adjudicators.

In the property tax administration system, the appeals process plays a critical role in ensuring that assessments are accurate, fair, and equitable. Without this critical check on the system (and periodic review by higher levels of government), local assessors would have little incentive to improve the quality of their assessments. As Malme (1991, p. 28) notes, a formal appeals process "guards against arbitrary over-the-counter value changes that decrease uniformity. A reasonable opportunity for taxpayers to challenge property assessments promotes fairness and greater accuracy." Appeals reduce an assessor's capacity for subjective judgment, i.e., the assessor's ability to "grant *ad hoc* property tax relief to shield those they think would be unduly burdened from the full brunt of the tax" (Bowman and Mikesell 1978, 139).

For the appeals process to serve as the accountability mechanism that is intended, however, it must be easily accessible at low cost, and it must be fair and efficient. If the

system is systematically biased in favor of certain property owners, then an assessor's willingness to grant assessment relief could have serious distributional effects. Appeals have the potential to alter the incidence of property tax: by lowering the burden on some property owners, it raises the burden on others.

This could lead to the problems associated with a lack of uniformity in property tax assessments and violate the principle of horizontal equity, which assumes that two taxpayers with identical houses receive the same tax bill. If the one who appeals receives a lowered bill, appeals can lead to disparate effective tax rates despite the use of a single, nominal tax rate. While appeals might explain a general lack of assessment uniformity, they can not, on their own, explain the tendency for regressivity. However, if appeals are positively correlated with owner attributes such as income, they may lead to vertical tax inequities and impose a disproportionate burden on low-income property owners and their tenants.

Appeals are also important from an administrative perspective as well. Appeals are costly to the assessing unit, who must devote scarce resources and staff time to their management. Appeals are also costly for those taxing jurisdictions that are dependent on property taxes but have little direct authority over assessment practices. Taxing bodies generally must return revenues collected from appealed assessments. Their vulnerability to property tax appeals is aggravated by the fact that some appeals, primarily larger valued homes and commercial properties, often take years to be resolved. In other words, taxing bodies must refund revenues that they collected and spent years earlier – long after budgets have been approved and tax rates set. Appeals activity therefore creates cash flow problems for these jurisdictions as they cannot project how much they will have to return in a given year.

Predicting the Frequency of Appeals Applications and Success

Knowing which property owners are more likely to appeal would be of administrative value for affected taxing jurisdictions, but beyond a handful of scholars (primarily legal scholars; see, for example, Youngman 1994; Shavell 2006), few have paid attention to these issues. Two sets of economists have examined the issue of institutional design, under which appeals processes would fall. Bowman and Mikesell (1978) initially found that policy variables – such as whether an assessing unit had an appeals board, used own-source or contract assessors, or employed tax maps – were not significant predictors of assessment uniformity for residential properties, measured by variation in the coefficient of dispersion. Structural factors less influenced by policy reforms (such as attributes of the local economy and housing market) were the primary determinants of assessment quality. However, the authors suggest that as both knowledge about market values and effective tax rates increase, the likelihood of property tax appeals also increases. For this reason, they attribute their finding of a strong positive relationship between assessment quality and higher property tax intensity to this relationship – "when the tax becomes large, there is more pressure on the assessor to 'do it right'" (p. 143).

In a follow-up article, Bowman and Butcher (1986) revise the original conclusions of Bowman and Mikesell (1978) by attributing more explanatory power to their policy variables in the determination of assessment quality. Annual reassessments and property tax relief for the elderly have a significant and positive effect on the uniformity of the property tax. Once again, assessment levels and effective tax rates were associated with more uniform assessments, because, the authors conjecture, in places with relatively high tax and assessment levels "erroneous assessments are more costly and therefore more worth appealing" (p. 166).

The scant literature leads to use believe that if assessed values are equal to a property's true market value plus some error term, the likelihood of appeals would increase in tandem with size of the error term. But which attributes of an individual property, property owner, or neighborhood are likely to be positively correlated with this error term?

Assessors rely on market information, deriving their estimates of market value from geographically matched cohorts of comparable sales.[1] The quality of that market information is a function of both its sheer volume and the accuracy in identifying and pricing different characteristics of the individual property. While the sales comparison approach works well in markets with many transactions of similar homes, it can provide seriously misleading estimates of market value for a more idiosyncratic home with few good comparable sales. Ironically, finding comparable sales can be particularly troublesome in large cities because many areas are characterized by rental buildings that trade infrequently, and by older, unique homes that have few counterparts. Moreover, many areas have a large stock of substandard housing that seldom trades.

When sample sizes are small, assessors may try to increase the sample by including more questionable sales, imputing value based on sales in other neighborhoods that are not truly comparable, or making other such adjustments. The more adjustments assessors make, the more potentially subjective and random the estimation of market value becomes. Thin markets – areas with few sales – compromise assessors' ability to set market values while more active markets provide assessors with more information. As such we might expect that error terms would be greater in thin markets, and property owners in such locations would have a greater incentive to appeal their bills. The frequency of appeals will be lower if assessments are roughly equal for comparable properties in an active market.

These hypotheses would also lead us to believe that when the tax "becomes large," property owners have more incentive to appeal. The perception of an inappropriately large increase could stem not from an error on the part of the assessor but from the true market value increasing at a relatively fast rate. If property owners confuse the increase from the market value with the increase in assessor error, they may feel justified in appealing – despite the fact that the increase in the underlying value of their asset can

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[1] Sales transactions form the basis for market value estimates in 37 states (the others tend to rely on some measure of replacement cost; see DeBoer, 1996).

offset the increase in their tax bill. We therefore expect that property owners whose underlying values are rising at a faster rate to be more susceptible to protesting their assessments. However, a property owner would be less likely to appeal if more information about the true market value is revealed. Property owners are exposed to this information in much the same manner as the assessor is: when a property is sold. As such we would expect property owners who have recently purchased their homes to be less likely to appeal.

We also expect that the behavior of one's neighbors influences the decision to appeal. Information about the justifications and benefits of appeals will circulate within small geographies, and in some cases, neighborhood organizations and condominium associations play a critical role in encouraging groups of property owners to appeal *en masse*. As such, we include the number of appeals filed in the immediate neighborhood as an independent variable.

Other neighborhood-related characteristics may proxy characteristics of the property owners that would lead to more or less likelihood of submitting an application. Those willing to challenge the judgment of a government agency likely possess both the sense of entitlement necessary to instigate a complaint and the knowledge necessary to navigate through complex bureaucratic systems. Education, income, and race affect the clout and connections necessary (or perceived to be necessary) to submit a successful appeal, which may discourage appeals activity in the first place. Moreover, there are costs to filing an appeals application and some households may be put off by the paperwork and time commitment.

To the extent that assessors already anticipate which property owners are most likely to appeal, they may make decisions that forestall the actual occurrence of appeals – such as lowering assessments or going to greater lengths to ensure that assessments in a particular area are uniform (Goolsby 1997). In other words, assessors have an incentive to preemptively check their behavior and keep deviations below the point at which appeals would be provoked. The cost of appeals in a large assessment region ensures that the assessor will try to avoid antagonizing particular property owners. However, in reality, assessors may be less certain about the identity of appeals applicants and therefore less able to strategically value their properties. Moreover, because assessors' abilities to randomly reduce assessments or apply different standards of uniformity to different property owners is likely constrained by law and principle, we still expect some variation in both appeals activity and successful appeals.

The Property Tax Appeal Process in Cook County, Illinois

The Cook County Office of the Assessor is the initial arbiter of the quality of its own assessments. This office has the authority to review and adjust incorrect real property tax assessments and is the first step in the appeals process. The sanctioned grounds for appeals are: a) a lack of uniformity (the onus is on applicants to demonstrate how their assessments are not in line with the assessed valuations of other homes by documenting the assessments of comparable properties); b) overvaluation (again, applicants must

demonstrate that their assessment is higher than that of comparable properties); and c) property description error (such as incorrect age or bedroom count that may affect property value). In Cook County, petitioners – either the property owners or their legal representatives – must submit their appeals during the official appeals period, which is approximately 30 calendar days from the when bi-annual assessment notices are sent out. Applications may be filed on-line or by filling out a hard copy form. Staff at the Assessor's Office review the information and notify applicants of the results of the appeal by mail.

Once the appeal has been evaluated by the Assessor's Office, it is passed on to the Board of Review, which is a separate, quasi-judicial agency independent of the Assessor. The three-member Board reviews and corrects the Assessor's evaluation "as justice shall require." It primarily focuses on appeals based on "lack of uniformity" with comparable properties. A property owner can choose to appeal to the Assessor and then again to the Board of Review, or may wait and appeal directly to the Board of Review during its "opening and closing townships" filing period (i.e., the 20 days in which an appeal must be filed with the Board of Review office in order to be considered). These dates are intentionally set for after the completion of the Assessor's appeal process. A change in assessment by the Assessor's Office does not preclude an additional change by the Board of Review. Disgruntled owners that have gone through both local channels may choose to go to the state Property Tax Appeal Board (PTAB) for a final review.

Since 1998, Cook County Assessor James Houlihan, as well as particular aldermen and county commissioners, has made a concerted effort to solicit appeals from residential property owners – staffing satellite offices at grocery stores and senior citizen centers. The County has also invested heavily in publicity materials that make the appeals process more transparent.

Some residential property owners and most commercial property owners retain the services of one of the 700 law and tax consulting firms in Cook County handling property tax appeals. Much has been made in the press of the fact that law firms affiliated with some of the state's most powerful politicians -- including those headed by Speaker of the House Michael Madigan, former County Assessor Thomas Tully, and City Council Finance Committee Chairman Edward Burke -- get better results for their clients than those without clout (*Chicago Tribune*, 2003).

Appeals activity in Cook County is critical because it can compromise the fiscal management of government agencies and overlapping taxing jurisdictions. Property-tax dependent jurisdictions such as school districts are especially concerned about the increasingly frequency of appeals applications. In the late 1990s, the state of Illinois eliminated a fund from which all refunds were paid, and commercial property owners were granted the opportunity to challenge local assessment decisions at the state level through the PTAB. As a result, the number and size of such refunds have escalated in recent years. Property tax refunds (which are comprised primarily of appeals but also such things as missed senior citizen exemptions and bounced checks) equaled $110 million in 1998 but increased to $356 million in 2003 (*Chicago Tribune*, 2003). Taxing

bodies are required to not only pay back the refund, but to also pay 5 percent interest on that amount. All taxing bodies are affected by such refunds, but schools are hit hardest because they rely so heavily on property taxes. Knowing which neighborhoods and property owners had the greatest likelihood of appealing could give them a better sense of how to estimate extensions and revenues so that they are not caught with unexpected shortfalls.

Data and Variable Descriptions

Our dataset includes all appeals applications filed for residential properties with one to six units (i.e., Class 2) in the city of Chicago for the reassessment years of 2000, 2003, and 2006. Although every property in the City of Chicago was reassessed during 2001, 2004, and 2007, the official assessment date is January 1, 2000, 2003, and 2006. Property owners can appeal their tax bills during non-reassessment years, but they rarely do so. As such, we have limited our study to the three years in which reassessments occurred.

Appeals application data were provided by the Cook County Office of the Assessor for all three years and by the Board of Review for years 2000 and 2003. These datasets also contains information on the parcel identification number (PIN), date of application filing, and assessed value. PINs allowed us to merge our appeals dataset with the complete assessment files for Chicago, which includes the same data for those Class 2 properties that did not file an appeal during the same three years. Even though condominium buildings are considered Class 2, we eliminated them from our dataset because of the different set of rules pertaining to the basis for condominium appeals and the fact that joint filing by all owners in a building is encouraged.

Table 1 reveals that 11% of 407,012 property owners in 2000, 20% of 414,148 property owners in 2003, and 13% of 417,498 in 2006 filed applications to appeal their property tax assessments.[2] Almost twice as many property owners appealed their assessments in 2003 than in 2000, most likely because it was between these years that average real prices and therefore assessed values appreciated rapidly. The mean change in assessment for our sample between 1997 and 2000 was 26%, while between 2000 and 2003 it was 37%. But the share of applicants decreased in 2006 despite the fact that mean change in assessment between 2003 and 2006 was the greatest at 48%.

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[2] Although there does not appear to be a centralized source of appeals data for different counties, let alone states, property tax experts have noted that the proportions of property owners appealing their assessments in Chicago are relatively high (personal conversation with Jane Malme, October 2007).

Table 1: Frequency of Non-Condominium, Residential Appeals Applications and Success

	2000	2003	2006*
Number of appeals applications to Assessor and Board of Review	44,771	82,829	54,274
Number of property owners	407,012	414,148	417,498
Share of property owners who appealed their property tax assessments	11%	20%	13%
Number of appeals applicants to Assessor who were successful	12,230	16,377	11,660
Number of appeals applications to Assessor	37,063	52,830	55,526
Share of appeals applicants to Assessor who were successful	33%	31%	21%

*Note. 2000 and 2003 data is from the Cook County Assessor and the Board of Review. Only the Cook County Assessor provided data for 2006.

The Assessor data were matched by PIN to data from the Illinois Department of Revenue (IDOR), which is responsible for conducting assessment ratio studies for all Illinois townships and counties and for collecting the property transfer declaration forms that must be filed when a property changes ownership. The IDOR eliminates non-arm's length sales and any sales with unusual financing. This transactions data includes information on whether the property was recently sold and is the basis for one of our key variables of interest: the number of recent sales within each census tract. The merged dataset includes appeals and assessments for 2000, 2003, and 2006 as well as detailed structural and neighborhood characteristics by census tract for all properties.

The Cook County Assessor and Board of Review provided us with information about whether the requested reduction was granted (i.e., "success"). An analysis of the Board of Review data, however, revealed several inconsistencies that led us to question the meaning of certain codes and the accuracy of this data set. As a result, we rely solely on data from the Cook County Assessor to determine whether an application was successful. As Table 1 shows, the chances of a successful appeal declined over time. Whereas in 2000, an applicant had a roughly one-in-three chance of winning the appeal, by 2006, an applicant's chances had been reduced to approximately one-in-five.

Our introductory discussion implies that the decision to appeal primarily depends on prior change in assessments, the degree of activity in the local real estate market, local assessment uniformity, and attributes of the individual property owner. As such, our explanatory variables can be grouped into four broad categories that might influence these factors—a property's structural characteristics, its assessment characteristics, neighborhood real estate market characteristics, and neighborhood demographic characteristics.[3] These characteristics alter the likelihood of assessor error, market

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[3] We used different measures to capture neighborhood fixed effects but report only on those models that used the eight township boundaries that cover the City of Chicago. Townships are political boundaries used primarily for the purpose of property assessment and taxation. Results from estimations using census tracts and community areas instead of townships were roughly similar as far as our primary variables of interest were concerned.

information, and a property owner's confidence of success and hence enter into the appeal probability function. The means and standard deviations of variables used in the analyses are presented in Table 2.

Table 2: Descriptive Statistics for Probit Model

| | 2000 | | | | 2003 | | | | 2006 | | | |
| | Appeal | | No Appeal | | Appeal | | No Appeal | | Appeal | | No Appeal | |
Variables	mean	st dev	mean	st dev	mean	st dev	mean	st dev	mean	st dev	mean	st dev
Income	45632.28	21459.16	41255.15	13058.64	46610.51	17680.31	40403.36	13052.98	46170.49	18248.11	41051.29	13461.41
Hm value	212056.8	155901.6	141999.8	85954.82	203790	126545.7	136331.5	85673.46	209307.6	146887.8	140807.2	85451.34
Black	23.93955	37.56879	38.99338	43.97568	17.27948	32.14606	42.68062	44.61169	23.80365	36.47475	39.41002	44.16728
Hispanic	18.63492	22.27782	24.74766	28.33238	17.80581	20.61782	25.6552	29.13904	21.74085	24.10023	24.43459	28.30833
College	1.511713	1.976336	0.81135	1.311439	1.236988	1.768348	0.812322	1.337992	1.542609	3.035074	0.818937	3.736272
H. School	96.39752	3.303825	96.86811	3.146144	96.84847	3.112586	96.77874	3.230339	96.28759	9.495526	96.8359	7.358636
Hmownship	54.98573	23.8498	57.05519	22.48928	58.23646	23.68886	56.21156	22.36686	53.09287	23.15752	57.37619	22.51279
Age	75.16046	30.4525	75.19806	27.06817	69.11697	29.02521	76.31227	27.52906	75.66997	33.21289	77.63625	27.24342
Sq ft	2211.763	1510.716	1714.847	1093.585	2018.69	1380.54	1714.428	1096.726	2197.273	1510.731	1702.229	1078.033
Rooms	8.486904	5.103353	7.150016	4.11315	7.919733	4.903204	7.142734	4.046359	8.401109	5.147917	7.09333	3.962594
Ass value	23391.86	16597.86	14694.05	9664.217	30179.92	18547.54	18977.55	13166.95	41986.29	29284.51	28594.15	17530.41
% Assmt	36.01547	137.9738	26.79086	78.69327	37.49998	33.47932	37.7716	33.41222	47.84498	55.49453	50.61595	44.52238
Sale?	0.10808	0.310485	0.115312	0.319399	0.106971	0.309079	0.124112	0.32971	0.152739	0.359739	0.155415	0.362301
Med Assmt	22115.81	12985	14206.44	8036.779	28956.37	14005.61	18427.45	10947.33	39072.15	20992.04	27517.38	13996.98
No. sales	135.5651	105.0267	155.3562	134.1697	161.3167	99.08002	176.5157	128.0692	149.863	208.2606	184.2846	228.9316
Appls block	10.92239	13.1601	2.384554	3.294727	18.38712	16.88835	3.311908	4.182094	7.418955	8.322694	3.543139	4.031157
town1	0.093961	0.291778	0.144726	0.351825	0.055659	0.229263	0.160721	0.367274	0.091381	0.288152	0.157023	0.363823
town2	0.316302	0.465038	0.257135	0.437055	0.487679	0.499851	0.203441	0.402559	0.279203	0.448611	0.257846	0.437449
town3	0.144633	0.351734	0.366981	0.481982	0.117326	0.32181	0.398512	0.489593	0.209632	0.407049	0.357964	0.479402
town4	0.152859	0.359856	0.04004	0.196054	0.095498	0.293903	0.042155	0.200943	0.138818	0.34576	0.037848	0.190829
town5	0.040422	0.196948	0.006905	0.082812	0.02568	0.158179	0.006919	0.082892	0.040215	0.196466	0.006213	0.078579
town6	0.072772	0.259765	0.011734	0.107685	0.089879	0.28601	0	0	0.038072	0.191373	0.015206	0.12237
town7	0.023057	0.150085	0.031163	0.173758	0.023877	0.152668	0.032968	0.178553	0.047437	0.212574	0.028679	0.166903
town8	0.155994	0.362854	0.141315	0.348347	0.104403	0.305785	0.155284	0.362176	0.155243	0.362139	0.139221	0.346177

From the descriptive statistics for our three study years, it appears that appeals applicants are more prevalent in census tracts with higher median incomes, median home values, median assessed values, and shares of college-educated residents. Applicants were less likely to come from census tracts with larger shares of blacks and Latinos. Owners of more recently constructed, larger, and highly valued houses were more likely to appeal their property tax assessments. Appeals were associated with census tracts with lower mean sales densities and a greater number of contemporary appeals applicants per census blocks.

Indeed the maps of appeals applicants as a share of Class 2 properties by census tract (Figures 1, 2, and 3) reveal that applicants tend to be clustered on the city's north and northwest sides, with pockets in the two south side neighborhoods with substantial shares of higher-income, white residents: Kenwood-Hyde Park and Beverly. It is interesting to note that over time the bulk of applicants has shifted eastwards, concentrating closer to the city's highly desirable lake shore – particularly in the areas on the perimeter of the Central Business District, such as the Near South Side, which has recently filled in with new town home developments on land that was once devoted to rail lines and yards.

Figure 1

% Non-condo Residential Parcels Appealing
Property Tax Assessment(2000)
by Census Tract

Legend

- 0.0000 - 0.0500
- 0.0501 - 0.1000
- 0.1001 - 0.2000
- 0.2001 - 0.3500
- 0.3501 - 0.6000
- 0.6001 - 1.0000

Figure 2

% Non-condo Residential Properties Appealing
Property Tax Assessment(2003)
By Census Tract

Legend

	0.0000 - 0.0500
	0.0501 - 0.1000
	0.1001 - 0.2000
	0.2001 - 0.3500
	0.3501 - 0.6000
	0.6001 - 1.0000

Figure 3

Percent Non-condo Residential Appealing
(=num of appeals/num of properties)
2006, by census tracts

Legend

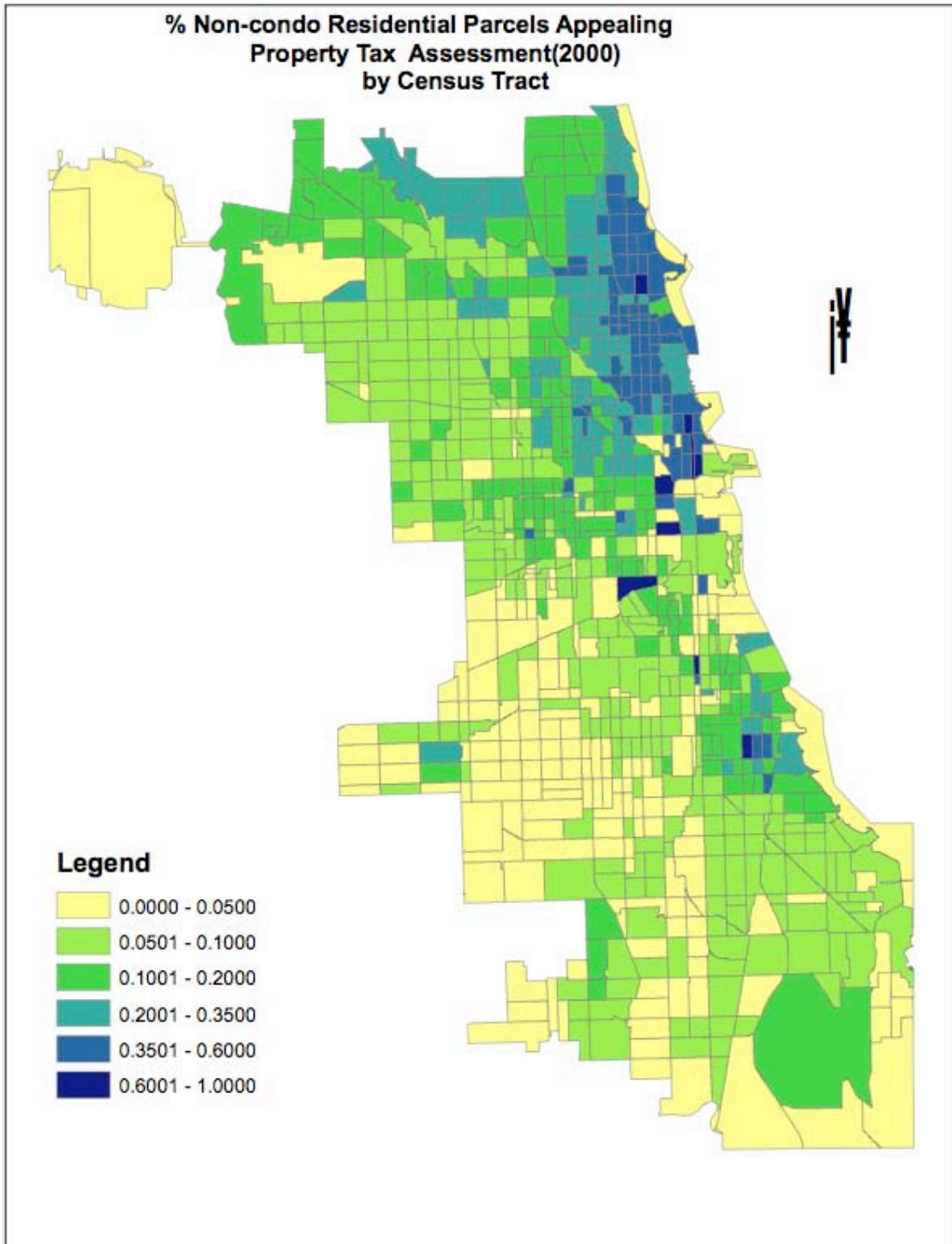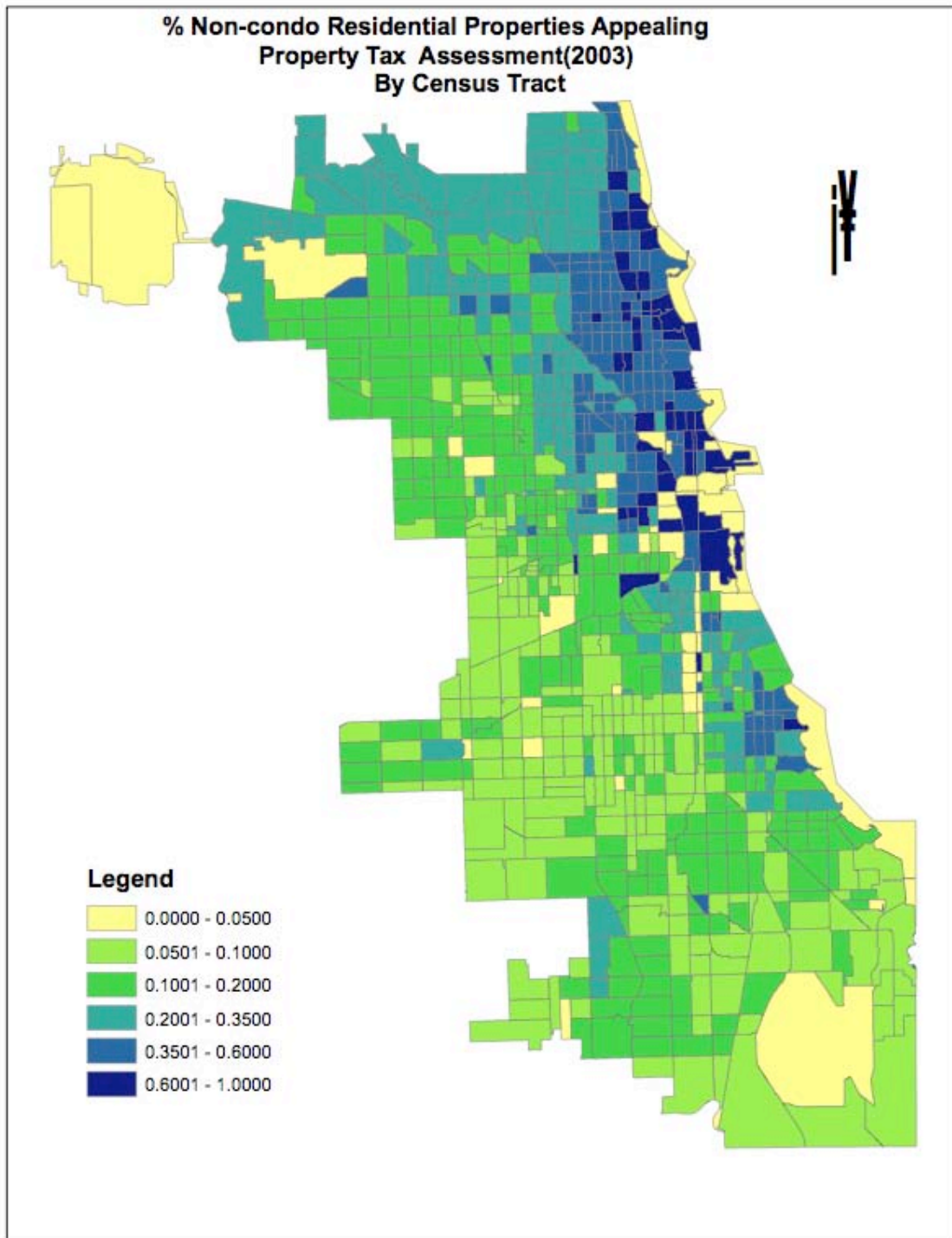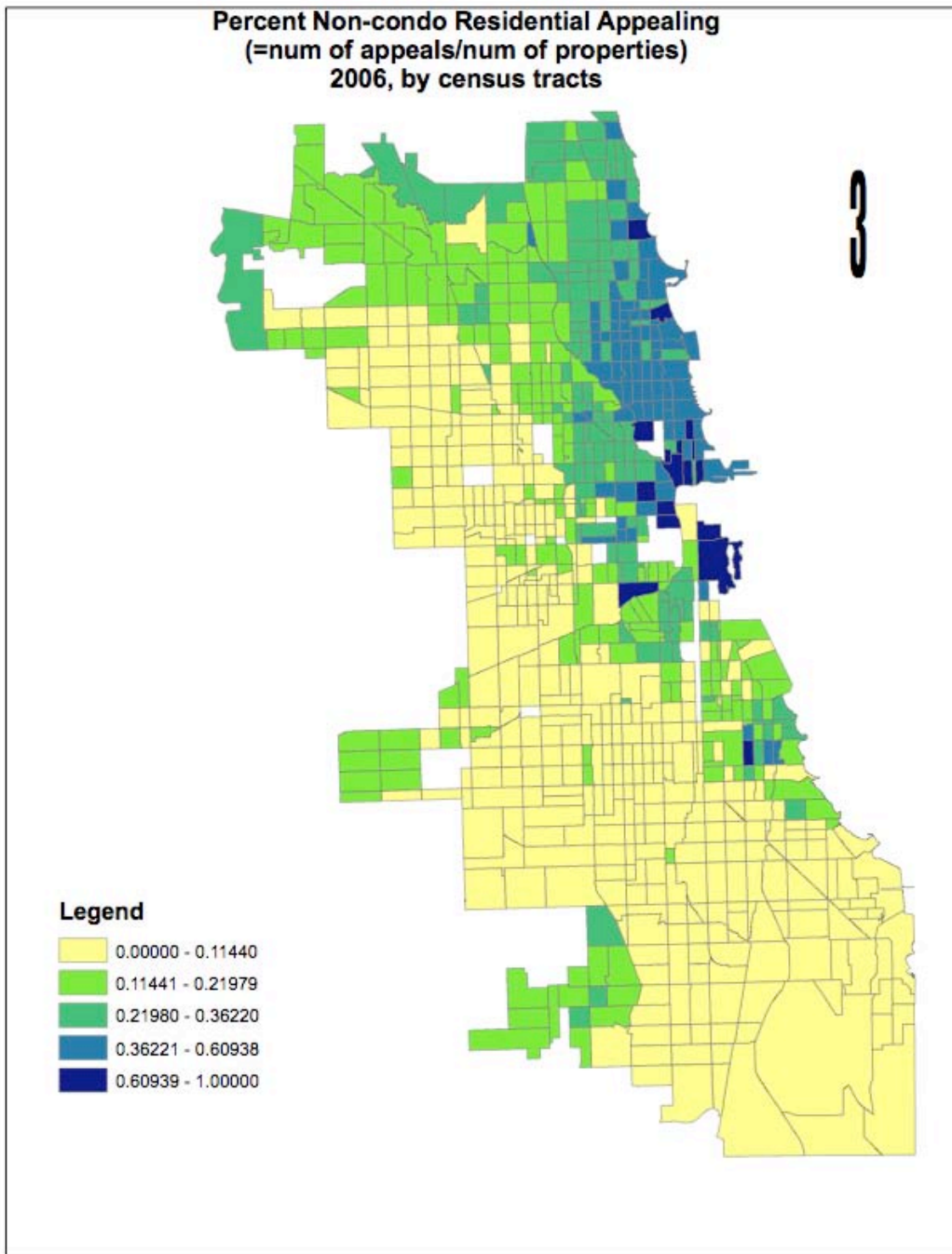|	
	0.00000 - 0.11440
	0.11441 - 0.21979
	0.21980 - 0.36220
	0.36221 - 0.60938
	0.60939 - 1.00000

The explanatory variables for the two probit models ("appeals" and "success") are different, reflecting both the fact that individual property owners use a different calculus in deciding to appeal than the Assessor uses in deciding individual cases and that each group is privy to different sets of relevant information. The Assessor's standards for granting a reduction hinge on findings of property description error, overvaluation, and a lack of assessment uniformity across the neighborhood and property type. This office's decision to grant an appeal is more focused on a property's structural and assessment characteristics and the neighborhood real estate market characteristics than on demographic characteristics. For example, the Assessor does not have access to data on the income or race of an individual property owner and even when neighborhood composition is likely skewed in a particular direction, high rates of absentee landlords in poor and minority neighborhoods make the possibility of overt discrimination less likely.

Maps of successful appeals as a share of Class 2 properties by census tract (Figures 4, 5, and 6) reflect a slightly different spatial logic than those of applicants. Like the maps of applicants, successful appeals are also concentrated on the north and northwest sides of the city, with pockets in Hyde Park and Beverly. However reductions tend to granted to property owners from more "inland" census tracts, particularly those that are relatively older and have been more stable than the areas of new construction ringing the Central Business District. It is likely that new construction and a dramatic transformation in the built environment will present new and existing property owners with the "sticker shock" of high property taxes. But the fact that new building stock trades more frequently and that the assessor has access to building permit data on replacement costs for new construction decreases the likelihood of both assessor error and a subsequent reduction in assessments.

Figure 4

% Non-condo Residential Properties Successfully Appealing
Property Tax Assessment by Census Tract 2000
(% = num of successful appeals/num of non-condo resdidential properties)

Legend

	0.000 - 0.040
	0.041 - 0.108
	0.109 - 0.231
	0.232 - 0.500
	0.501 - 1.000

Figure 5

% Non-condo Residential Properties Successfully Appealing
Property Tax Assessment by Census Tract 2003
(%= num of successful appeals/num of non-condo residential properties)

Legend

- 0.000 - 0.043
- 0.044 - 0.104
- 0.105 - 0.208
- 0.209 - 0.500
- 0.501 - 1.000

Figure 6

Percent Non-condo Residential Successful Appeals among the Properties
(=num of successful appeals/num of properties)
2006, by census tracts

Legend

- 0.00000 - 0.03468
- 0.03469 - 0.08264
- 0.08265 - 0.18440
- 0.18441 - 0.49259
- 0.49260 - 1.00000

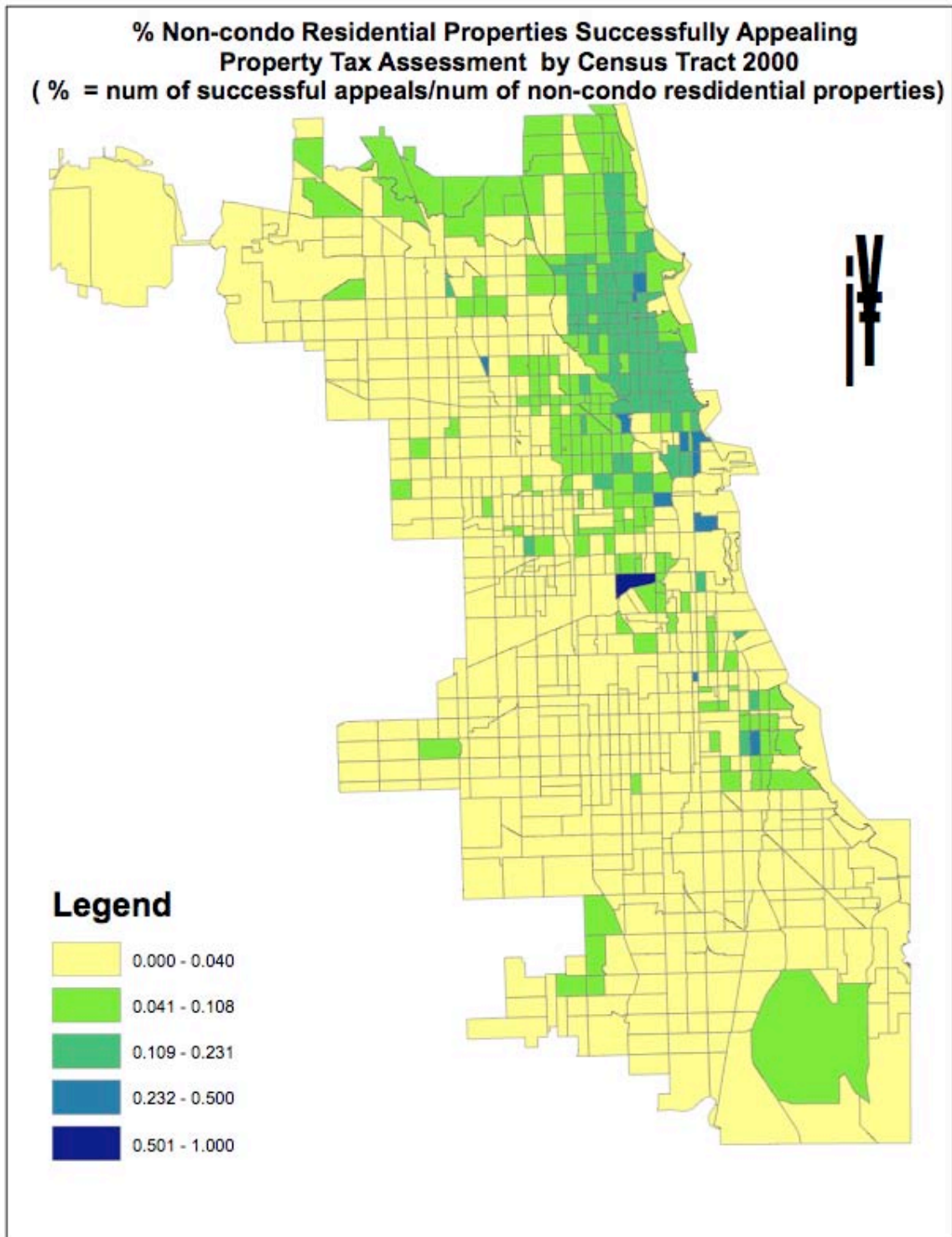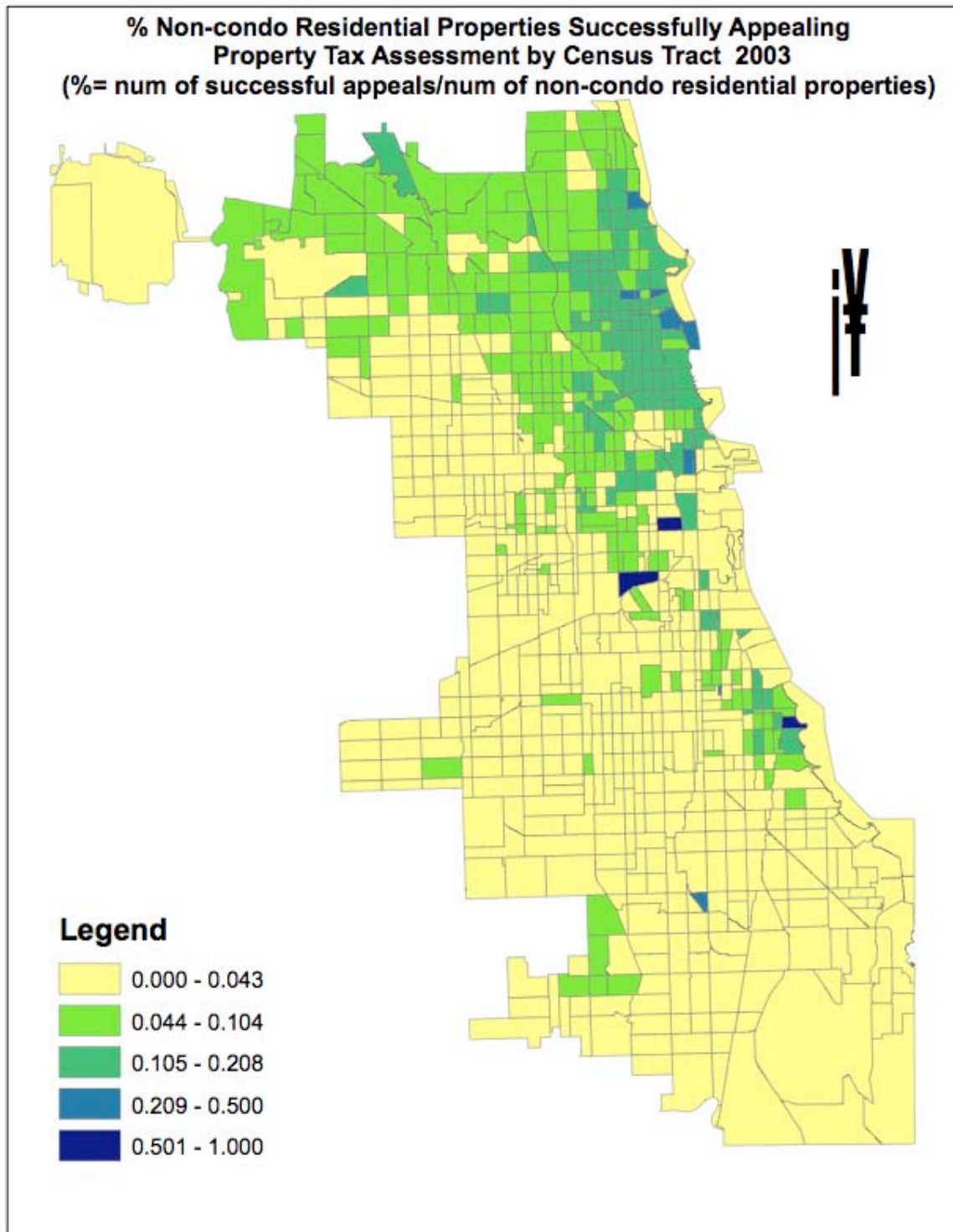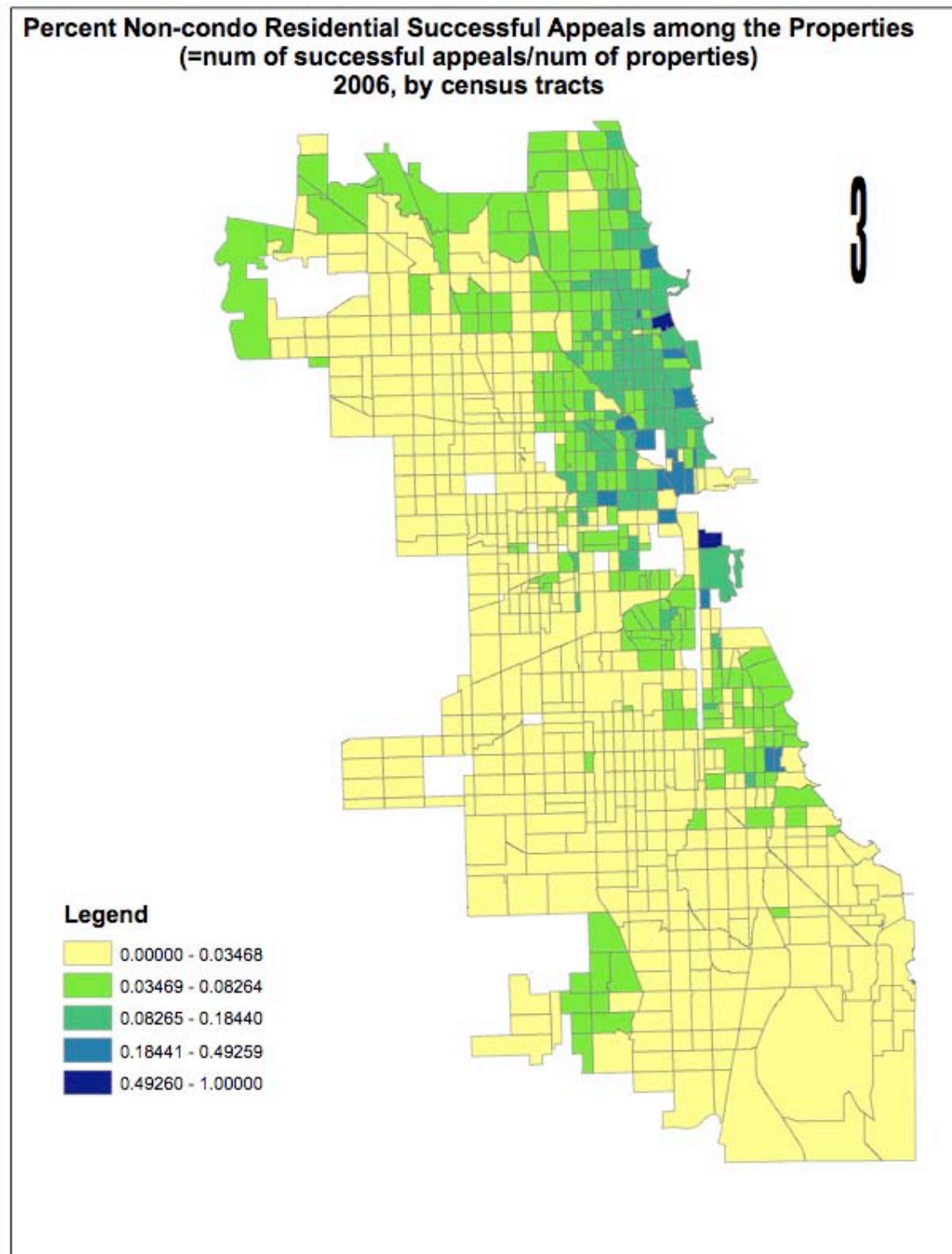## Models and Results

Separate probit models

We estimate two separate models for each of our three study years. In the first model, the *appeals* model, we estimate the probability that a property owner files an appeal with Cook County Assessor or Board of Review during the study year. Letting X_1 represent the set of variables that determine this decision, this probability is simply $\Phi(X_1\beta_1)$, where Φ is the standard normal distribution function. The coefficients, β_1, can be estimated using a simple probit model. Similarly, X_2 would represent the set of variables in the second model, the *success* model, that determine the success of the appeal.

The results from the appeals analysis are presented in Table 3. Each of the three columns shows the relationship between the listed explanatory variables and the probability of filing an appeals application.

Table 3: Probit Results for Appeals Model

Variable name	2000 (n=404,210)	2003 (n=399,311)	2006 (n=399,734)
Median income (census tract), 2000	-8.71E-06**	-7.88E-06**	1.44E-06**
Median home value (census tract), 2000	-5.07E-08	6.45E-07**	2.08E-07**
Percent Black (census tract), 2000	-0.00197**	-0.00641**	-0.0037**
Percent Hispanic (census tract), 2000	-0.00528**	-0.0132**	-0.00434**
Percent > age 25 with at least BA (census tract), 2000	0.014002**	-0.01437**	0.000184
Percent > age 25 without hs deg (census tract), 2000	-0.00011**	0.002506	0.000177
Percent homeowners (census tract), 2000	0.010306**	0.006782**	9.25E-06
Age of building, study year	0.000325*	-0.0027**	-0.00207**
Square footage of building area, study year	0.000136**	0.000102**	0.000136**
Number of rooms of building, study year	-0.00815**	0.001422**	-0.00581**
Assessed value, study year	-4.28E-06**	-5.47E-06**	-4.08E-06**
Percent change (abs) in assessed value in prior 3 years	0.000233**	-0.00064**	0.000212**
If property sold in prior 3 years	-0.08285**	-0.06461**	-0.01847*
Median assessment (census tract), study year	3.66E-05**	1.79E-05**	1.46E-05**
Number of sales (census tract) in prior 3 years	-0.00079**	-0.00072**	-0.00071**
Number of appeals filed in census block, study year	NA	0.030026**	0.003073**
Township 1	0.208223**	0.112074**	0.010988
Township 2	0.351304**	0.81556**	-0.07032**
Township 4	0.543668**	0.218738**	0.150684**
Township 5	0.122911*	-0.09266*	-0.07335*
Township 6	1.037597**	NA	0.28431**
Township 7	0.213894**	0.218154**	0.237865**
Township 8	0.492473**	0.486732**	0.113153**
Constant	-2.18631**	-1.37883**	-1.34952**
Pseudo R^2	0.127	0.215	0.086

*Significance probability at or below 0.01 but above 0.001; ** Significance probability at or below 0.001.

With few exceptions, the results for the three years were very similar. Appeals applicants were more likely to come from census tracts with high median home values and assessments and those with a greater share of homeowners. Owners of larger (in terms of area) properties were more likely to appeal, but those with more rooms were less likely to do so. Taken together, these results imply that owners of subdivided and multi-family properties (recall that Class 2 properties can contain 6 separate units) were less likely to file an appeal application. Property owners located in tracts with more blacks and Hispanics, and also those with higher median incomes were less likely to appeal. Compared to property owners in our control of Township 3 (Lake) located on the City's south-east side, those in Townships 1 (Hyde Park), 4 (Lakeview), 6 (Rogers Park), 7 (North) and 8 (West) were consistently more likely to file an appeal.

Our hypotheses about predictors of appeals applications involve the actual and perceived valuation of one's own property as well as that of neighboring comparable properties. Somewhat surprisingly, we find that those property owners whose homes are assessed at lower values are more likely to appeal – although they are located in census tracts with relatively high *median* assessments. Those whose assessed values were increasing at a faster rate were more likely to appeal in 2000 and 2006, but, surprisingly, change in the assessed value of the property is associated with less propensity to appeal in 2003. If many of one's neighbors appealed in a given year, an individual property owner was also more likely to do so.

Our results point consistently to the fact that sales activity suppresses appeals applications. For all three study years, the absolute number of recent, nearby sales and the dummy that measures whether the individual property sold within the last three years were significant and negative.   Such findings suggest that the more market information property owners can access about market values, the less likely they are to appeal their own property tax assessments. They also suggest that error terms would be lower in thicker markets, and property owners in such locations would have less incentive to appeal their bills. New property owners (those who purchased their homes within three are less likely to appeal their tax bills.

The results from the second probit analysis are presented in Table 4. Each of the three columns shows the relationship between the listed explanatory variables and the probability of a successful appeals application.

Table 4: Probit Results for Success Model

Variable name	2000 (n=36,493)	2003 (n=50,686)	2006 (n=52,203)
Median income (census tract), 2000	2.10E-06*	2.10E-06**	2.88E-06**
Median home value (census tract), 2000	5.94E-09	-1.46E-08	1.98E-08
Age of building, study year	0.00214**	0.002337**	0.002043**
Square footage of building area, study year	4.24E-5**	-0.0001**	-9.08E-06
Number of rooms of building, study year	-0.01387**	0.018708**	0.007485**
Assessed value, study year	-3.04E-06**	-1.55E-06*	-5.44E-06**
Percent change (abs) in assessed value in prior 3 years	4.52E-05	-0.00162**	-0.00074**
If property sold in prior 3 years	-0.00717	-0.16006**	-0.19588**
Median assessment (census tract), study year	1.15E-05**	1.11E-05**	1.33E-05**
Number of sales (census tract) in prior 3 years	-0.00025*	-0.00024**	-0.00053**
Attorney used?	-0.21923**	-0.26166*	-0.14536**
Number of appeals filed in census block, study year	NA	-0.00224*	-0.00276**
Township 1	-0.02476	-0.12218**	0.177274**
Township 2	0.147884**	0.203709**	0.065815*
Township 4	0.11962*	-0.06209	-0.14892**
Township 5	-0.16687*	-0.42126**	-0.50649**
Township 6	0.31147**	0.187851**	0.033417
Township 7	0.128877**	-0.17538**	0.06513
Township 8	0.04418	0.005377	0.008043
Constant	-0.85523**	-0.79724**	-1.25379**
Pseudo R^2	0.0163	0.0253	0.020

* Significance probability at or below 0.01 but above 0.001; ** Significance probability at or below 0.001.

In general the success model explains less variability than the appeals model, as reflected in the lower pseudo-R^2s. Nonetheless there are several significant and consistent results over the three study years. In general, property owners located in census tracts with both relatively high median assessments and median household incomes were more likely to file a successful claim. Owners of older and larger (measured by building size in 2000 and number of rooms in 2003 and 2006) properties were also more likely to be successful, probably because larger properties have a greater chance of some structural idiosyncrasy and therefore an inaccurate recording of property characteristics by the Assessor. Compared to Township 3 (Lake), applicants in Chicago's far north side in Townships 2 (Jefferson Park) and 6 (Rogers Park) were more likely to be granted an appeal. These two townships, which may be considered to be part of Chicago's "Bungalow Belt," are home to a number of new, younger in-movers but also have larger populations of older, long-term residents than many of the neighborhoods near Lake Michigan and the Central Business District.

Neither a high nor rapidly increasing assessed value assured a property owner of a reduction. In fact, the findings reveal the opposite tendency: assessments and prior change in assessment were both negatively associated with appeals success. One's property tax bill needs be more than high and burdensome to expose some sort of error on the assessor's part.

Our results suggest that sales activity provides the assessor with more accurate information about underlying market values and allows analysts there to make more informed judgments about the degree to which assessor error or market dynamics are responsible for the perception of overvaluation. The number of recent sales in a census tract and whether an individual property recently sold are both consistently associated with rejection. Both variables indicate that many property owners believe themselves to be the victims of individual mistreatment in situations where their property tax bills are fueled by heated market activity and not by errors on the part of the adjudicators.

Interestingly, hiring a property tax lawyer is no guarantee of success. It is likely that lawyers in this area of specialty "go fishing" for clients, many of which do not have strong cases for reassessments. If this is the case, lawyers may represent a less success-prone clientele than the individual property owner appealing on his or her own. Similarly, herd behavior is no guarantee of success. The number of proximate appeals applicants lowered one's chances of success in both 2003 and 2006.

Sequential probit model

Modeling the probabilities of applications and success in the manner above is appropriate when the error terms are not correlated for the two models. But unobserved variables that influence the decision to appeal can also be expected to determine the success of an appeal once made. If there is an omitted variable that influences both the probability of appeals and success, coefficients for the separate models may be biased, and the models will require a different functional form.

In this case, the probability of a successful appeal can be written as $\Phi_2(X_1\beta_1,X_2\beta_2,\rho)$, where Φ_2 is the bivariate normal distribution function and ρ is the correlation between the errors of the two equations. The complete set of probabilities is shown in the following table:

	Probability
No Appeal	$1 - \Phi(X_1\beta_1)$
Successful Appeal	$\Phi_2(X_1\beta_1,X_2\beta_2,\rho)$
Unsuccessful appeal	$\Phi_2(X_1\beta_1,-X_2\beta_2,-\rho)$

Consistent estimates of β_1, β_2, and ρ can be obtained by maximizing the log-likelihood function implied by this set of probabilities.

We conducted a sequential probit analysis of the 2003 data to confirm the robustness of results from our separate probit models. With a point estimate of 0.308 and a standard

error of 0.025, the correlation coefficient was indeed statistically significant and positive. Although the statistically significant correlation suggests that the estimates from separate probit models are biased, the estimates from the sequential model are very similar to the standard probit estimates. Thus, the standard probit estimates appear to be quite robust.

Conclusion

Like many other political institutions in Cook County, the property tax appeals process has long been perceived as sclerotic and corrupt. The presence of hundreds of politically-connected property tax attorneys and the seeming importance of social networks dating back to the County's ward system have given the impression that the decision to reduce one's property tax bill turned more on who you knew than on the presence of any actual errors in one's assessment. Indeed the process of valuing property has been considered so arbitrary that the concept of an "error" compromising the accuracy of already subjective assessments is hard for many to fathom.

But the appeals process of the 21st century does not necessarily resemble the process of yore. Although we cannot comment on the Board of Review's adjudication process, the Cook County Assessor has made bold efforts to solicit appeals applications and has made the process more transparent. The number of applicants has jumped since the late 1990s, not simply because underlying property values have increased rapidly but because transaction costs required to file an application have decreased. Increasing demands for reductions, however, have not corresponded to a necessary increase in appeals granted. Indeed, the analysts who make the decision about whether to grant an appeal must justify their decision based on strong evidence of three kinds of error: a lack of uniformity, overvaluation, or property description. Improvements in the valuation process (such as the adoption of more sophisticated Computer Assisted Mass Appraisal and Geographic Information Systems) and the increase in the quality of information about underlying market values due to increased transaction activity are decreasing the likelihood of assessor error and, therefore, an applicant's chances of success.

Nonetheless there still is a disconnect between those who believe they are owed a reduction and those who actually receive one. Applicants are typically those in neighborhoods with relatively high home values and assessments faced with the "sticker shock" of a tax bill that had increased dramatically since the last reassessment year. They are more likely to be educated and white, although not living in the highest income tracts of the city. They are influenced by their neighbors' decisions to file an appeal and appear to live in areas with activist aldermen, county commissioners, and neighborhood associations who urge property owners to apply. However, they also have selective access to information about market values through transactions data, and the frequency of sales and their knowledge of sales prices suppresses the tendency to file an appeals application.

Information-rich environments not only temper the perception of individual mistreatment, but they also improve the quality of assessor decision-making. In other words, thick markets lead to fewer errors that need to be corrected through the appeals process.

Assessments tend to be more uniform in such areas (McMillen and Weber 2005). In contrast, successful applicants tend to be those where there is a greater likelihood of assessor error: census tracts with fewer sales and where the individual property has not been recently sold. The greatest chances of success can be found in neighborhoods where property owners are confident enough to file an application (note the positive correlation with income and building size) but that have experienced less new construction, sales activity, and appreciation than can be found in areas with the greatest share of applicants. Moreover, legal representation is no substitute for a finding of assessor error, such as overvaluation or mistakes in the recording of structural information. The fact that the average property owner that wins an appeal is slightly different from that who files an appeal demonstrates that the assessor exercises some informed discretion over the final judgment and does not just capitulate to the "squeakiest wheel."

Appeals processes have the potential to serve as an important check on administrative decision-making in different realms of public administration if they are easy to access and independent of applicants' power to game the system. If they are not, such processes will not only leave dysfunctional systems intact but will also have serious distributional consequences. A system of property tax appeals biased in favor of owners of higher-valued properties or those that can afford legal representation can exacerbate existing inequities and make the incidence of this unpopular tax more regressive. Our research demonstrates that while the appeals process has become more accessible, the primary drivers of success in Chicago are not qualities and resources of the individual applicant (with the exception of the neighborhood's median income) as much as the propensity for actual valuation errors based in part on the lack of accurate market information. While evidence of regressivity in Chicago's assessment exists, it is unlikely caused by the appeals process.

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