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Location incentives in the low-income housing tax credit: Are qualified census tracts necessary?

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ABSTRACT

The low-income housing tax credit (LIHTC) is the largest project-based housing subsidy in the United States. Within the program, private developers receive a subsidy in exchange for constructing apartment units that rent for a predetermined affordable rate. Because the subsidy requires apartment buildings to charge a lower rental rate, the opportunity cost of developing subsidized housing in a location is the market rent that a developer could have charged if he had not received the subsidy. This study characterizes how profit incentives motivate location decisions within the LIHTC program by showing that opportunity cost causes more LIHTC development in locations with low market rent. This result implies that additional financial incentives, like the qualified census tract, may not be necessary to promote construction of subsidized housing in low-rent areas.

1. Introduction

Since the creation of the low-income housing tax credit (LIHTC) in 1986, the program has become the primary source of project-based subsidized housing in the United States.[1] Under the LIHTC program, private developers propose apartment projects to government housing agencies. If the projects are selected, developers receive tax credits that partially fund construction and, in exchange, apartments are required to rent at a rate considered affordable to low-income families. Between 1986 and 2003, 28% of all multi-family housing built in the United States received funding from tax credits, building over 1.2 million low-income units (Schwartz, 2006; Malpezzi and Vandell, 2002). Currently, the LIHTC program "is the most important resource for creating affordable housing in the United States" (Abt Associates, 1996).

The location of LIHTC units has been an important topic of debate, primarily because a unique aspect of the program is that private developers propose the location of housing developments. Because developers propose locations, one expects profit incentives to play a role in the location of LIHTC housing. A number of studies have documented the effect of a specific location incentive called the qualified census tract (QCT), which provides additional funding for construction in designated low-income census tracts (Freeman, 2004; Hollar and Usowki, 2007; Baum-Snow and Marion, 2009; Oakley, 2008). The current study shows that, even after controlling for QCT designations, differences in the market rent level affect the location of subsidized housing. Specifically, developers are more likely to build subsidized housing in locations with low rent.

The economic reasoning that motivates this result is that developers must reduce the rent charged in apartment units in exchange for the subsidy. This implies that a developer will choose to construct subsidized units as long as the rent reduction is completely offset by the subsidy received. As the market rent increases, the amount of forgone rent increases, reducing the likelihood that the size of the subsidy is sufficient to make LIHTC development the most

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[1] The housing choice voucher program is the largest tenant-based federal subsidy program. This program provides individual tenants with funds that can be used at designated apartments to reduce the rent paid by the tenant.

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profitable decision. Therefore, subsidization is less likely to be profitable in locations with relatively high market rent because the opportunity cost of building subsidized housing is high in these locations.

The degree to which developers respond to differences in market rent has implications for the efficiency of the LIHTC program. First, if the LIHTC subsidies are constructed such that developers are already motivated to build in locations with low rent, offering additional subsidies for building in these locations may be redundant. Qualified census tracts are defined as low-income locations and the correlation between low-income and low-rent areas is substantial. Because the majority of qualified tracts are designated in the lowest part of the rent distribution, it is possible that rent-based incentives would already motivate construction in locations that are most likely to be designated as QCTs.

Additionally, if LIHTC housing is primarily located in low-rent locations, tenants within these buildings may not be paying significantly less than the rent in an equivalent unsubsidized building in the same area. Burge (2011) shows that only a small portion of the cost of the LIHTC subsidy is used to reduce rent for tenants and rent savings diminish over the lifetime of the apartment units. The outcome Burge demonstrates may be the result of incentives to build subsidized housing in locations where the rent is already low.

This study shows that market rent levels, absent of other location incentives, affect the number of LIHTC units built in a census tract. Empirical evidence suggests that LIHTC units are most likely to be constructed in locations with low rent, which is likely due to the profit incentives that developers face. If the LIHTC program structure attracts subsidized construction to low-rent locations, additional subsidies for construction in QCTs may not be necessary. The estimates from this study suggest that reducing or eliminating the QCT incentive from the LIHTC program would reduce costs without substantially altering the locations and quantity of LIHTC construction.

2. The low-income housing tax credit

The low-income housing tax credit (LIHTC) was established in the Tax Credit Reform Act of 1986 to motivate private investment in low-income housing. Although the program is federally funded, state housing agencies decide which projects will receive tax credits. Each year state agencies accept applications for potential projects and then allocate credits to those that are considered most viable and beneficial for the community. National regulations require projects to remain affordable for at least 30 years. Often the number of tax credits requested by developers outweighs the available supply, so many allocation agencies have systems to award tax credits to the developments that are considered the most beneficial.[2]

When a project is selected for the subsidy, developers do not immediately receive tax credits. Instead, credits are allocated over the ten year period after the building begins operation. To fund construction of apartments, developers sell the future stream of tax credits to investors in a process called "syndication". While syndication is not addressed in the current study, previous research finds mixed results on the efficiency of the syndication process.[3]

The number of tax credits that each project receives is directly related to the cost of construction, excluding land and other financing fees. Through the calculation process, a developer can alter the size of the tax credit with certain decisions. These decisions and incentives are most easily understood using an example. Imagine a proposed project that costs $12 million to develop. If the cost of land and financing is $4 million then the tax-credit calculation begins with $8 million. This is called the "qualified basis".[4]

The location of a project can influence the number of tax credits received. Developers can increase their qualified basis by a factor of 1.3 if the proposed project is located in a "difficult to develop area" or a "qualified census tract". Difficult to develop areas are counties and Metropolitan Statistical Areas (MSAs) that have high construction, land and utility costs relative to income. Qualified census tracts (QCTs) are tracts where the poverty rate is above 25% or at least half the households earn below 60% of median family income for the MSA or county.

The purpose of qualified census tracts is to motivate the construction of low-income housing in high-poverty areas. Consequently, studies cite this incentive as the primary reason for high-poverty clustering (Oakley, 2008; Hollar and Usowki, 2007; Jewell, 2005). Of the 800,000 units built between 1995 and 2003, about 40% were located in at least one of these geographies (Abt Associates, 2006). If the example building is located in a qualified census tract, the qualified basis is adjusted from $8 million to $10.4 million.

The final step needed to calculate the tax credit is to multiply the adjusted qualified basis by the current tax-credit rate.[5] In the example, if the credit rate is 8%, then multiplying $10.4 million by the credit rate yields $832,000. This is the number of tax credits the developer will receive each year for the ten years immediately after the project is completed. In the example, the total number of tax credits received is $8.32 million. Tax credits make up approximately 70% of the original $12 million of costs. The futures of these tax credits are then sold to investors

[2] Gustafson and Walker (2002) review the allocation plans for 47 states and find that in the year 2000, 43 states favored projects in targeted areas. In almost every case, targeted areas are low-income and the intent is to revitalize the areas with LIHTC construction.

[3] See Stegman (1991); Case (1991); Cummings and DiPasquale (1999); McClure (2000) and McClure (2006).

[4] This example assumes that 100% of units are rent-restricted. The "qualified basis" is adjusted based on the number of units in the building that are rent-restricted. If a fraction of units are dedicated to market renters, the number of credits the developer receives is reduced by that fraction. Although this option is always available, few mixed-income buildings are ever developed. Of all the tax-credit projects built nationally before 2002, 84% were entirely dedicated to low-income use (McClure, 2006; US Department of Housing and Urban Development, 2005).

[5] Projects with less than $3000 of development cost per unit or projects that receive certain federal subsidies are given the four percent credit. All other projects receive the nine percent credit. The names four percent and nine percent are labels only, as the IRS publishes the actual rate each month.

to raise the money that will fund construction and a portion of the subsidy will be used to finance those transactions. Using data on the financing of tax-credit projects, McClure, 2006 estimates that after syndication, tax credits have funded approximately 55% of construction costs for projects built after the year 2000.

Once the LIHTC units are put into operation, the rent level charged to low-income tenants is restricted based on the LIHTC program standards. Within the program, rent is defined as "affordable" if households pay no more than 30% of their income on housing. While other subsidy programs calculate rent for each tenant based on income, LIHTC rents are determined using median income statistics on a county or MSA level. The result is that every tax-credit funded apartment of a particular size within a county or MSA is restricted by the same rent maximum. Because the subsidized rent that is required in apartments is constant across a single county, a developer can easily observe the trade-off between constructing subsidized versus market-rate housing. This is the basis for the profit incentives that motivate subsidized construction in low-rent locations.

3. Market rent as a location incentive

Under the assumption that only subsidized and unsubsidized housing development is possible, the development type with the highest expected future profit will occur in a particular location. While the market rent is not received in subsidized units, the decision to build subsidized housing is dependent on the market rent level in an area. Because the subsidized rent level is constant across MSAs and counties, the locations with the highest level of market rent within those geographies have the highest opportunity cost of developing subsidized housing. Consequently, if one holds the subsidy fraction constant, there exists a level of market rent level above which no developer would ever construct subsidized housing in a county. It follows that subsidized housing is less likely to be the most profitable development type in locations with higher market rent.

In the subset of locations where the market rent is less than the required subsidized rent, many tax credit allocation agencies require that subsidized units charge a rent that is ten percent less than the local market rent.[6] If a ten percent rent reduction is required, locations with the highest relative rent have the highest opportunity cost of subsidized construction. As the market rent level decreases, the required rent reduction also decreases, making subsidized construction relatively more profitable. Given this reasoning, at every point along the rent distribution, the profitability of subsidized construction relative to unsubsidized construction should decrease as the market rent increases. This is the intuition behind why developers are motivated to build LIHTC construction in low-rent areas even without additional location incentives like the QCT.

It is also important to determine how land value affects the decision to develop LIHTC units. Because the subsidy is only applied to non-land construction costs, the land value should play a limited role in the decision to build LIHTC units. Theoretically, developers make minimal profit because the landowner sells land to the highest bidder, capturing profit from the developer. Therefore, providing additional funding to build units in locations that are already likely to be profitable locations for subsidized construction may only provide additional funding to developers, landowners and investors. In the empirical model, it is difficult to determine if developers will be drawn to lower valued land. Land value and market rent are likely correlated, which confounds the estimation of the effect of differences in rent. To account for these possibilities, I include median home price as a proxy for land value in the empirical analysis.

The reasoning outlined above suggests that the LIHTC program is designed such that the lowest rent areas are desirable for construction without the QCT. If this is the case, it is unclear how much QCT incentives alter the location patterns of subsidized units. The following sections determine what factors affect the amount of subsidized construction in a census tract, with particular attention on the effects of market rent and the QCT.

4. Data and empirical model

The purpose of the empirical model is to measure what factors affect the number of LIHTC units built in a census tract. The number of units built is dependent on the profitability of subsidized construction in a particular location. As discussed in the section above, the market rent plays an important role in developer profit. Locations with higher rent have a higher opportunity cost of subsidized construction and should be less likely to experience LIHTC construction. This section proposes an empirical model that seeks to separately measure the effect of market rent from other location characteristics that affect profitability.

The ideal unit of empirical analysis is a parcel, which would allow each available piece of land and its characteristics to be examined before any development takes place. Because these data are not available, an observation in this empirical analysis is a census tract with its associated Census 2000 characteristics and the number of LIHTC units built between 2004 and 2006. This aggregation allows for the general measurement of housing conditions and the number of subsidized units built to be used as a proxy for profitability of subsidized construction in that location.[7]

The 2004 to 2006 time period is chosen for two reasons. First, 2003 was the first year that HUD used the 2000 Census geography to define qualified census tracts (QCTs). Second, between 2004 and 2006, there was no change in the qualified census tract designation. This makes it possible to aggregate the total LIHTC construction between 2004

[6] Explicit evidence of this practice is found in the LIHTC Policies and Procedures for California, Indiana, Ohio and Oregon for the 2012 allocation cycle. All agencies require an analysis of local market conditions for each proposal.

[7] While this model may fit into a latent variable framework that uses a binary dependent variable, a linear specification is used due to the issues that arise with fixed effects in non-linear models. Additionally, using log values of the dependent variable is not reasonable due to the large number of census tracts for which there is zero subsidized construction.

Table 1
Descriptive statistics for census tract observations.

Variables		Mean by QCT status	
	All census tracts	Non-qualified census tract	Qualified census tract
Binary: positive LIHTC construction	0.05	0.04	0.13
	(0.23)	(0.20)	(0.33)
LIHTC units built between 2004 and 2006	5.0	3.6	13
	(30)	(24)	(50)
Median contract rent	625	654	459
	(276)	(283)	(149)
Median owner-occupied home value	134,450	143,941	79,202
	(110,945)	(113,966)	(69,514)
Binary: qualified census tract	0.15	0	1
	(0.36)	–	–
LIHTC units built before 2004	18	14	40
	(60)	(50)	(99)
Rental housing vacancy rate	0.08	0.08	0.10
	(0.12)	(0.12)	(0.09)
Land area (square miles)	54	57	40
	(573)	(547)	(704)
Total number of rental units in 2000	545	510	746
	(500)	(482)	(547)
Percentage of land classified urban	77	75	92
	(38)	(39)	(25)
Number of census tracts	65,443	55,748	9,695

Standard deviations reported in parentheses.

and 2006 without losing precision on the QCT designation.[8] The department of Housing and Urban Development reports the location of all LIHTC units built up until 2006. To test how rent affects the amount of LIHTC development that occurs in a census tract, the location of each LIHTC development is merged with Census characteristics creating one observation for each census tract over the time period.

Table 1 describes the 65,443 census tracts used in this analysis, which is every reported census tract in the United States. The first column reports statistics for all census tracts and the second and third column describe tracts conditional on their QCT status. Because the number of subsidized units constructed in a census tract is dependent on profitability, the variables included in the analysis control for factors that affect profitability.

As discussed in the previous section, a developer only produces subsidized housing if it is the most profitable development type. Therefore, subsidized construction is more likely to occur in locations where the profitability is high relative to unsubsidized construction. If a census tract is profitable for subsidized construction, more parcels of land will be developed as LIHTC projects. As more parcels are developed using LIHTC, the number of subsidized units in the census tract increases. The empirical specification measures how market rent affects the relative profitability of subsidized construction. A regression specification that separates the effect of differences in market rent from these other factors is described by

$$Units_i = \beta_0 + \beta_1 MedianRent_i + \beta_2 QCT_i + \beta_3 Controls_i + \gamma_i + \epsilon_i, \quad (1)$$

where $Units_i$ is the number of LIHTC units built between 2004 and 2006 in census tract i, $MedianRent_i$ is the median rent for the census tract from the 2000 Census, QCT_i is a binary indicator equal to one if the census tract is designated as a qualified census tract and γ_i is a county fixed effect that controls for difficult to develop designation and the subsidized rent level.

The variable $Controls_i$ is a vector of the variables described in Table 1. Specifically, $Controls_i$ includes median owner-occupied home value, the number of LIHTC units built before 2004, the rental housing vacancy rate, land area, total rental units and the fraction of the population living in locations classified as urban within the census tract. Each of the variables in this vector, in addition to market rent and the QCT indicator, should affect the profitability of subsidized construction in a census tract. Changes in variables that increase the profitability of subsidized development should increase the number of subsidized units constructed over the time period.

As expected, qualified census tracts create a strong incentive to build subsidized housing. Columns two and three of Table 1 report that QCTs house significantly more LIHTC construction both before and during the time period of interest. Before 2004, a QCT housed an average of 40 LIHTC units, compared to only 14 units in non-QCTs. In the time period between 2004 and 2006, 13% of QCTs had LIHTC construction compared to only four percent of non-QCTs.

The significantly lower rent in QCTs relative to non-QCTs indicates that there is a strong relationship between QCT designation and market rent. In fact, 46% of all QCTs are designated in the lowest 20% of rent distribution. Therefore, it is important to indicate whether the QCT is the dominating location incentive in subsidized construction or if rent incentives also motivate development in low-rent areas.

[8] While the Difficult to Develop Area designations do have minor changes between 2004 and 2006, it is not possible to account for these using a year fixed effect because rent level data do not vary by year.

With regard to other variables in Table 1, the median owner-occupied home value is a proxy for land value that, along with land area, is included to control for differences in land value that may motivate changes in development type. The number of subsidized units built before 2004 are included to control for neighborhoods that have demonstrated that they are open to subsidized housing construction. These variables may also capture other unmeasured characteristics of locations that are more profitable for LIHTC construction.

The inclusion of the total number of rental units present in the census tract controls for the probability that a neighborhood will have any rental housing construction, subsidized or unsubsidized. The empirical model assumes that the presence of rental housing indicates that rental housing is likely to be one of the more profitable development types in a location. Total rental housing proxies for the relationship between rental housing profit relative to the profit values for all other possible development types.

With this specification, the coefficient of primary interest is β_1, which measures the marginal effect of a difference in rent on the number of subsidized units built. If developers respond in the expected way, the sign on β_1 will be negative, which indicates that subsidized units are more likely to locate in low-rent areas. An unbiased estimate of β_1 is obtained if market rent is not correlated with any omitted variables that should be included in specification (1). While many of the possible confounding variables are controlled for, it is not possible to control for every characteristic that may affect the profitability of subsidized construction.

Possible omitted variables include incentives that developers may face from a state's tax credit allocation agency that favor some locations in a way that is not standard or documented within the LIHTC program. If these kinds of location incentives are correlated with rent, it will be difficult to separately identify the two effects. The regression is also unable to control for the amount of vacant land that is available during this time period. If more land is available for construction in low-rent areas, it may also artificially inflate the coefficient on rent. To the degree that the factors that affect profitability of subsidized construction have been controlled for, specification (1) will correctly identify the effect of differences in market rent on the number of subsidized units constructed in a census tract between 2004 and 2006.

5. Results

Results from regressions using specification (1) are reported in the first column of Table 2. Column (1) estimates do not include a measure of land value but it is included in subsequent regressions to indicate how it alters the estimates. In this specification, the coefficient on median rent is −0.49 and significant, indicating that a $200 reduction in rent is associated with the construction of one more LIHTC unit between 2004 and 2006. If a tract is designated as a QCT, it is associated with the construction of approximately six more LIHTC units over the time period. Also, the presence of LIHTC units before 2004 and the presence of rental housing units in general are positively correlated with LIHTC construction.

To control for possible effects of land value, column (2) of Table 2 includes the census tract's median home value. The inclusion of median home value has no effect on the rent coefficient, even though one might expect changes in these variables to be highly correlated. To further investigate possible correlations with rent, the QCT indicator is interacted with the median rent variable. The results from this regression are presented in column (3) and indicate that the magnitude of the effect of rent is significantly stronger within qualified census tracts. This may be due to targeting of areas that are low rent QCTs for tax credit allocation. If these locations are favored by the allocation agency, it will increase the number of total and approved proposals in low-rent areas.

The fourth column of Table 2 reports estimates from a regression that includes an interaction of the QCT indicator and median home value. These results demonstrate that allowing for differential reactions to land value within and outside of QCTs does not change the general implications of the effect of rent. In all cases, the effect of rent is significantly negative, although the magnitude is smaller than the effect of the QCT. A coefficient of −0.32 implies that moving to a census tract where the median rent is $300 less is correlated with the construction of one more subsidized unit. Because the average number of units built in a census tract is only five, this indicates a nontrivial increase in subsidized construction.

Profit incentives based on market rent indicate that a decrease in rent at any point along the rent distribution should increase the likelihood that LIHTC construction is the most profitable development type. If the estimates in Table 2 result from subsidized units clustering at the lowest part of the rent distribution, housing developers may not be responding to changes in rent on the margin. To estimate the effect of rent differences across the entire rent distribution, census tracts are placed into deciles based on the rent level within their Consolidated Metropolitan Statistical Area (CMSA).[9] The following regression,

$$Units_i = \alpha_0 + \alpha_{19} decile9_i + \alpha_{18} decile8_i + \cdots + \alpha_{11} decile1_i + \alpha_2 QCT \times deciles_i + \alpha_3 Controls_i + \gamma_i + \epsilon_i, \quad (2)$$

estimates how LIHTC housing is distributed across rent within MSAs. In this specification, $decile9_i$ is a binary indicator that equals one if the census tract is between the 80th and 90th percentile distribution of rent within the census tract's CMSA, $decile8_i$ is an indicator that equals one if the census tract is between the 70th and 80th percentile of rent within its CMSA and so on. The indicator for the highest ten percent of the rent distribution is the omitted category. Each regression interacts the QCT indicator with the rent distribution indicators, represented by the α_2 term in specification (2) above. This allows for the effect of the QCT to vary across the rent distribution.

Table 3 reports the results from two regressions that use rent deciles as independent variables. The first two col-

[9] All census tracts within a state that are not located within a CMSA are placed into a state-specific non-CMSA group distribution.

Table 2
OLS regression results independent variable: number of LIHTC units built from 2004 to 2006.

Independent variable	(1)	(2)	(3)	(4)
Median gross rent in 2000 census (100s)	−0.49***	−0.49***	−0.42***	−0.32***
	(0.082)	(0.089)	(0.079)	(0.080)
Median gross rent × QCT indicator			−1.67***	−2.31***
			(0.37)	(0.45)
Median home value in 2000 census (100,000s)		0.0038		−0.43***
		(0.18)		(0.13)
Median home value × QCT indicator				3.75***
				(1.19)
Qualified census tract indicator	6.15***	6.15***	14.1***	14.0***
	(0.56)	(0.56)	(1.80)	(1.77)
LIHTC units built before 2004 (100s)	5.64***	5.64***	5.62***	5.57***
	(0.62)	(0.62)	(0.62)	(0.61)
Rental vacancy rate in 2000 census (10s)	0.054	0.054	0.045	0.066
	(0.079)	(0.078)	(0.077)	(0.077)
Land area (1000s of square miles)	−0.17	−0.17	−0.17	−0.16
	(0.13)	(0.13)	(0.12)	(0.12)
Total rental units in 2000 census (1000s)	3.74***	3.74***	3.93***	3.85***
	(0.55)	(0.55)	(0.56)	(0.54)
Percentage of population in urban area (10s)	0.19***	0.19***	0.17***	0.17***
	(0.037)	(0.036)	(0.038)	(0.037)

Dependent variable is the number of LIHTC units built between 2004 and 2006. All regressions include county fixed effects and 65,443 census tract observations.
* 10% Significance.
** 5% Significance.
*** 1% Significance.

Table 3
OLS Regression results: distributional effects independent variable: number of LIHTC units built from 2004 to 2006.

Independent variable	Model (1)			Model (2)		
	Non-QCT	QCT × decile	QCT effect	Non-QCT	QCT × decile	QCT effect
80th to 90th rent percentile	0.7	−2.9	−1.6	0.6	−2.9	−1.5
	(0.5)	(4.3)		(0.5)	(4.3)	
70th to 80th rent percentile	0.8	2.2	3.9	0.5	2.4	4.2
	(0.5)	(4.9)		(0.5)	(4.9)	
60th to 70th rent percentile	2.4***	2.5	4.2	2.2***	2.8	4.6+
	(0.6)	(4.4)		(0.6)	(4.3)	
50th to 60th rent percentile	1.6***	3.0	4.7++	1.5**	3.4	5.2+++
	(0.6)	(4.0)		(0.7)	(4.0)	
40th to 50th rent percentile	2.0***	1.1	2.8+	1.9***	1.6	3.4++
	(0.6)	(3.9)		(0.6)	(3.9)	
30th to 40th rent percentile	2.7***	2.1	3.8+++	2.6***	2.7	4.5+++
	(0.7)	(3.5)		(0.8)	(3.5)	
20th to 30th rent percentile	2.8***	2.7	4.4+++	2.8***	3.4	5.2+++
	(0.7)	(4.0)		(0.8)	(4.0)	
10th to 20th rent percentile	3.6***	2.7	4.4+++	3.7***	3.3	5.1+++
	(0.7)	(4.3)		(0.8)	(4.3)	
Lowest 10th rent percentile	5.3***	7.3*	9.0+++	5.5***	7.8***	9.6+++
	(1.0)	(3.8)		(1.1)	(3.8)	
QCT indicator	1.7		1.8			
	(3.5)		(3.5)			
QCT × rent interaction	Yes			Yes		
Home value–linear effect	Yes			No		
Home value–percentiles	No			Yes		

+Indicates that the sum of the rent percentile effect and QCT coefficient are significantly different from zero with *F*-test. Dependent variable is the number of LIHTC units built between 2004 and 2006. All regressions include control variables from Table 2, county fixed effects and 65,443 census tract observations. Percentiles are calculated using the rent/home value distribution within each CMSA. The highest 10th percentile of rent is the excluded category for comparison.
* 10% Significance.
** 5% Significance.
*** 1% Significance.
+ 10% Significance on *F*-test.
++ 5% Significance.
+++ 1% Significance.

umns report results from the first model, a regression that includes a linear control for median home value. In Model (2) the specification includes nine control indicators for each decile of the median home value in the state. The first column of each model reports the rent percentile effect for census tracts that are not designated as QCTs. The second column of each model reports the coefficients from interacting the QCT indicator with the rent deciles. The third column of each model reports the total effect of QCTs in each decile by adding the QCT indicator to the interacted rent decile coefficients. This allows for *F*-tests that determine if the effect of the QCT designation within each decile is significantly different from zero. The statistical significance of *F*-tests are indicated by plus signs.

The results in both models in Table 3 have similar implications. Using the estimates in Model (2), the results suggest that differences in rent have at best small effects in the top 30% of the rent distribution. Below the 70th rent percentile and above the 30th percentile, the number of subsidized units built per census tract increases. Moving toward the lowest 30% of the distribution, the magnitude of the rent coefficients increase further, which is consistent with the idea that the bottom of the rent distribution is most profitable subsidized construction.

The estimated QCT indicator is 1.8 and not significantly different than zero. Because this coefficient estimates the effect of a QCT designation in the highest tenth percentile of rent, it implies that QCT designation does not motivate significantly more subsidized construction relative to non-QCTs in high rent locations. An effect from the QCT is not measured in the top 30% of the rent distribution. The lack of statistical significance in this portion of rent distribution is expected for QCTs because there are few census tracts designated as QCTs in the highest part of the rent distribution.

The figures in the final subcolumn of Model (2) indicate that, like non-QCTs, the lowest part of the QCT rent distribution attracts the largest relative amount of subsidized construction. The largest effect on subsidized construction is present in the lowest part of the rent distribution. As previously stated, this large effect could be caused by the effect of rent on profitability or by additional preference given to QCTs that are also in low-rent locations. If preference for these locations exist, developers will seek to maximize the probability that they receive the subsidy by proposing projects in these locations without regard to marginal differences in rent. This implies that the value of increasing the probability of receiving the subsidy overcomes any loss in value due to higher opportunity costs.

What is clear from these results is that, even without the QCT incentive, low-rent locations are the most desirable for subsidized construction. Within non-QCTs, moving from the top of the rent distribution to the bottom of the distribution increases the number of LIHTC units built by approximately 5.5. If that census tract is a QCT, the effect is 9.6 units. While it is difficult to measure how many units would be built in QCTs without the additional subsidy, the following section discusses how the distribution of units might be altered if construction in QCTs followed the same patterns found in non-QCTs.

6. Discussion

The results in the previous section indicate that absent of the qualified census tract incentive, LIHTC construction is more likely to occur in low-rent locations. Because QCTs are most likely to be designated in the lowest part of the rent distribution, this calls to question if QCTs are necessary to motivate subsidized construction in these locations. Using the coefficients estimated above, it is possible to provide some insight into this question. This section of the paper asks how the distribution LIHTC construction might change if the QCT incentive was removed from the program.

Panel A of Table 4 reports the distribution of LIHTC construction between 2004 and 2006, separated into QCT and non-QCTs. These statistics indicate the majority of QCTs are in the lowest part of the rent distribution. In the lowest tenth percentile of rent, over half of the total census tracts are designated as QCTs.

Combining the total number of LIHTC units built with the number of tracts in each category yields the number of units per tract, reported for both QCTs and non-QCTs. Relative to non-QCTs, the number of units constructed per tract is larger in QCTs. This is expected, as there are sizeable financial incentives available for building units within QCTs. As Table 4 shows, QCTs make up only 15% of total tracts but account for 38% of LIHTC construction.

Panel B of Table 4 proposes how the distribution of LIHTC construction might appear if construction within QCTs followed the pattern indicated by the regression estimates found in Table 3. The first column of Panel B reports the rent distribution coefficients estimated for non-QCTs in the empirical section. In the second column, the point estimates are added to 2.3 units per tract, which is the observed density of LIHTC units in the highest rent decile for non-QCTs. These imputed units per tract figures for are then multiplied by the total number of tracts in each of the deciles. This yields an imputed distribution of LIHTC construction that assumes QCTs and non-QCTs follow the same pattern across the rent distribution.

The imputed and observed distribution of construction are reported in the last columns of Panel B. The final column calculates the difference between the two distributions. Relative to the observed distribution, the imputed distribution only deviates by more than five percent in three of the deciles. Two of those occur between 70th and 90th percentile and the other occurs in the lowest rent percentile. The discrepancy in high-rent tracts may suggest that QCT designation may be useful in motivating construction that may not have occurred otherwise in high-rent locations. While this is a possibility, it is not conclusive as the distribution of construction is closely predicted within the mid-range rent deciles.

The substantial discrepancy between the imputed and observed LIHTC unit distribution in the lowest rent decile reinforces that QCTs in the lowest part of the rent distribution are most attractive to LIHTC developers. As previously discussed, it is unclear if the QCT, rent incentives or preference from allocation agencies drives this outcome. Because the QCT does not appear to motivate substantial differ-

Table 4
LIHTC construction across MSA rent distribution imputed results based on regression coefficients.

Rent decile	QCTs			Non-QCTs		
	# Tracts	LIHTC units	Units/tract	# Tracts	LIHTC units	Units/tract
Panel A						
Highest	59	621	10.5	6515	15,031	2.3
90th	149	1199	8.0	6407	20,760	3.2
80th	249	1227	4.9	6283	25,359	4.0
70th	403	3919	9.7	6153	26,577	4.3
60th	528	5320	10.1	5993	20,899	3.5
50th	706	6782	9.6	5863	22,343	3.8
40th	986	10,515	10.7	5555	22,371	4.0
30th	1312	15,986	12.2	5235	17,559	3.4
20th	2023	21,358	10.6	4618	18,154	4.0
Lowest	3280	57,346	17.5	3227	13,123	4.1
Total	9695	124,273		55,748	202,176	
	Table 3 Coefficients	Imputed units/tract	Total # tracts	Observed # units	Imputed # units	Difference
Panel B						
Highest	–	2.3	6574	15,652	15,752	−100
90th	0.6	2.9	6556	21,959	19,059	2900
80th	0.5	2.8	6532	26,586	18,336	8250
70th	2.2	4.5	6556	30,496	29,549	947
60th	1.5	3.8	6520	26,219	24,826	1396
50th	1.9	4.2	6569	29,125	27,637	1488
40th	2.6	4.9	6541	32,886	32,098	788
30th	2.8	5.1	6547	33,545	33,436	109
20th	3.7	6.0	6541	39,512	39,293	219
Lowest	5.5	7.8	6507	70,469	50,801	19,668
Total				326,449	290,783	35,666

ences in construction in even the 20th and 30th percentile of rent, it is unlikely that the QCT is the only factor that increases subsidized construction.

While there exists a discrepancy between observed and imputed construction, the calculations in Table 4 suggest that over two-thirds of the total construction in the lowest rent decile would occur without the QCT designation. Across the entire distribution, the total imputed construction is 35,666 units, or ten percent, less than the observed construction from 2004 to 2006. Abstracting from statistics reported in Eriksen, 2009 on cost of construction, each non-QCT unit built between 2004 and 2006 cost approximately $72,876. A 30% subsidy increase implies that each LIHTC unit built in a QCT cost approximately $94,739.[10] Using these cost estimates, the 10% reduction of construction results in a 20% reduction in total cost. If these savings were invested back into production of LIHTC units, the capacity for construction would increase.[11] Additional units that are constructed in low-rent locations would further equalize the imputed and observed LIHTC construction distribution.

These calculations suggest a redundancy between rent incentives and QCT incentives. As such, reducing or eliminating the financial incentives associated with the QCT could provide reductions in cost without substantial changes to the location and amount of LIHTC construction that occurs. This implies that, it may be possible to increase the efficiency of the LIHTC program by restructuring the funding process.

7. Conclusion

This paper examines how profit incentives affect location decisions of developers that participate in the low-income housing tax credit. The results presented here suggest that because of the opportunity cost of building subsidized housing, developers are more likely to build LIHTC housing in areas where market rent is low. As such, LIHTC construction is most likely to occur in low-rent and low-income locations without additional location incentives like the qualified census tract.

The results presented in this study effectively show how developers would respond to rent incentives if qualified census tracts were not offered as a location incentive. By controlling for QCTs directly, it is possible to measure the effect of rent to the degree that it is not correlated with any unmeasured census tract characteristics. These results indicate that without the QCT incentive, developers are motivated to build subsidized construction in locations with low rent. Estimates suggest that moving from the highest to the lowest part of the rent distribution motivates approximately 5.5 more subsidized units to be built per non-qualified census tract. Qualified tracts attract additional construction, but because they are primarily lo-

[10] These figures are calculated using the statistics on cost and total units funded from 2004 to 2006, found in Table 1 of Eriksen (2009).

[11] This assumes that the demand for tax credits is sufficient without the QCT. While the investment demand for tax credits has fallen due to disruptions in the credit market, profitability and demand from developers remains high if investors are available (Urban Institute, 2009).

cated in low-rent areas, estimates suggest that much of that construction may have already occurred without additional funding.

The findings in this study suggest that incentives within the LIHTC program may not be efficiently producing the desired outcomes. If the program seeks to build subsidized housing in low-rent locations, offering financial incentives for locating in QCTs in addition to those already present in the structure of the program may be an inefficient use of resources. This research identifies how developers react to program incentives and suggests that reduction or elimination of the QCT incentive may lead to more efficient production. Further research should continue to study how incentives motivate developer actions to improve the efficiency of the LIHTC program and align profit incentives with the location preferences of subsidized housing tenants and administrators.

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