

Do Tenants Capture the Benefits from the Low-Income Housing Tax Credit Program?

Abstract

This paper compares the rent savings accrued by recipient households over the life-cycle of LIHTC projects to their allocated tax credits. A simple two-stage empirical procedure is developed and implemented for a selected medium sized MSA. Using hedonic pricing parameters estimated in the first stage, LIHTC ceiling rents are compared to predicted market rents. The findings indicate rent savings constitutes a relatively small fraction of the programs costs, suggesting developers and investors may capture some of the programs benefits. As this finding characterizes only one potential source of benefits of the LIHTC program, a brief discussion of other potential benefits to low-income households supplements the analysis.

Introduction

For more than two decades the Low-Income Housing Tax Credit (LIHTC) program has been the primary source of growth in federal support for enhancing the affordability and availability of rental housing for low and moderate income households in the U.S.

(Cummings and DiPasquale, 1999) Since it was created as a part of the Tax Reform Act of 1986, over 1.5 million rental housing units have been built under the program nationwide and it has become the primary source of project based federal aid.¹ Roughly 125,000 units are developed under the program on an annual basis. LIHTC subsidized projects house a considerable fraction of all low-income renting families in urban, suburban, and rural communities, now constituting a larger share of the overall stock of low-income housing than remaining public housing units (Schwartz, 2006).²

However, the program is quite controversial and debates over its relative merits are far from being resolved.³ At a tax expenditure of over 5 billion dollars annually, the burden of the LIHTC program on taxpayers is considerable.⁴ On the other hand, measuring the benefits of the program is a complicated task, in part because the potential beneficiaries

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are numerous. In addition to benefits that accrue to low-income households (the intended benefit group), some benefits may be captured by project developers, ownership deal syndicators, and private investors in LIHTC projects. The present investigation does not directly estimate the extent to which the LIHTC program benefits the latter three groups, and hence, makes no claim of carrying out a comprehensive cost-benefit analysis of the program. Instead, this paper focuses on a single aspect of the LIHTC program that has not been addressed by empirical studies to date by investigating the following question: How do the rent savings that accrue to tenants over the life cycle of a typical LIHTC project compare to the magnitude of tax expenditures associated with the program?

This straightforward question is actually quite difficult to answer since rent savings are not directly observable. Therefore, this paper develops a simple two-stage empirical methodology for estimating the rent savings of individual LIHTC projects. The procedure is applied for the population of LIHTC projects located in Tallahassee, FL, a selected representative medium-sized MSA. To establish that Tallahassee is an appropriate case study, the paper argues that median income and area median rents are two key factors in determining the magnitude of rent savings across various housing markets, and shows how Tallahassee is representative on these dimensions. The results suggest that less than half of the tax expenditures are captured in the form of rent savings. An important finding is that, for the majority of the LIHTC projects in the test case housing market, the LIHTC pricing constraint becomes non-binding at some point during the commitment period associated with the program. Instead, as the LIHTC complexes in the sample age, they become more affordable naturally. The LIHTC program seems to

be placing low-income households into considerably newer (as opposed to larger, more conveniently located, or less expensive) rental housing units. Additionally, the paper argues the large gap between the tax expenditures associated with the program and the rent savings that accrues to tenants suggests that project developers, syndicators, and investors are likely able to capture a significant portion of the benefits of the LIHTC program. I argue this outcome compares unfavorably to the merits of demand-side voucher programs or other direct forms of household level assistance, and that future rental housing subsidy programs should incorporate a better understanding of the dynamic nature of rental housing prices as complexes age.

Tempering this conclusion is the possibility that the LIHTC program may generate other types of benefits to low income households. Therefore, the following section presents a brief overview of the LIHTC program and develops a simple framework that outlines the potential channels by which the LIHTC program may benefit low income households. It also briefly references some of the recent literature concerning each type of benefit. Section III presents the empirical approach, along with a description of the data used. The results of implementing the methodology for the selected housing market are presented in Section IV. Section V considers discusses extensions and limitations. Section VI discusses the policy implications of the findings and concludes.

Overview of the LIHTC program

The LIHTC program has been the primary federal policy used in attempts to boost the production of affordable rental housing since it was created by the Tax Reform Act of

1986 (Cummings and DiPasquale, 1999). Additionally, while the stock of public housing has been declining steadily for a number of years, the stock of LIHTC developed units is rapidly growing each year. Schwartz and Melendez (2008) find that about 45% of LIHTC projects are located in urban areas, while about 30% and 25% of all projects are found in suburban and rural areas, respectively.

Qualified projects are selected by state housing finance agencies through a competitive process and developers are awarded a 10-year stream of tax credits (that begins only after the proposed development is completed). The size of the tax credits follows a predetermined formula that depends upon the qualifying construction (rehabilitation) costs and the proportion of the projects' units to be occupied by low-income households.⁵ Low-income households are defined as those earning no more than 60% of area median income (adjusted for family size). For new construction or substantial renovation projects, developers total lifetime tax credit is typically set at 70% of the present value of the qualifying costs, which translates to an annual tax credit of roughly 9 percent of the projects initial costs. Existing property acquisition projects and projects receiving other forms of tax-exempt bond financing receive annual credits of roughly 4 percent of qualifying costs. (McClure, 2000)

Largely because the tax credits are non-refundable, project developers typically sell the tax credits immediately to acquire up front capital that is applied to construction costs, thereby reducing the size of the mortgage held on the property. This is usually accomplished by forming a limited partnership that involves both syndicators and

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investors (Schwartz and Melendez, 2008). Syndicators effectively match groups of corporate and private investors to specific projects and the developers who need to sell their tax credits. Investors buy in with up-front cash payments in return for shares of ownership of the project and, in turn, future tax credits, depreciation allowances, cash flow from operations, and capital gains if the property is ever sold.⁶

In return, project owners make a long term commitment that units developed under the LIHTC subsidy will be occupied by qualifying households and that rents will not exceed LIHTC ceiling rents.⁷ LIHTC ceiling rents are specific to local housing markets and are set each year as follows:

1. HUD estimates and publishes the annual median family income for all housing markets. This occurs at the MSA level for Census designated metropolitan counties. Non-metropolitan counties have their own levels set but there is little, if any, variation in rates across counties in relatively large geographic areas.
2. 60 percent of this amount (family size adjusted) determines the cutoff for a marginally qualifying low-income family. The law stipulates this amount is multiplied by 30 percent (the implied affordability benchmark) and divided by 12 to determine the base value for the LIHTC ceiling rent.
3. This base value is adjusted for unit size: 75 percent for one bedroom units, 90 percent for two bedroom units, and 104 percent for three bedroom units.

4. These amounts are reduced by the amount the local public housing authority designates as utility allowances. The result now provides the final cap on rents that project owners can charge to the qualifying tenant.

It is worth noting that once this baseline standard is set, the actual rents collected for a particular unit *do not depend on individual characteristics* of the family renting that unit. Hence, families making less than 60 percent of adjusted area median income will, in turn, devote more than 30 percent of their annual income to rent.

Potential Benefits of the LIHTC to Low Income Households

There are three channels through which the LIHTC program may benefit low-income households. First, the program may stimulate the overall production of rental housing units above the level that would have otherwise been constructed in the absence of the program. Higher construction levels for affordable rental units would shift the market supply curve forward and push down competitive rental housing prices (holding other factors constant).⁸ If this occurs, households need not find themselves in an actual LIHTC unit to benefit from the program- low income households renting privately developed units will face lower rents than they otherwise would have.

However, while over 1.5 million units have been developed under the LIHTC program, it is naïve to assume these units have been net additions to the stock of affordable rental housing. “Crowding out” (i.e., the possibility that LIHTC units are simply replacing units that would otherwise have been built under private financing) has been investigated

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by Malpezzi and Vandell (2002), Sinai and Waldfogel (2005), Baum-Snow and Marion (2009), and Eriksen and Rosenthal (2007). Malpezzi and Vandell find no significant relationship between the number of LIHTC units (and other subsidized units) built in a given state and the size of the current housing stock in that state. This suggests an extremely high rate of substitution (implying full crowding out) between LIHTC funded developments and private developments. Sinai and Waldfogel (2005) find that for supply-side subsidy programs, government-subsidized units do increase the total number of housing units, but that on average only one out of every three units built is an actual increase to the housing stock (i.e., two out of every three subsidized units simply replace a unit that would have otherwise been provided by the private market). Baum-Snow and Marion (2009) find that for every LIHTC unit built, the stock of rental housing increases by approximately 0.23 units within a 1 km. concentric ring around the development, but that this effect dissipates to zero (i.e., full crowding out) as the considered area becomes larger. Thus, while their results show the LIHTC program has a small effect on the geographic distribution of units built *within a given housing market*, they find no evidence for a positive overall effect on the stock of rental housing. Eriksen and Rosenthal (2007) find that within a ten-mile area, only one-third of LIHTC development is offset by a reduction in privately constructed rental units, suggesting a somewhat larger positive effect on the stock of rental housing than other investigations. Collectively, the literature suggests that LIHTC based additions to the rental housing stock are at least largely, and potentially fully, crowding out private construction. As such, it is reasonable to conclude that benefits from this first channel are small.

A second potential source of benefits is that, by giving state and local governments the authority to allocate awards to projects that they feel best serve the needs of low-income households, LIHTC projects may locate within higher quality neighborhoods than privately developed units of similar quality, providing increased access to public services and social networks. An empirical literature investigating this possibility has recently emerged. Cummings and DiPasquale (1999) find that the program is most frequently used to provide additional rental housing opportunities in already poor neighborhoods rather than generating affordable units in higher income areas. Newman and Schnare (1997) find that federal assistance programs including the LIHTC do a poor job of improving recipients' neighborhood quality relative to welfare households, while voucher programs did reduce the likelihood that recipients lived in the worst areas. Eriksen and Rosenthal (2007) suggest that more recently developed LIHTC projects may have started to make inroads into middle and upper income areas to a small extent. They find that only 56% of LIHTC units were located within lowest-third income census tracts, comparing favorably to the 77% of traditional public housing units that fall into lowest-third income tracts. Again though, their findings show LIHTC units are largely crowding out units that would otherwise be developed privately in higher and middle income neighborhoods. Collectively, these findings suggest there is little, if any, improvement in neighborhood quality for low-income households renting LIHTC sponsored units.

Lastly, and of primary concern for the present analysis, LIHTC subsidized units may simply cost low-income households less to rent than otherwise comparable units that

were privately developed. Unlike the first potential benefits described above, rent savings accrue only to actual tenants of LIHTC units. Since benefits of this type are in kind transfers, the value of the actual benefit to the recipient can be equal to *or less than* the rent savings, and is not directly observable.⁹ Furthermore, there is the possibility that the LIHTC pricing constraint may not bind. That is to say, the rent the unit could command in the private market may fall at or below the LIHTC ceiling rent. In this case no benefit attributable to the LIHTC program accrues. Because property age significantly affects market rents but does not influence LIHTC rent ceilings, the rent savings that accrue to tenants is expected to dissipate significantly over the life-cycle of an LIHTC project. Unlike the first two potential sources of benefits that have been investigated in previous studies, scant attention has been directed towards the rent savings possibility. This study addresses this gap by developing and implementing a simple methodology for estimating the rent savings associated with the LIHTC program.

Data and empirical approach

The employed data come from 126 apartment complexes that were operational in 2002 in the Tallahassee, Florida MSA.¹⁰ However, apartment complexes themselves are not the unit of observation. Rather, an observation represents *all* the individual units within a given complex that share common physical characteristics and rent level within a complex. The 126 apartment complexes produce 371 observations. Of these, 356 come from non-LIHTC developed complexes and 15 come from LIHTC subsidized complexes.¹¹ Individual apartment complexes contribute as many as nine observations. In total, there are just under 20,000 individual apartment units represented by the 371

observations in the data. Save privately rented homes and extremely small operations (duplexes and so on), the data cover the entire rental housing stock in the selected market. Observations are classified using eleven different “unit types” variables. To illustrate, if a complex has two-bedroom/one-bathroom as well as two-bedroom/two-bathroom units, with different rents for each, this contributes two distinct observations (each sharing the same complex level variables but differing in unit specific variables in addition to rent).

The Empirical Methodology

This paper develops a simple procedure that can be used to estimate the rent savings that accrue to tenants over the life-cycle of LIHTC projects, and implements the procedure for the population of LIHTC projects in a selected medium sized MSA (Tallahassee, FL). A simple two-stage procedure to accomplish this task is developed. In the first stage, I follow a traditional approach to modeling apartment rents that employs hedonic regression techniques. The rent decomposition model is summarized by:

$$R_{ij} = a_1 + a_2 U_{ij} + a_3 C_j + a_4 A_j + a_5 N_j + a_6 L_j + a_7 P_j + e_{i,j} \quad (1)$$

where R_{ij} , denotes the monthly rent paid by unit i located in complex j . U_{ij} , C_j , A_j , and N_j , represent physical attributes of the unit and complex, accessibility, and neighborhood quality respectively. L_j is a vector of contractual variables describing the leasing arrangement for complex j , P_j are variables reflecting the level of public service provision to complex j , and $e_{i,j}$ is an unobserved error term with mean zero. These factors are commonly identified within the literature as important determinants of rent.¹² Equation (1) is estimated using only the 356 observations from non-LIHTC subsidized projects, producing pricing parameters (i.e., estimated regression coefficients) that reflect market

valuations. Since all variables are also observed for LIHTC units, the procedure estimates market rents for LIHTC units in the second stage. A comprehensive listing of all variables along with summary statistics can be found in Table 1. [Insert Table 1 about here] Means and standard deviations are presented for the full sample as well as the subsamples of LIHTC subsidized units and non-subsidized units.

Unit structure variables include square footage, a series of categorical variables that places the unit into its type (see Table 1 for a listing of the eleven types), and binary variables for a washer/dryer hookup and outdoor patio. Complex level variables include age, age squared, number of units in the complex, and binary variables for the presence of a pool, tennis court, and clubhouse. Capturing accessibility is an important but complicated task. Renters presumably value proximity to jobs, shopping, entertainment, as well as interstates and other local thoroughfares. The monocentric model of urban land use, developed by Alonso (1964), suggests that accessibility may be approximated by measuring the distance to a “central place” of economic activity. Following this approach, accessibility is measured using GIS software as the straight-line distance from the complex to a centrally located and heavily traversed major street intersection in the Tallahassee downtown area.¹³

Neighborhood quality, defined broadly as how desirable it is to live in a particular area, is also difficult to measure. Various techniques have been used in previous studies of single and multifamily housing, including the use of census tract level variables such as percent black, percent renter, and median household income. The present study includes these

measures but also adds a location specific measure of the intensity of crime. Specifically, a crime-cost density measure is constructed (for each complex) using GIS techniques.¹⁴

A measure of public school performance is used to reflect the quality of local public services associated with the unit. School zone designation maps provided by Leon County allow each apartment complex to be matched to its respective elementary school. The numerical score the corresponding elementary school earned on an annual statewide examination proxies for the level of public services provided to residents in the area.¹⁵

While the contractual nature of rental leasing agreements has been largely ignored in previous models of apartment rent, two important contractual variables are included in the present study. The first is a binary variable showing whether the lease structure is one rental contract per unit or one contract per resident. While the former is easily the more common arrangement, the latter is rapidly growing in popularity. The second shows whether the complex has a formal policy requiring potential renters to document that they earn a minimum level of monthly income before signing the lease.

Since the second stage of the present empirical exercise involves out-of-sample prediction, it is important to note the similarities and differences between the LIHTC and non-LIHTC units in the Tallahassee market. A high degree of similarity is present when looking at the most important physical characteristics - interior square footage and the series of categorical unit type variables. The few differences that are present seem to revolve around the one variable for which the two sub-samples differ greatly – property age. The LIHTC units have a mean age of 6.1 years as compared with 22.2 for the rest of the sample. Other differences are likely related to this gap. Compared to privately

developed units, LIHTC units in this housing market are located farther away from the city center, have lower crime cost, and reside in areas with higher school test scores.¹⁶

Each of these tendencies is also found when looking only at the group of newer privately developed units, providing an indication that age is likely driving these trends.

Pricing equation results and post estimation LIHTC program evaluation

Table 2 reports the findings of two OLS regression models. [Insert Table 2 about here]

Model 1 represents a linear model while model 2 is of semilog form. The explanatory power is very high in both estimations. After using standard methods to compare the fit of both models, Model 1 was selected for use in the second stage procedure and is primarily focused on in the discussion that follows.¹⁷ Over ninety percent of the observed variation in market rents is explained by Model 1 and nearly all of the structural control variables coefficients are highly significant and of the anticipated sign. While a few brief comments on some of the specific findings regarding the pricing equation follow, the most important point is that the fit of Model 1 is tight and, therefore, out of sample prediction should be accurate. Hence, it is reasonable to use these pricing parameters (estimated variable coefficients) in the second stage for the purpose of predicting otherwise obtainable market rents for LIHTC subsidized units.

Unsurprisingly, unit type and size, as well as complex size and age, are among the most influential explanatory variables. As expected, complex age exerts a significant downward pressure on rent. The significant non-linearity of this relationship in the selected MSA is worth noting since previous research has found that age exerts a nearly

constant effect on rents (Malpezzi et al., 1987). The relationship between property age and predicted market rent is summarized by Figure 1. [Insert Figure 1 about here] The pricing parameters suggest that rents fall relatively quickly as complexes age initially, but that the rate of decline slows over time. For example, otherwise identical units would differ in rent by over \$105 on average if one was new and the other was ten years old while the estimated difference in rent between twenty and thirty year old units is less than \$35.¹⁸ It is worth noting that LIHTC rent ceilings are not adjusted based on the age of the complex. This implies the rent savings should initially be the greatest, and then dissipate (potentially to zero) over the life-cycle of the project.

Accessibility, as measured by distance to the selected central place, performs as expected. The negative gradient is consistent with traditional urban economic theories of land use patterns. Although most register with the anticipated signs, the neighborhood quality variables typically do not achieve statistical significance. The exception is that both percent black and household median income are significant at the 1% and 5% levels (respectively) in the semilog model. The effect of individual occupant lease arrangements is positive in both Model 1 and 2, but is only significant in Model 1. In equilibrium, landlords of both types should receive the same expected rate of return. One explanation is that the individual occupant lease structure is associated with higher administrative costs on the side of the landlord stemming from increased paperwork and turnover, but that tenants are willing to bear these higher costs because of the reduced risk associated with having their own lease. (i.e., they are no longer at risk of being put in a troublesome situation if a roommate falls behind on rent and/or wants to leave the

arrangement) Higher rents for individual leases may also be driven by higher repair and maintenance costs created by the types of renters using this arrangement (typically students). The income requirement variable is negative and significant. One explanation for this finding is that higher income renters tend to pay the full rent each month more frequently than lower income households. As such, landlords would be willing to accept a small reduction in monthly rent for the returned higher probability of timely payment. As such, the income requirement variable may simply be picking up an important omitted variable – namely, the fraction of months that resident's of the complex pay their full rent on time and without the landlords having to expend time and/or money to track down payment.¹⁹

*LIHTC Program Evaluation*²⁰

As mentioned before, this paper estimates the rent savings accruing to resident tenants, as a direct result of the LIHTC pricing commitment, over the life-cycle of LIHTC projects. A straightforward approach to estimating this rent savings involves taking the difference between the LIHTC rent ceiling and what the unit would otherwise rent for on the open market. This difference is characterized as an upper bound of the personal benefit to low-income households who rent units subsidized under the program.²¹ Since the regression parameters are estimated using only observations from non-subsidized apartment complexes, they reflect the market value of each measurable attribute. Hence, the variable coefficients from Model 1, along with the observed independent variables, are used to estimate otherwise obtainable market rents for the LIHTC units. This allows the

estimation of the rent savings which can, in turn, be compared to the magnitude of the tax credits for the same project.

Recall that each LIHTC complex is given a tax credit that is allocated over a 10 year period following completion of the project. The annual credits are roughly 9 percent of the total project cost for new construction and 4 percent annually for acquisition of existing structures and cases where owners finance using tax exempt bonds.²² The discounted present value of the forgone tax revenue, at the time of initial allocation, provides a measure of the social cost of the project.²³ In return, owners make a long-term commitment to rent their units under the guidelines previously described. The analysis is straightforward: provided that this capped amount for a given year falls below predicted market rent, the difference becomes rent savings to the household. If the capped amount exceeds predicted rent, the pricing constraint does not bind and the rent savings to the household is taken to be zero. The results of the hedonic pricing equation, along with the data from LIHTC units, allow for the computation of predicted market rent, for the year 2002, for each subsidized unit. Predicted market rents are then compared to HUD's maximum allowable 2002 rents to see where (and to what extent) the constraint binds.²⁴

Table 3 presents information concerning the fifteen LIHTC subsidized observations, coming from the six different LIHTC developed complexes. [Insert Table 3 about here] The first three columns show the designated complex identification number, complex age in 2002, and the unit type for each observation. The fourth column reports the unit size adjusted HUD allowed maximum rent. The fifth column shows the predicted markets

rents for each observation. As predicted rents exceed maximum allowed rents for all cases, the sixth column reports the estimated rent savings to tenants, which fall between \$20 and \$117 per unit. It is worth noting that the vast majority of rent savings can be attributed to the requirement that LIHTC landlords account for utility allowances. More specifically, the LIHTC rent ceiling at step 3 in the process described in Section II is largely non-binding, such that step 4 generates the vast majority of rent savings.²⁵ Note however that Table 3 only reflects a static snapshot and that rent savings for other years of each projects existence requires more detailed calculations that account for the properties age fluctuating over time. Obtainable market rent declines over the life-cycle of an LIHTC project, while LIHTC ceiling rent is unaffected by the age of the unit. As such, the largest portion of rent savings occurs during the initial years of a project's existence. Over time, allowable rents begin to approach, and even fall below, what the units could otherwise command on the private market. Thus, the pricing dynamics of rental housing with respect to project age are important to consider when estimating the benefits of the program to low-income households.

The following discussion outlines the dynamic comparison of the overall cost of the LIHTC tax expenditures to the magnitude of household's rent savings that have accrued over the projects' life-cycle for the six LIHTC complexes in the data. The monetary costs of LIHTC program come from the ten year stream of the tax-credits allocated to the project owner. In each case, this stream of credits is turned into a present value at time of allocation using a discount rate of 5% (see endnote 23).

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The rent savings that accrues to tenants for each complex is estimated as follows:

1. Using the estimated coefficients from Model 1, predicted 2002 market rents are computed for each observation. (See Table 3) For each other year of the project's existence, predicted rents still make use of the estimated hedonic pricing parameters but are adjusted according to the varying age of the project, so that predicted rent is for a unit with the correct vintage. (i.e., all independent variables remain the same, except the age and age squared variables which are modified to reflect the implied age the property was *in that year* prior to calculating predicted rent) The first three columns of Table 4 outline this process for an example observation. [Insert Table 4 about here] Beginning with the complex age in 2002 (8 years), moving down column three shows how the predicted rent increases as the unit becomes newer, holding all else constant.
2. Since values in the third column are in 2002 dollars, these figures must be adjusted to reflect market price conditions that prevailed in earlier years. Annual rental housing cost indexes are used to adjust these figures for each year.²⁶ Index multipliers are reported in the fourth column of Table 4 and the fifth column reports adjusted predicted rents.
3. LIHTC ceiling rents for each unit (by year) were obtained following the process outlined in Section II. This accounts for adjustments to the base rate for unit size and also incorporates the downward adjustment due to utility allowances.
4. If the difference between the adjusted predicted market rent for a year and LIHTC ceiling rent for that same year is positive, it is defined as the rent savings per unit, per month. This is multiplied by 12 to obtain the rent savings associated with the

- unit for the full year. Where the predicted market rent falls below the maximum allowed rent, a rent savings of zero is assumed.
5. This figure is multiplied by the number of units of that type in the apartment complex and rent savings across each different type of unit within each complex are summed to obtain the aggregate yearly benefit total for that complex.
 6. Aggregate yearly rent savings totals for each complex are transformed into present values at the time of the initial year of operation (which is also the first year of credits) and summed across years. Again a 5% discount rate is employed.
 7. Finally, the discounted present values of the tax expenditures and rent savings generated by the program are compared for the six LIHTC complexes examined.

Table 5 reports the results of the exercise. [Insert Table 5 about here]

The rent savings is only 26.7%-51.3% as large as the magnitude of the tax credit costs, with the overall rent savings/cost ratio of 35.1%. Framing the results in a per-unit basis is illustrative. The present value cost, on average, is nearly \$40,000 per unit, while the present value rent savings stream is just under \$14,000. Also, for reasons discussed previously, the \$40,000 figure likely represents an extreme lower bound measure of the programs costs, potentially moving the ratio for the program in an even more unfavorable manner. This is disturbing when combined with the previously described literature that suggests neither of the other two sources of benefits to low income households of the program (stimulation of additional rental housing production and the possibility that affordable rental housing will be built in better areas) are very large. One point that tempers the harshness of this result to a degree is that most of the LIHTC complexes

considered are still generating positive (albeit very small) rent savings during the final year under consideration (2009). This is not surprising since several complexes are still several years away from the year 15 transition. However, only a single complex (#5) experienced rent savings during the final year under consideration that exceeded 1% of the overall present value cost, and all complexes still experiencing rent savings were rapidly losing that status. All told, the results of the exercise suggest it is reasonable to question whether or not the considerable costs of the program are worthwhile, given the limited size of rent savings to low-income families.

Extensions and limitations

Again, to be fair, there are other important potential benefits of the LIHTC program this study has not investigated directly. The possibility that the program enhanced the availability of affordable rental units and/or that the development of LIHTC projects helped dampen free market rental housing prices in the selected MSA must be recognized. The presented exercise attempts to quantify only one important aspect of the social benefits of the LIHTC program that has not been previously investigated.

Also, to the extent that foregone tax revenues exceed the rent savings that accrues to low-income households, it is inaccurate to characterize the difference as a pure loss to society. The present analysis is not able to comment directly on the magnitude of benefits from the LIHTC program that accrue to developers or project investors, since I have no data on profit levels from investments for the LIHTC projects considered. Still, the large gap between rent savings and the size of the subsidy implies they may be considerable. In

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fact, the results support a conjecture that those developers and investors fortunate enough to be awarded the tax credits gain much. Hence, the LIHTC program may partially act as a wealth transfer to recipient developers and project owners, rather than conferring benefits concentrated to low-income families.

Furthermore, a closer examination of the nature of the rent savings that accrue to low-income households is merited. Since a majority of the rent savings that accrues takes place during the early years of all considered project's life-cycles, the 'benefit' of the LIHTC program to low-income households stems from a relatively small number of moderately low-income families paying well below market rents for the first several years of a project's life. Over time, tenants receive fewer and fewer gains, eventually reaching a point where there is no gain associated with the pricing constraint faced by the projects owners. Thus, one interpretation would be that a primary benefit to low-income households is moving families into *newer housing*, rather than into housing that is larger, subject to improved locational amenities and/or increased access to public goods, or less expensive. This should be considered a poor outcome if the primary goal of the program is to alleviate issues of housing affordability for low-income families. Conversely, the literature that has developed concerning the Section 8 program suggests that personal vouchers are a fairly efficient subsidy program, in the sense that transfers are made directly to lower income families without distorting their housing consumption decisions on the margin.²⁷ Most notably, lower income households may be unlikely to pay a significant premium for newer housing, instead focusing more on the units' size, physical attributes, and accessibility to employment opportunities and amenities.

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A potential limitation of the study is that a single housing market (Tallahassee, FL), and the LIHTC complexes within that housing market, has been selected as a case study to implement the procedure developed in the paper. A natural question is: How do the results generalize to LIHTC projects in other housing markets? A rigorous investigation of this question would require obtaining the type of detailed data used in this paper for both LIHTC and non-subsidized apartment complexes in many different MSAs, and stands as a potential area for future research. However, an informative preliminary answer to this question can be determined by focusing on the extent to which developers find the LIHTC generated pricing constraint to be binding within a given housing market. This should largely depend on two variables: area median income (which is used to determine allowable rents) and area median rent for non-subsidized housing (serving as a rough proxy for the level of market rents units could otherwise obtain). Table 6 presents this information for 2002 for a sample of thirty metropolitan areas.²⁸

The percentages in the fourth column are the most important signal of how the results of the present exercise may relate to conditions in other housing markets across the US. They show the fraction of area median income that would be needed to rent a median priced two bedroom unit on the open market for one month. The intuition is straightforward, the lower the percentage, the more similar LIHTC allowable rents should be to market based rents, implying smaller levels of rent savings from the program. Conversely, as the percentage moves higher, the rent savings associated with the program should rise. Thus, the potential benefits of the LIHTC program to low-income renters

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should be the largest (smallest) in housing markets where the percentage is large (small). While Tallahassee is an average representative of the medium sized housing markets, the potential benefits of the LIHTC program are expected to be somewhat larger for the other two tiers. In particular, very large urban areas seem to have the greatest potential for rent savings. For example, Boston, Los Angeles, Miami, and New York may have larger rent savings for their LIHTC projects than those examined in the selected housing market.

Conclusions and policy implications

This study extends the literature concerning the LIHTC program by estimating the rent savings that accrue to low-income households over a typical LIHTC project's life-cycle and comparing them to the costs of the same project. The analysis reveals that LIHTC project owners face pricing constraints that bind to the largest extent during the projects initial years, and that, over time, projects age and owners no longer face arduous pricing constraints. The results imply the LIHTC program may significantly benefit project developers and owners, with approximately one-third of the programs cost going to low-income households in the form of rent savings. All told, this study tends to support the notion that the LIHTC program is an inefficient mechanism for generating benefits to low-income households. Future work should verify whether similar results hold for other housing markets, particularly in large urban housing markets. Future attempts to model apartment rents should also further investigate the effect that property aging in various housing markets has on market rents, and the extent to which this dynamic distorts the intended benefits of federal project based subsidy programs, such as the LIHTC program.

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Table 1: Descriptive Statistics

Variable Description	Variable Vector	Type	Mean full sample	St. Dev. full sample	Mean non-LIHTC	Mean LIHTC
Rent (monthly rent in dollars)	R_{ij}	Cont.	648.6	246.0	648.6	-----
Log Rent (natural log of rent)	R_{ij}	Cont.	6.418	0.321	6.418	-----
Interior square footage of the unit	U_{ij}	Cont.	953.9	300.9	952.1	997.6
Efficiency unit (reference category)	U_{ij}	Binary	0.027	0.162	0.028	0
One bedroom/ one bathroom unit	U_{ij}	Binary	0.342	0.475	0.348	0.200
Two bedroom/ one bathroom unit	U_{ij}	Binary	0.162	0.369	0.169	0
Two bedroom/ two bathroom unit	U_{ij}	Binary	0.213	0.410	0.208	0.333
Three bedroom/ two bathroom unit	U_{ij}	Binary	0.137	0.345	0.129	0.333
Three bedroom/ three bathroom unit	U_{ij}	Binary	0.022	0.145	0.020	0.067
Four bedroom/ two bathroom unit	U_{ij}	Binary	0.016	0.126	0.017	0
Four bedroom/ four bathroom unit	U_{ij}	Binary	0.024	0.154	0.025	0
2 bedroom townhouse	U_{ij}	Binary	0.032	0.177	0.034	0
3 bedroom townhouse	U_{ij}	Binary	0.024	0.154	0.022	0.067
Extra half bathroom	U_{ij}	Binary	0.046	0.209	0.048	0
Washer/dryer hook-up	U_{ij}	Binary	0.650	0.478	0.635	1
Patio (or balcony)	U_{ij}	Binary	0.757	0.429	0.778	0.267
Age of complex. (2002- Year Built)	C_i	Cont.	21.51	11.10	22.17	6.067
Age squared	C_i	Cont.	585.6	434.3	608.8	39.27
Number of units in complex	C_i	Cont.	157.9	91.50	156.14	198.5
Pool	C_i	Binary	0.868	0.339	0.862	1
Tennis court	C_i	Binary	0.167	0.374	0.174	0
Clubhouse	C_i	Binary	0.245	0.431	0.225	0.733
Distance to city center (miles)	A_i	Cont.	2.581	1.096	2.532	3.762
Crime cost measure	N_i	Cont.	114.9	145.6	117.0	65.12
% black in census tract	N_i	Cont.	30.05	13.29	29.92	33.07
% renter in census tract	N_i	Cont.	64.59	21.30	64.93	56.67
Median household income	N_i	Cont.	29613	15352	29391	34860
Individual occupant lease structure	L_i	Binary	0.102	0.304	0.107	0
Resident income requirement	L_i	Binary	0.075	0.265	0.079	0
Elementary school test score	P_i	Cont.	375.2	65.63	372.2	444.67
LIHTC Complex		Binary	0.040	0.197	0	1
# of observations			371		356	15

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Table 2: OLS Regression Results

Dependent Variable	Model 1	Model 2
	Rent	Log Rent
age of complex	-12.321** (1.702)	-0.0162** (0.0025)
age squared	0.178** (0.038)	0.0002** (0.0001)
individual occupant lease structure	49.493* (21.419)	0.0385 (0.0314)
interior square feet	0.078** (0.031)	0.0002** (0.0000)
number of units in complex	0.202** (0.058)	0.0003** (0.0001)
resident income requirement	-34.698* (15.095)	-0.0657** (0.0221)
distance to city center	-9.803* (4.538)	-0.0121 (0.0067)
one bedroom/ one bathroom	22.362 (25.774)	0.0557 (0.0379)
two bedroom/ one bathroom	106.391** (29.979)	0.2049** (0.0440)
two bedroom/ two bathroom	142.673** (31.494)	0.2534** (0.0462)
three bedroom/ two bathroom	255.929** (37.292)	0.3935** (0.0547)
three bedroom/ three bathroom	466.105** (45.625)	0.5734** (0.0669)
four bedroom/ two bathroom	646.867** (47.998)	0.7492** (0.0704)
four bedroom/ four bathroom	836.968** (52.444)	0.8135** (0.0769)
2 bedroom townhouse	161.574** (39.992)	0.2793** (0.0586)
3 bedroom townhouse	278.134** (45.382)	0.4246** (0.0665)
extra half bathroom	16.225 (19.779)	0.0379 (0.0290)
washer/dryer hook-up	17.289 (11.086)	0.0547** (0.0163)
Patio	20.793 (11.181)	0.0367* (0.0164)
Pool	16.445 (14.473)	0.0416 (0.0212)
tennis court	-0.442 (12.454)	0.0169 (0.0183)
Clubhouse	16.065 (12.539)	0.0066 (0.0184)
crime cost measure	0.009 (0.031)	-0.0002 (0.0005)
school test score	-0.031 (0.091)	-0.0001 (0.0001)
% black (census tract)	-0.668 (0.387)	-0.0018** (0.0006)
% renter (census tract)	0.167 (0.438)	0.0013* (0.0006)
median HH inc. (census tract)	0.000 (0.001)	0.0014 (0.0011)
Constant	552.390** (62.435)	6.078** (0.092)
Observations	356	356
Adjusted R-squared	0.919	0.900

Standard errors in parentheses

* significant at 5%; ** significant at 1%

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Figure 1: Estimated Effect of Complex Age on Market Rent from Model 1

Table 3: HUD Allowed & Predicted Market Rents: LIHTC Subsidized Units

Complex	Age (2002)	Unit Type	Ceiling Rent (2002)	Predicted Rent (2002)	Rent Savings Per Unit
1	7	1 bed / 1 bath	578	617	39
1	7	2 bed / 2 bath	693	737	44
1	7	3 bed / 2 bath	791	859	68
2	8	2 bed / 2 bath	693	713	20
2	8	3 bed / 2 bath	791	837	46
3	7	3 bed / 2 bath	791	851	60
3	7	3 bed town.	791	881	90
4	5	1 bed / 1 bath	578	620	42
4	5	2 bed / 2 bath	693	756	63
4	5	3 bed / 2 bath	791	877	86
5	5	1 bed / 1 bath	578	648	70
5	5	2 bed / 2 bath	693	785	92
5	5	3 bed / 2 bath	791	908	117
6	4	2 bed / 2 bath	693	753	60
6	4	3 bed / 2 bath	791	879	88

Table 4: Example Calculation of Predicted Market Rents by Year

Year	Implied Age	2002 Predicted Rent (Varying Age)	Rental Housing Cost Index Multiplier	Adjusted Predicted Rent
2002	8	713	1	713
2001	7	723	0.961	695
2000	6	733	0.925	678
1999	5	743	0.898	667
1998	4	754	0.875	660
1997	3	765	0.847	648
1996	2	776	0.823	639
1995	1	788	0.798	629
1994	0	800	0.772	618

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Table 5: LIHTC Benefit to Cost Comparison Results

Complex	# Units	PV: foregone tax revenue	PV: rent savings stream	Rent Savings/Cost Ratio
1	160	\$6,175,267	\$2,049,634	33.2%
2	183	\$6,120,961	\$2,504,728	40.9%
3	111	\$4,086,633	\$2,097,265	51.3%
4*	183	\$7,594,483	\$2,202,838	29.0%
5*	279	\$10,798,555	\$4,319,458	40.0%
6*	253	\$11,507,253	\$3,069,290	26.7%
Totals	1169	\$46,283,152	\$16,243,213	35.1%

* Indicates the project selected the 4% tax credit pair with tax exempt bonds option such that the foregone tax revenue figures shown above are calculated after multiplying the annual tax credit for the project by 2.25. See endnote 22 for additional explanation.

Table 6: HUD Defined Area Median Income and Median Rent for 2002

Housing Market	Median Income (2002)	Median Rent (2002) Two Bedroom Unit	Monthly Rent as a Percentage of Median Income
Tier 1 Markets			
Atlanta, GA	71200	878	1.23
Boston, MA	74200	1338	1.80
Chicago, IL	75400	891	1.18
Dallas, TX	66500	810	1.22
Houston, TX	59600	709	1.19
Los Angeles, CA	55100	882	1.60
Miami, FL	48200	781	1.62
New York, NY	62900	1095	1.74
Philadelphia, PA	63300	839	1.33
Washington, DC	91500	943	1.03
Tier 1 Average	66790	917	1.39
Tier 2 Markets			
Birmingham, AL	52700	581	1.10
Charlotte, NC	64100	725	1.13
Columbus, OH	63400	673	1.06
Jacksonville, FL	55600	701	1.26
Las Vegas, NV	54300	783	1.44
Memphis, TN	57300	656	1.14
Milwaukee, WI	67200	697	1.04
New Orleans, LA	44000	673	1.53
Oklahoma City, OK	46000	566	1.23
Sacramento, CA	57300	709	1.24
Tier 2 Average	56190	676	1.22
Tier 3 Markets			
Ashville, NC	49000	609	1.24
Boise City, ID	54500	585	1.07
Des Moines, IA	66900	609	0.91
Flint, MI	55600	605	1.09
Jackson, MS	53100	607	1.14
Mobile, AL	45100	534	1.18
Reno, NV	62300	792	1.27
Salem, OR	46700	656	1.40
Spokane, WA	46600	564	1.21
Tallahassee, FL	57200	670	1.17
Tier 3 Average	53700	623	1.17

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¹ See the website of the Danter Company (<http://www.Danter.com>) for data tables showing overall levels of LIHTC subsidized construction, including breakdowns by state.

² For a complete listing of all LIHTC sponsored projects see the webpage <http://lihtc.huduser.org/>.

³ The term “relative merits” is meaningful in this context. Policy makers face tradeoffs when they allocate scarce resources between the LIHTC program and other federal housing programs, most notably the Section 8 housing voucher program. Weicher (1990), Stegman (1991), Case (1991), Nelson (1994), Olsen (2000), McClure (1998, 2000) and Deng (2005) are a few of the existing studies that have investigated the efficiency and effectiveness of the LIHTC program relative to tenant based vouchers.

⁴ Note that LIHTC projects frequently receive support beyond the initial tax credits through other subsidy programs such as Section 8 project-based or tenant-based assistance (Cummings and DiPasquale, 1999). There are also considerable administrative costs of the program. Hence, the magnitude of the tax credits alone understates the full cost of adding LIHTC units to the existing affordable housing stock and should be viewed as a lower bound to the programs full costs.

⁵ Non-depreciable costs such as land acquisition, for example, do not qualify. Besides physical construction costs of the units, expenditures for impact fees, on-site infrastructure and landscaping, and utility hookups are all eligible. If less than 100% of the units are committed to the program, the ratio of qualifying units to total units determines the fraction of these costs that can be claimed. Consistent with the vast majority of LIHTC projects, all complexes examined in the benefits estimation exercise carried out in this paper took the 100% low-income tenant option. Note also that states can, and on occasion do, offer subsidies smaller than the maximum levels allowed under the law in an effort to serve more families.

⁶ See Schwartz and Melendez (2008), Cummings and DiPasquale (1999), and Case (1991) among others for a more detailed description of the process typically used to finance LIHTC projects.

⁷ Under the original 1986 enabling legislation, LIHTC project owners were required to meet defined affordability standards for 15 years. The 1989 Omnibus Reconciliation Act of 1989 mandates an additional 15 year “extended use agreement” period that covers years 16-30 of the project. All LIHTC projects considered presently were built after 1989 such that the extended use agreement applies. However, project owners are not subject to identical requirements during the two periods. Most importantly, provisions exist that allow project owners to request the state make a “qualified contract” offer to purchase the project at the year 15 mark. If the state fails to find an entity to make an offer, the 15 years under the extended use agreement become void. For these reasons, it is hard to say just how different the long term affordability commitment aspect of the program differs under the initial and subsequently updated rules. Also note that the exercise later carried out finds the gap between ceiling rents and market rents typically becomes small to non-existent by the year 15 transition period. As such, both for the purposes of the present exercise and for more general questions relating to how long LIHTC projects create tangible benefits for low income households, it is not clear what impact extending the commitment period from 15 to 30 years has made.

⁸ Those interested in the nuanced relationship between the LIHTC program and the supply and demand for affordable rental housing services should refer to Sinai and Waldfogel (2005).

⁹ Thank you to an anonymous referee for pointing this out.

¹⁰ All data, including monthly rent, come from a database that reflected current values in June 2002. The data were collected by the DeVoe L. Moore Center at Florida State University as a part of their ongoing efforts to explore issues of housing affordability.

¹¹ Selection bias is not an issue since the data represent an exhaustive sample of apartment complexes in the housing market as of summer 2002. The original database contained 384 observations. One observation was dropped because monthly rent included a meal plan, utilities, and other services. Another was dropped because several key explanatory variables were missing. The lone 4-bedroom townhouse observation was also dropped. Finally, 10 observations came from complexes that were subsidized by the Section 8 new construction program. Because they are not free to charge market rent, but also are not LIHTC properties, they are unable to contribute to either the first or second stage of the empirical exercise.

¹² See Sirmans, MacPherson, and Zietz (2005) for a recent review of this broad literature.

¹³ The intersection of Tennessee Street and Monroe Street was selected from a group of several potential locations. This heavily traversed intersection lies within a few blocks of the state capital building, the state

Supreme Court, several large hotels, and downtown Tallahassee. Knowledge of the local housing market along with early empirical results informed this selection.

¹⁴ Census tract level variables come from the 2000 census. Crime data come from publicly available digitized arrest files that show the location and details of each arrest. The crime-cost measure accounts for the weighted seriousness of each arrest that occurred during 2002 within a one-half mile concentric circle of the center of the apartment complex. Lynch and Rasmussen (2001) show that using simple count variables can be problematic in this application and demonstrate the advantages of weighting each crime by its seriousness. The weighting index used in the present analysis is taken from Cohen et al. (1995).

¹⁵ These scores are used by the state in a formula that assigns each elementary school a grade of A through F for their 'accountability system'. Schools care about these scores because they can affect state funding. Figlio and Lucas (2004) show that school grades have a significant impact on single family house prices.

¹⁶ Thank you to an anonymous referee for pointing out that none of the LIHTC properties used in the present exercise were developed in a qualified census tract (QCT). LIHTC properties developed in QCTs can be found in other housing markets and are eligible for additional credits. Unfortunately, the present exercise is not able to comment on how rent savings to tenants varies across QCT and non-QCT areas.

¹⁷ Model 1 has a slightly higher adjusted R-squared and also outperforms the semilog model using techniques that compute directly comparable sums of squared deviations of predicted values from observed values for the dependant variable. The qualitative results of the LIHTC program evaluation exercise that follows are highly robust to the use of either model.

¹⁸ The relationship between age and rent should also be subject to expenditures on property maintenance and repair at the individual complex level, with greater expenditures leading to slower rates of decline in rents. *Ceteris paribus*, intuition suggests LIHTC complexes would invest less in property upkeep since they face a binding price constraint.

¹⁹ Thank you to an anonymous referee for a helpful suggestion concerning the explanation of the income requirement variable.

²⁰ The following exercise calculates the costs and benefits associated with each unit that have accrued to the present year (2009). On the cost side this can be viewed as exhaustive – each of the 10 year streams of tax credits has presently expired. Unfortunately, on the benefits side, the same clean truncation does not apply. While several observations have reached the point where they generate little or no rent savings by 2009 (i.e., predicted rent does not exceed allowable rent), others still are. (In particular for the relatively younger properties developed in the late 1990s) Further discussion of this issue surfaces after presenting the results of the exercise. Also, transition issues will shortly arise as projects move from the original 15 year commitment into their 15 year extended use agreements. See endnote 7 for clarification. Note also that the use of LIHTC ceiling rent for the present exercise does not imply all tenants are actually paying ceiling rent. The database does not have tenant specific rent payments. Because LIHTC projects frequently receive other subsidies, and because tenants residing in the facility may have personal vouchers, there are many reasons an individual tenant's monthly rent could fall below LIHTC ceiling rent. However, the goal of the exercise is to compare the tax expenditures associated with the LIHTC program to the rent savings attributable to this program. A consideration of the additional savings in rent due to other factors, and their associated public costs, is beyond the scope of this exercise. I also thank an anonymous referee for pointing out that Congress has just recently decided to require that HUD collect actual monthly rent payments made by tenants living in LIHTC properties. The data collection should begin in 2010 and should be useful for future studies examining the LIHTC program.

²¹ Three factors support this conjecture. First, even with a rich database, some aspects of quality are likely unobservable. Because LIHTC developers know they will face a binding pricing constraint for many years, subsidized units likely exhibit lower levels of quality with respect to unobservable variables. Second, the effect of age on complex rent may be sensitive to the level of maintenance expenditures. Again, because a price ceiling is in place for LIHTC units, owners may spend less on maintenance than complexes charging market rents. Lower levels of upkeep would suggest a more rapid decline in otherwise obtainable market rents. Supporting this claim, Schwartz and Melendez (2008) document that many LIHTC projects are in need of serious renovations when they reach the year 15 mark. Finally, as is always the case with in kind transfers, the household may not place a monetary value on the additional housing consumption that is as large as the rent savings itself.

²² Of the six LIHTC developed apartment complexes, three used the 9% option and three selected the 4% credit plus tax exempt bonds option. (Florida Housing Finance Corporation, 2007) Under the 4% option,

the size of the tax credits is an inaccurate measure of the costs of the developer subsidy. Developers select the option generating the largest subsidy. As such, a lower bound estimate of the cost associated with the 4% plus tax exempt bonds cases is easily found by calculating the size of tax credits that would have been associated with the 9% option. As such, for each of the 4% option projects, the size of the allocated tax credit is multiplied by 2.25 before beginning the exercise.

²³ A reasonable choice for a discount rate would be the 10 year Treasury yield at the time of allocation. The six LIHTC projects examined in this exercise were undertaken over a relatively short time period (1994-1998). For simplicity and to construct a conservative estimate of the social costs of the forgone tax revenue, I use a discount rate of 5% for all present value cost and benefit calculations later presented.

²⁴ Allowable rents are a function of the unit structure type (i.e., number of bedrooms), and can be easily calculated once the annual median family income used by HUD is determined. The 2002 figure for the Tallahassee MSA is \$57,200 (HUD, 2007).

²⁵ The Tallahassee Housing Authority provided historical utility allowances for the project. I am thankful to a suggestion from an anonymous referee that led me to confirm that LIHTC projects use the same utility allowances that apply to the Section 8 household voucher program. Unfortunately, the Tallahassee Housing Authority did not have records for years before 2005. However, the process used to generate utility allowances has been stable over the course of the program and utility allowances for years prior to 2005 were estimated using the CPI-U, an index to which all future fluctuations in the annual utility allowances are now explicitly tied.

²⁶ The “owners’ equivalent rent” series from the Urban Consumer Price Index (CPI-U), found in the U.S. Statistical Abstract, is used for this adjustment. A disadvantage of using this series is that it reflects national trends while an advantage is that it is specific to rental housing costs (rather than housing cost indices which are sensitive to single-family home prices). More specific indices with Tallahassee MSA specific rental housing price trends would be preferable, however, this series (contained in the Florida Statistical Abstract) was found to be extremely unstable over time. The index value for Tallahassee rises and then falls again by nearly 20 percent in just a few years, a highly implausible result.

²⁷ Families pay 100% of the marginal cost of their housing choice unless the size of their individual voucher exceeds the magnitude of their rent.

²⁸ The metropolitan areas fall into three groups. Tier 1 contains the ten largest housing markets in the US. Tier 2 is a representative sample of housing markets that are clearly larger than Tallahassee, FL. They are a subset of metropolitan areas with populations between one and two million in the 2000 census. Tier 3 is a representative sample of medium sized housing markets, such as Tallahassee, FL. Each had a population above 300,000 but not greater than 500,000 in the 2000 census. The data section of HUD’s website, www.huduser.org/datasets/, is the source for all median income and rent data presented in Table 6.