Are Rural Areas Underserved by HUD's Subsidy Programs?

Paul E. McNamara
Department of Agricultural and Consumer Economics,
University of Illinois at Urbana-Champaign
Email: mcnamar1@illinois.edu

Han Bum Lee
Department of Agricultural and Consumer Economics,
University of Illinois at Urbana-Champaign
Email: lee466@illinois.edu

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Paul E. McNamara, *University of Illinois at Urbana-Champaign*
Han Bum Lee, *University of Illinois at Urbana-Champaign*

Abstract

Despite the extensive research exploring the effects of public provision of subsidized housing opportunities in urban areas, especially large cities, in the United States, very little or no research exists concerning the geographical inequality of federally funded rental subsidy programs in rural areas. This paper uses a multilevel modelling approach to analyze the extent rural-urban spatial disproportionality exist in rental subsidy programs of the U.S. Department of Housing and Urban Development (HUD) across all counties in the 48 contiguous states. Results indicate that rural residents in poverty are less likely to receive the rental subsidies by approximately 3.4 – 7.1 percentage points, based on different rural-urban geographical classifications and model specifications, than those in urban areas. Also, the predicted estimates of heterogeneous state effects reveal intergovernmental relationship of particularly how a state is involved in local government's administration of the rental subsidy programs.

Keywords: Rural poverty; HUD rental subsidy programs; Geographical inequality

Introduction

A federally funded rental subsidy program, managed by the U.S. Department of Housing and Urban Development (HUD) in the United States, primarily provides housing subsidies to the elderly, persons with disabilities, and low-income families who face a probable risk, in the absence of the subsidy, of falling into poverty. In recent years, HUD has served approximately 5 million eligible low-income families each year, devoting around $40 billion annually, which is over two-thirds of federal spending on the Earned Income Tax Credit (EITC) and twice what is spent on the Temporary Assistance for Needy Families (TANF) (Falk, 2012). Because of its national scale of regulatory intervention and governance, and the large federal contribution, an extensive research literature exists concerning the effectiveness of the federal rental subsidy program in assisting vulnerable people and reducing spatial poverty concentration, as well as helping people move toward employment and breaking the poverty cycle (i.e. Wilson, 1987; Currie & Yelowitz, 2000; Katz, Kling, & Liebman, 2001; Goetz, 2003; Jacob, 2004; Jacob & Ludwig, 2012). However, the majority of research efforts have concentrated on understanding the effects of public provision of subsidized housing opportunities in urban areas, especially large cities under the urban antipoverty political agenda, and very little research exists concerning the spatial inequality of federal rental subsidy programs across rural and urban areas.

The research question we explore in this paper is does a rural-urban bias exist in the current HUD rental subsidy programs across all counties in the 48 contiguous states? Also, given the existence of the rural-urban effect, we examine the role of state government of particularly how heterogeneous state characteristics are associated with the local government's administration of the rental subsidy programs. This paper adopts a multilevel modelling approach to explain variation in the percent of people in poverty who received HUD's rental subsidy programs (or *recipient-poor ratio*), attributed by rural-urban geographic basis, in different geographic levels. We structure a two-level model with counties (local governments or public housing authorities) at the lower level grouped within the states at the higher level, enabling us to investigate how the *recipient-poor ratio* varies at each level compared to the others, and at the same time to identify plausible factors that may explain this variation. The main data set used in this paper is the HUD's 2013 Picture of Subsidized Households (PSH) merged with the 5-year (2009-2013) American Community Survey (ACS) data at the county level. Also, we adopt two rural-urban geographical

classifications using the Economic Research Service's (ERS) 2013 Rural-Urban Continuum Codes and HUD's definition of rurality.

The remainder of the paper proceeds as follow: it begins by describing poverty in a rural context and addressing its critical needs of the adequate rental subsidy programs. Then the paper discusses the background information of the federally funded rental subsidy programs. The next section presents data on the geographical distribution of the rental subsidy programs and the comparison of selected rural-urban characteristics based on defined rural-urban geographical classifications. The following section details the empirical strategy, discusses the regression results, and performs robustness checks of the results. Lastly, the paper closes with concluding remarks.

Poverty in Rural America

Rural America has long suffered a disproportionate share of the nation's poverty population (Tickamyer & Duncan, 1990; Albrecht & Albrecht, 2000; Duncan & Coles, 2000). According to the 2014 Census, 14.8 percent of the U.S. population (or 46.7 million persons) was poor (DeNavas-Walt, 2014). Particularly, poverty is more prevalent among women, racial and ethnic minority groups, people with low-socioeconomic status, and single-parent families. Because these phenomenon are often presented as the nation's urban problems, most of us tend to think of poverty as being associated with metropolitan areas; however, in reality, nearly 16.5 percent of non-metropolitan residents, which were 2 percentage points higher than those of metropolitan areas, were impoverished. Also, the recent report from the ERS shows that persistent poverty existed in 301 counties in non-metropolitan areas, compared to 52 counties in metropolitan areas (Farrigan, 2015).[1]

Furthermore, severity and persistence of poverty in rural areas are often linked to a limited opportunity structure – mainly derived from past social and economic development policies targeting economic areas with promising higher returns, particularly in large urban centers, and the industrialization of agriculture – associated with insufficient and unstable jobs (significant decrease in share of agricultural employment), challenges in geographic and income mobility, and

[1] The study defines persistent poverty as at least higher than 20 percent poverty rates in each U.S. Census 1980, 1990, 2000, and ACS 5-year estimates 2007-2011.

limited access to proper health care and decent affordable housing, as well as narrow investment for community development and diversity in economic and other social institutions (Albrecht, 1998; Brown & Swanson, 2003; Conger & Elder, 1994; Duncan & Coles, 2000; Irwin et al., 2010; Ricketts, 1999). Moreover, according to the 2014 National Rural Housing Coalition (NRHC) report, nearly half (48 percent) of all rural renters are cost-burdened (spending 30 percent or more of their monthly income), and about half of theses households pay more than 50 percent of their monthly income toward housing. Without access to adequate rental subsidies, these people have very few options for decent affordable housing, rendering them vulnerable toward homeless.

The Provision of Federally Funded Rental Subsidy Programs

HUD's rental subsidy programs can be broadly divided into three major programs – public housing (publicly owned housing), Section 8 Housing Choice Voucher (HCV) (privately owned housing), and Section 8 Project-Based Voucher (PBV) programs (privately owned, subsidized housing). Eligibility for HUD's rental subsidy programs is limited to physically and financially disadvantaged people, determined by applicants' demographic status (elderly or disability status) and annual gross income adjusted by family size.

Public housing was the first federal housing subsidy program, established by the Housing Act of 1937, aimed at clearing slum-dwelling poor, especially in large cities, to create a better living environment believed to improve their economic mobility (Hoffman, 1996, 2012). Rents for the public housing tenants are limited to 30 percent of income, with public housing authorities receiving federal operating subsidies intended to cover the difference between rental income and operating costs. By 1950, the government had begun or completed construction of about 150,000 public housing units nationally. Through the next two decades of rapid expansion, the stock of public housing units peaked at 1.4 million in 1991 (Schwartz, 2014). However, as the public housing program grew, emerging issues (i.e. obsolete building conditions, inefficient utility costs, racial and economic segregation) led to a policy shift to the tenant-based rental subsidy programs, gradually diminishing the stock of public housing (Jencks & Mayer, 1990; Massey & Kanaiaupuni, 1993; Wilson, 1987).

Since the mid-1970s, the Section 8 HCV program has received greater attention as an alternative public housing policy to resolve pre-existing problems, particularly the issue of low-income minorities' poverty concentration around public housing developments (i.e. Devine, Gray, Rubin, & Taghavi, 2003; Newman & Schnare, 1997; Goering, Stebbings, & Siewert, 1995; Pendall, 2000; Lens, Ellen, & O'Regan, 2011; Turner, 1998). In contrast to the downward trend of public housing units, the HCV program has grown to represent the nation's largest housing subsidy program, serving more than 2.2 million low-income families in conjunction with over 3,000 local public housing authorities. Uniquely, the HCV program allows recipients the opportunity to rent privately owned housing in any neighborhood within the jurisdiction of the local public housing authority, allowing recipients more flexibility about where to live. Section 8 housing voucher holders are generally obliged to pay the Total Tenant Payment (TTP) which is 30 percent of their monthly income towards housing; however, the HCV program exceptionally allows an additional 10 percent of their income in situations where the gross rent exceeds the locally designated payment standard representing the maximum allowable rent subsidy. HUD pays the subsidy to the landlord of the unit selected by the tenant, provided the unit meets certain quality standards.

The Section 8 PBV program, which emerged in the 1960s, relies on a public-private partnership in which federal government enters into contracts with private owners to provide affordable housing for a specified number of years, after which the housing is converted to market rate by owners' decisions. Specifically, unlike the HCV program renewing the rental contract every year, the PBV program provides owners with a guaranteed rental contract (a long-term contract of 10 years) as long as the property remains in the assisted program. Recently, the PBV program serves nearly 1.3 million low-income families, mostly elderly or disabled head of households; however, this stock of housing is in danger of being permanently lost as a result of owners opting out or physical deterioration of a property (Newman, 2005; Rice, 2009). Therefore, a key challenge for this housing program is to incentivize existing owners to remain under contract, as well as increase new owners' program participation, to maintain the stock of affordable housing for low-income families.

Data Set

The data set used in this paper is HUD's 2013 Picture of Subsidized Households (PSH) merged with the 5-year (2009-2013) American Community Survey (ACS) data at the county level. Specifically, the PSH provides a total number of HUD's rental subsidies including public housing, Section 8 HCV, Section 8 PBV, Section 8 New Construction/Substantial Rehabilitation, Section 236, and Multi-family rental subsidy programs. Also, the 5-year ACS data set provides more reliable estimates of demographic and socioeconomic characteristics at smaller geographic boundaries than one-year and three-year estimates (Census Bureau, 2008). We use the 5-year ACS data to obtain the number of households with income below the poverty threshold to calculate the percent of poor who receive HUD's rental subsidy programs. Additionally, other county-level and state-level variables are obtained from the 5-year ACS data and 2013 Annual Survey of State Government Finances.

We consolidate the data to the county level because HUD's rental subsidy programs are administered by local PHAs, distributed across more than 3,000 counties in the 48 contiguous states of the United States.[2] For the purpose of this analysis, we adopt HUD's rural geographic definition – a county with a population of 20,000 inhabitants or less, and not located in a Metropolitan Statistical Area. According to HUD's rurality definition, there are 1,464 rural counties and 1,645 urban counties. Also, in order to confirm the robustness of the results, we replicate the analysis with a different definition of rurality using the ERS's 2013 Rural-Urban Continuum Codes defining a county as rural if it belongs to the category "Completely rural or less than 2,500 urban population." According to the ERS geographical classification, there are 3,106 counties that include 626 counties in non-metropolitan rural areas and 2,480 counties in metropolitan and non-metropolitan urban areas. Since the PSH contains observations that list number of rental subsidies with no geographic identifier for each state, we exclude a total of 6,060 housing subsidies – 5,860 housing subsidies in New York State (about one percent of all allocated housing subsidies), and 200 housing subsidies for the rest of the 47 states.[3]

[2] Some PHAs manage public provision of the rental subsidy programs in city area rather than county (i.e. Chicago Housing Authority, Housing Authority of Baltimore City, etc.). In order to run county-level analysis, we incorporate city-based PHAs into county-based housing authority.

[3] New York State consists of 62 counties with 49 urban counties (or 79%). Excluding 5,860 rental subsidies in New York State may decrease the recipients-poor ratio of a certain county. For example, if majority of the rental

Regional Characteristics and Descriptive Statistics

Since the late 1970s, state and local governments have had an increasingly important role than federal government in implementing programs and providing services more closely attuned to the needs of specific communities and populations. In order to capture distinct effects of the components determining the *recipients-poor ratio* at different geographical levels, we construct the state- and county-level variables.

County-level variables: we measure *poverty rates* by dividing the number of persons with income below the poverty threshold by the total number of persons in the county, and the *recipients-poor ratio* represents the percent of persons in poverty who received HUD's rental subsidies. *Rural* is binary variable – 1 for rural and 0 for urban counties. *Sex ratio* indicates the number of males per 100 females (divided by 100); *elderly dependency ratio* is the number of persons 65 and older to every 100 persons of traditional working ages (divided by 100); *population-housing ratio* represents the average number of persons in a housing unit; and *population density* represents the average number of people living in a unit of an area (mile). Also, *percent black population*, *percent Hispanic population*, *percent disabled population*; *percent single-parent family*, *median income*, and *median rent* are included as county-level control variables to increase precision of the estimates in the regression.

State-level variables: we measure *public welfare expenditure* by dividing state's public welfare expenditures (Medicaid, Supplementary Security Income (SSI), and TANF; and other welfare services) by the number of persons in poverty in the state.[4] Also, we include the state's intergovernmental expenditures since rural communities depend heavily on such transfers from the states to provide local services (Felix & Henderson, 2010). *Intergovernmental expenditure* is measured by the total amounts paid to local governments – "as fiscal aid in the form of shared

subsidies were missing from rural counties, it will decrease the recipients-poor ratio in rural counties which result in upward bias of the rural effect estimate because this will create a greater gap of the recipients-poor ratio between rural and urban counties. On the other hand, if majority were missing from urban counties, it will decrease the recipients-poor ratio in urban areas resulting in a downward bias of the rural effect estimate. We first regress with all observed counties, and then regress without New York state observations in order to see how the estimates (sign, statistical significance, and the magnitude) change.

[4] See State Government Finances glossary, Census Bureau, for detailed metric of public welfare expenditures.

revenues and grants-in-aid, as reimbursements for performance of general government activities and for specific services for the paying government, or in lieu of taxes" (State Government Finances, n.d.) – divided by the number of counties within the state. This represents the average amount of the state's transfers to each local government if all conditions are identical; however, in reality, it is more likely that a larger share of transfers happens in metropolitan areas and large cities potentially due to high population density (high demand for local services) and economic returns. The state-level variables do not necessarily indicate the exact amount transferred to the local governments, but they explain the specific state effect related to those expenditures on the *recipients-poor ratio* in the regression, and the story of the rural effect conditioned on such expenditures can be explained by the interactions with those variables with the *rural* variable. These state-level variables are designed to capture state efforts – financial supports and means-tested assistance programs dedicated to poverty alleviation and administration of general activities and programs related, but not limited to, housing and community development on specific places and populations in need – on the provision of HUD's rental subsidy programs at the local government level.

For more detailed comparison between rural and urban counties across the 48 contiguous states, Table 1 presents descriptive statistics for the selected rural and urban characteristics. We observe that overall *poverty rates* are shown to be higher in rural counties, and the gap of mean poverty rates between rural and urban counties becomes greater using HUD's rurality definition, while, on average, the *recipients-poor ratio* in rural counties tends to be smaller than those in urban counties (the absolute mean difference of the *recipients-poor ratio* is greater with the ERS definition). Taken at face value, the results suggest that, although rural counties have higher percentages of people living in poverty than the metropolitan/non-metropolitan urban counties, HUD's underprovides rental subsidy programs in rural counties. Also, rural counties tend to have a higher level of *sex ratio*, *elderly dependent ratio*, *proportion of disabled people*, and *population density* than those in urban counties; while, on average, rural counties tend to have a lower proportion of minorities (black and Hispanic population) and single-parent families. Rural counties have a lower level of *population-housing ratio*, *median income*, and *median rent*, and the results show a distinct difference between rural and urban counties in *population density* and *population-housing ratio* variables. Moreover, we observe that, on average, rural counties tend to be in states

with a relatively lower level of public welfare (adjusted by the number of persons in poverty) and intergovernmental expenditures (adjusted by the number of counties in the state) than more urbanized states.

Empirical Model

The multilevel models, also referred to as linear random coefficient model and hierarchical model, have long been applied in the social sciences. The distinct feature of the model is to capture regional random effects (heterogeneous state effects), and it also accounts for the correlation between counties nested within the same state (non-independently identically distributed). Additionally, the multilevel models address potential issues of spatial heterogeneity, assuming that the effect of an explanatory variable can be different in each geographical level. For instance, in some states, rural counties may be more strongly associated with the outcome variable than others, indicating that the slope would vary from one state to another. In this paper, we structure a two-level model in which county-level variables explain county (lower level) variation within a state, and state-specific variables explain state (higher level) variance between states. If we denote by y_{ij} the outcome variable at the county, *i*, in state *j* ($i = 1,\ldots n_j$; $j = 1,\ldots, J$), the following equations show a simple two level linear model:

$$y_{ij} = \beta_{0j} + \beta_{1j}R_{ij} + \beta_{2j}X_{ij} + \varepsilon_{ij} \qquad (1)$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}C_j + u_{0j}. \qquad (2)$$

In Eq. (1), the outcome variable, y_{ij}, can be modeled as a function of the mean outcome variable for state *j* (β_{0j}), rural-urban binary variable (R_{ij}), county-level control variables (X_{ij}), and county-level errors (ε_{ij}) that assume to be independent and normally distributed with a mean of 0 and a variance of σ_e^2 within each state. In Eq. (2), the state mean of the outcome variable (β_{0j}), is modeled as a function of a state-mean outcome variable (γ_{00}), state-level variable (C_j), and state-level errors (u_{0j}) which are assumed to be normally distributed with mean 0 and variance of σ_{u0}^2**.** Specifically, u_{0j} measures a state-specific deviation from the state-mean outcome (γ_{00}) after accounting for the effect of state-specific variable (C_j). Variance of the residual errors of ε_{ij} is specified as σ_e^2. Substituting Eq. (2) into Eq. (1) yields the two level multilevel model shown as:

$$Y_{ij} = \gamma_{00} + \beta_{1j}R_{ij} + \beta_{2j}X_{ij} + \gamma_{01}C_j + u_{0j} + \varepsilon_{ij}. \quad (3)$$

Relaxing the assumption of the fixed coefficient in the Eq. (3) yields the random slope model, in which, of particular relevance to our paper, we allow rural-urban binary variable (R_{ij}) to vary randomly across states, shown as the following equation:

$$\beta_{1j} = \gamma_{10} + \gamma_{11}C_j + u_{1j}, \quad (4)$$

In Eq. (4), β_{1j} (the regression coefficient of the effect of R_{ij} on Y_{ij}) can be modeled as mean slope (γ_{10}), state-specific variable (C_j), and state-level errors (u_{1j}) which represent the deviation of the slope within each state from the overall slope γ_{10} after accounting for the effect of C_j. Substituting Eq. (4) into Eq. (3) yields the two level random slope model shown as:

$$Y_{ij} = \gamma_{00} + \gamma_{10}R_{ij} + \beta_{2j}X_{ij} + \gamma_{01}C_j + \gamma_{11}C_j\,R_{ij} + u_{1j}R_{ij} + u_{0j} + \varepsilon_{ij}. \quad (5)$$

The state-level errors u_{0j} and u_{1j} are assumed to have a multivariate normal distribution with expectation 0, and to be independent from the county-level residual errors (ε_{ij}). The variance of the residual errors u_{1j} is specified as σ_{u0}^2. Also, covariance between u_{0j} and u_{1j} denote by σ_{u2}^2 (for example, if is positive, as the intercept increases the slope increases). Eq. (5) includes the fixed coefficients for county-level variables, state-level variables, and interaction terms, as well as it has complex error structure including random intercept component and a random slope and individual level errors.

Results

Table 2 presents the results of three multilevel models of the geographical distribution of federally funded rental subsidy programs. Column (1) presents results of the unconditional model that only includes the intercept which varies across states. This preliminary information is useful in providing Intraclass Correlation (ICC) coefficient estimated by the ratio of variance between states (σ_{u0}^2) to the total variance ($\sigma_{u0}^2 + \sigma_e^2$). As can be seen in the column (1), the estimated variance, σ_e^2,

is 0.0177 at county level, and at the level of states equals, σ_{u0}^2, 0.0129. The ICC is approximately 42.2 percent, and the remaining variation is at the county level (57.8 percent). The ICC shows that a large amount of variance, attributed to the state-level, confirms that the two-level multilevel models provide a better fit to the data.

Columns (2) and (3) report the results of the random intercept models with an inclusion of the *rural* variable and the set of county-level control variables based on the two rural-urban geographical classifications. With the exception of the *percent disabled population* variable, all coefficients exhibit high levels of statistical significance. Specifically, using the ERS classification, the negative coefficient of the *rural* variable indicates that rural residents in poverty are less likely to receive federal rental subsidies by approximately 6.9 percentage points than those in urban areas; and 3.4 percentage points lower with HUD's rurality definition. Also, the results show that the *elderly-dependent ratio*, proportion of minorities (black and Hispanic population), and single-parent family are positively associated with the *recipients-poor ratio*. Additionally, *population-housing ratio*, *population density*, and *median income* positively correlate, while *sex ratio* and *median rent* negatively correlate with the *recipients-poor ratio*. Moreover, based on the estimates of the random intercept model, we can predict the state-level random effects (unobserved heterogeneity) to examine what extent the state influences the uneven administration of the current federal rental subsidy programs. Since, in this model specification, we predict a random effect for each state without state-level predictors, the interpretation of the results are straightforward.[5] Based on the ERS definition, most states in the South region (i.e. Florida, Georgia, Mississippi, and South Carolina) and some states in the West region (i.e. Arizona and Nevada) tend to have a relatively lower-level of the *recipients-poor ratio* among 48 contiguous states; while some states in the Northeast region (i.e. Connecticut, Massachusetts, New Hampshire, New Jersey, and Rhode Island) and the Midwest region (South Dakota and Minnesota) are predicted to have a relatively higher level of the *recipients-poor ratio*.[6]

[5] Because state random effect (u_{0j}) measures a state-specific deviation from the state-mean outcome after accounting for the effects of state-specific variables, the inclusion of additional state-level variables make the interpretation difficult.

[6] We observe very similar results of the predicted state effects (random intercepts) using the HUD's rural definition except slight changes in the magnitude of coefficients in South Dakota, Kansas, and Kentucky states.

In columns (4) and (5), we add state-level variables into the random intercept models. The results show that state-level variables – the *public welfare expenditure* (per person in poverty) and *intergovernmental expenditure* (adjusted by the number of counties within state) – are positively associated with the *recipients-poor ratio*. Also, the inclusion of state-level variables explains about an additional 31 percent of variance between states (σ_{u0}^2) relative to the estimated variances without state-level variables reported in columns (2) and (3). However, these measures refer to variation without random attributes existing across states. Estimating the random slope model can reveal a state effect operating within the slopes as well. Specifically, we allow the *rural* variable to vary randomly across states in addition to state-level random intercepts (Table 3). Also, as we discussed in Eq. (5), we add the interaction terms between *rural* variable (random slope variable) and state-level variables into the regressions. In column (1), the results show that rural residents in poverty are less likely to receive the rental subsidies by 4.5 percentage points after accounting for the interaction terms (fixed effects) and random effects (random intercept and random slope), however, using HUD's rurality definition, the coefficient for *rural* variable still shows a negative sign but most of the rural effects are absorbed into interaction terms (lose its statistical significance). Also, we find that the multilevel random slope model reveals a statistical significance (at 10 percent level of significance) of heterogeneous rural effects across states. Also, we find that both interaction terms negatively correlate with the *recipients-poor ratio*, indicating that rural counties tend to have a lower level of the *recipients-poor ratio* compared to the urban counties with the same level of the state's public welfare and intergovernmental expenditures. The rural context and intergovernmental relationships explain these results.

If the state's expenditures on public welfare programs and intergovernmental transfers to local governments are concentrated in particular urban areas, the high level of such expenditures (at the state level) does not necessarily alleviate poverty nor increase the number of rental subsidies in rural areas. Indeed, in this case, rural poverty and inequality of the provision of federal rental subsidies between rural and urban areas would become more severe. This story is plausible based on findings in the previous literature. Undeniably, rural local governments may have insufficient professionals, administrative capacity, and experience to obtain block grants and undertake housing and community development initiatives (Reeder, 1996; Brown & Swanson, 2003). Also, in economic return perspective, "federal funds are increasingly disbursed in the form of block

grants to the states, which can then decide whether they will invest in lagging rural communities or in more economically vibrant communities that can serve as engines of economic growth" (Brown & Swanson, 2003, p. 254). Under block grants, with less redistributing within a state, even more rural local governments may fall behind.

Discussion

This paper uses multilevel modelling to analyze what extent of the rural-urban spatial disproportionality exists in the current federal rental subsidy programs across all counties in the 48 continuous states. Our main findings suggest that rural residents in poverty are less likely to receive the rental subsidies by approximately 3.4-7.1 percentage-points, based on different rural-urban geographical classifications, than those in urban areas. Also, we understand the role of state of particularly how states' financial transfers, as well as state heterogeneity, are attributable to uneven administration of the federal rental subsidy programs.

Our primary findings show a statistically significant program bias in the HUD public housing subsidy programs against rural poor people. While 3.4 to 7.1 percentage points may not appear to be a large effect size, the bias against rural poor people that we measure implies between 23,000 and 64,000 rural poor people do not receive services under the current program implementation compared to a subsidized housing program implementation where rural people were treated similarly to urban people. The within HUD housing program differential points to the importance of the USDA housing and rental assistance programs, such as the Section 521 Rental Assistance Program and the Section 515 financing program for developments that include low-income households. Despite their importance as part of the rural housing safety net, these USDA programs have experienced lower funding levels in recently, with reductions for the Section 521 Program in 2013 totaling 7.5% of the previous year's funding level (Housing Assistance Council [HAC], n.d.).

Because of the presence of USDA's rural housing programs, our estimates represent an upper bound on the size of the overall urban bias in public housing in the United States. That said, significant variation in rural housing services exists at the state level, and public housing in general

faces a difficult financial future. All of these reasons point to the need for continued monitoring and measurement of access to affordable housing in rural areas of the United States.

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Tables

Table 1: Descriptive Statistics of Selected Rural and Urban Characteristics

		ERS		HUD	
	All Counties	Rural	Urban	Rural	Urban
Poverty Rates	0.159	0.165	0.157	0.171	0.146
	(0.060)	(0.067)	(0.058)	(0.063)	(0.054)
Recipients-Poor Ratio	0.222	0.155	0.239	0.193	0.255
	(0.150)	(0.138)	(0.148)	(0.138)	(0.157)
County-level variables					
Sex ratio	1.004	1.034	0.997	1.024	0.982
	(0.109)	(0.143)	(0.097)	(0.129)	(0.074)
Elderly dependent ratio	0.275	0.348	0.256	0.310	0.236
	(0.086)	(0.094)	(0.072)	(0.083)	(0.069)
Percent black population	0.091	0.061	0.098	0.078	0.104
	(0.146)	(0.145)	(0.145)	(0.153)	(0.136)
Percent Hispanic population	0.085	0.059	0.092	0.078	0.093
	(0.134)	(0.111)	(0.139)	(0.138)	(0.129)
Percent disabled population	0.140	0.154	0.136	0.154	0.125
	(0.052)	(0.063)	(0.049)	(0.056)	(0.042)
Percent single-parent family	0.300	0.272	0.307	0.300	0.303
	(0.102)	(0.125)	(0.094)	(0.111)	(0.090)
Population-housing ratio	2.165	1.864	2.240	2.025	2.321
	(0.371)	(0.395)	(0.323)	(0.382)	(0.287)
Population density	219.012	14.305	270.684	32.404	428.850
	(1245.18)	(15.491)	(1388.768)	(92.871)	(1789.466)
Median Income ($/10^4$)	4.575	4.135	4.687	4.135	5.071
	(1.180)	(0.872)	(1.221)	(0.850)	(1.296)
Median Rent ($/10^2$)	6.786	5.563	7.094	5.883	7.800
	(1.847)	(1.135)	(1.865)	(1.118)	(1.975)
State-level variables					
Public welfare expenditure	10.393	9.951	10.505	10.112	10.709
(/ persons in poverty)	(3.613)	(2.611)	(3.817)	(2.962)	(4.206)
Intergovernmental expenditure	1.565	0.845	1.747	1.113	2.074
(/ number of counties in state; $/10^6$)	(2.512)	(1.404)	(2.692)	(1.771)	(3.066)
N	3106	626	2480	1644	1462

Note: Standard deviations are in parenthesis.

Table 2: Multilevel Model Regression Results: Unconditional and Random Intercept Models

	Unconditional	Random Intercept			
		ERS	HUD	ERS	HUD
	(1)	(2)	(3)	(4)	(5)
Rural		-0.0691***	-0.0342***	-0.0693***	-0.0345***
		(0.0067)	(0.0059)	(0.0093)	(0.0059)
Intercept	0.2514***	0.5155***	0.4894***	0.4697***	0.4445***
	(0.0167)	(0.1214)	(0.1253)	(0.1211)	(0.1249)
County-level characteristics					
Sex ratio		-0.0997***	-0.1109***	-0.1010***	-0.1121***
		(0.0217)	(0.0222)	(0.0217)	(0.0221)
Elderly dependent ratio		0.1065**	0.0783*	0.1072**	0.0790*
		(0.0418)	(0.0422)	(0.0418)	(0.0422)
Percent black population		0.2062***	0.1885***	0.2063***	0.1886***
		(0.0270)	(0.0273)	(0.0270)	(0.0272)
Percent Hispanic population		0.0521**	0.0483*	0.0489*	0.0451
		(0.0257)	(0.0260)	(0.0256)	(0.0259)
Percent disabled population		-0.0021	-0.0013	-0.0026	-0.0017
		(0.0625)	(0.0633)	(0.0625)	(0.0632)
Percent single-parent family		0.3526***	0.3727***	0.3487***	0.3687***
		(0.0341)	(0.0344)	(0.0341)	(0.0443)
Population-housing ratio		0.0302***	0.0409***	0.0315***	0.0421***
		(0.0091)	(0.0091)	(0.0091)	(0.0091)
Population density		0.0019***	0.0018***	0.0019***	0.0018***
		(0.0002)	(0.0002)	(0.0002)	(0.0002)
Median Income [a]		0.1473***	0.1278***	0.1469***	0.1273***
		(0.0204)	(0.0207)	(0.0204)	(0.0207)
Median Rent [a]		-0.0920***	-0.0840***	-0.0945***	-0.0867***
		(0.0188)	(0.0193)	(0.0188)	(0.0193)
State-level variables					
Public welfare expenditure				0.0074***	0.0075***
				(0.0018)	(0.0018)
Intergovernmental expenditure				0.0127***	0.0128***
				(0.0048)	(0.0048)
Estimated variances:					
State (σ^2_{u0})	0.0129***	0.0116***	0.0117***	0.0080***	0.0080***
	(0.0029)	(0.0026)	(0.0027)	(0.0019)	(0.0019)
County (σ^2_e)	0.0177***	0.0142***	0.0146***	0.0142***	0.0146***
	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
N	3106	3106	3106	3106	3106

Notes: [a] Denotes variable measured in natural logarithms. Standard errors are in parenthesis. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table 3: Multilevel Model Regression Results: Random Slope Models

	ERS	HUD
	(1)	(2)
Rural	-0.0451***	-0.0100
	(0.0096)	(0.0107)
Intercept	0.4935***	0.4296***
	(0.1211)	(0.1243)
County-level characteristics		
Sex ratio	-0.1024***	-0.1160***
	(0.0219)	(0.0221)
Elderly dependent ratio	0.1059**	0.0679
	(0.0421)	(0.0424)
Percent black population	0.2032***	0.1803***
	(0.0267)	(0.0292)
Percent Hispanic population	0.0415	0.0346
	(0.0254)	(0.0257)
Percent disabled population	-0.0074	-0.0038
	(0.0621)	(0.0628)
Percent single-parent family	0.3320***	0.3633***
	(0.0339)	(0.0342)
Population-housing ratio	0.0321***	0.0408***
	(0.0092)	(0.0092)
Population density	0.0018***	0.0017***
	(0.0002)	(0.0002)
Median Income [a]	0.1353***	0.1248***
	(0.0204)	(0.0207)
Median Rent [a]	-0.0952***	-0.0828***
	(0.0190)	(0.0193)
State-level variables		
Public welfare expenditure	0.0078***	0.0097***
	(0.0017)	(0.0018)
Intergovernmental expenditure	0.0072	0.0143***
	(0.0045)	(0.0049)
Interaction variables		
Public welfare expenditure x Rural	-0.0060***	-0.0058***
	(0.0014)	(0.0014)
Intergovernmental expenditure x Rural	-0.0022	-0.0085***
	(0.0391)	(0.0028)
Estimated variances:		
State ($\boldsymbol{\sigma_{u0}^2}$)	0.0097***	0.0081***
	(0.0029)	(0.0020)
State ($\boldsymbol{\sigma_{u1}^2}$)	0.0026*	0.0011*
	(0.0014)	(0.0006)
COV ($\boldsymbol{\sigma_{u0}^2}$, $\boldsymbol{\sigma_{u1}^2}$)	-0.0031	-0.0017
	(0.0022)	(0.0010)

County ($\boldsymbol{\sigma_e^2}$)	0.0138***	0.0143***
	(0.0004)	(0.0004)
N	3106	3106

Notes: [a] Denotes variable measured in natural logarithms. Standard errors are in parenthesis. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct level.