

# **Quantifying Sprawl: Commuting, Migration, and Affordable Housing.**

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Understanding county-level population growth in the U.S. requires some knowledge of the grid of inter-county commuting flows. In large part, counties grow because of their ability to attract residents who commute to workplaces in other counties; counties fail to grow because they are poorly situated in the inter-county commuting network. This perspective provides some insight into two phenomena: urban sprawl and rural population decline.

Both rural population decline and urban sprawl are important policy issues. For rural counties, population loss is a serious problem, typically resulting in the kind of vicious circle Myrdal (1956) discussed—lower population leading to closed schools, businesses, churches, etc., giving residents even less incentive to remain and leading to further shutdowns in the local economy. Urban sprawl is considered a problem, since it creates fiscal difficulties for central cities and leads to many inefficiencies in the provision of public services. It also entails aesthetic costs as more and more land is used to accommodate the automobile—to the point that the distinguishing feature of the American city has become the parking lot. While the most effective opponents of sprawl focus on this aesthetic dimension (e.g., Kunstler 1993), the economic issues are less clear, and are still the subject of hot debate. For example, Peter Gordon and Harry W. Richardson (1997) note that over the last half century, changes in technology have caused transportation and communications costs to fall, a trend which is likely to continue and which will favor even more dispersed settlement patterns. It is also clear that the average American prefers suburban living, and that when compact development does occur, it is invariably “a result of top-down command-and-control planning rather than an expression of individual preferences.” On the other hand, Reid Ewing (1997) points out that transportation costs would not be so low, were it not for the fact that costs of air pollution, congestion, and parking are not completely borne by the automobile driver. This implicit subsidy to auto transportation amounts to about 22 cents per passenger mile—it would require an additional gasoline tax of \$6.60 per gallon before automobile drivers fully paid the social costs of driving. Prices that high would surely discourage sprawl, but are extremely unlikely within the near future.

Sprawl is first and foremost a land-use phenomenon; even an area of static population can experience sprawl as its built environment is modified in a low-density, auto-friendly way. But sprawl also involves a population migration dimension, a dimension which appears in the migration statistics as the movement of persons away from workplace locations toward specialized residential locations.

### **U.S. County-Level Population Change**

Figure 1 presents a map of county population change since 1930. Those counties with fewer residents in 1997 than in 1930 are primarily located in areas with a long history of “problems” (Hoover 1963), such as the High Plains, Appalachia, and the Black Belt. One thing these counties have in common is their rural character—small in population, they are not located in close proximity to any major urban area.

Table 1 presents population change aggregated over the Beale Classification Codes. Between 1930 and 1980 population growth was directly related to the size and centrality of a county, as measured by the Beale categories—i.e. population growth was lower, the smaller and more isolated the county. This pattern changed, however, in two significant ways during the 1980-1997 period: first, fringe counties of large metropolitan areas grew much faster than their core counties; and second, rural counties, regardless of size, experienced respectable growth *provided that the county was adjacent to an MSA*.

Table 1 divides 1980-1997 population change into net migration and natural increase. Net migration clearly determines the total population growth in each category. One point is particularly intriguing: net migration is negative for all rural areas not adjacent to a MSA. This suggests that the issue of rural population growth or decline is intimately related to the issue of urban sprawl: rural counties in close proximity to a metropolitan area experience population growth as the urban population spills further and further out into the countryside; isolated rural counties, on the other hand, continue to send migrants to counties within or near urban areas.

**Table 1: 1980-1997 Population Change by County Beale Category: Net Migration and Natural Increase**

Beale Code	Beale Classification Description	Annual Population Growth Rate 1930-80	Annual Population Growth Rate 1980-97	Total Net Migration 1980-97, Divided by 1980 Population	Total Natural Increase 1980-97, Divided by 1980 Population
_0	Central county of MSA with 1993 population of 1 million or more	1.6%	1.0%	3.7%	15.3%
_1	Fringe counties of MSA with 1993 population of 1 million or more	1.6%	2.1%	28.1%	14.3%
_2	Counties in MSA of 250 thousand to 1 million population	1.6%	1.2%	8.5%	13.5%
_3	Counties in MSA of less than 250 thousand population	1.3%	0.9%	4.3%	12.3%
_4	Urban population of 20,000 or more, adjacent to an MSA	1.0%	0.7%	3.2%	9.4%
_5	Urban population of 20,000 or more, <b>not adjacent to an MSA</b>	1.0%	0.6%	-2.4%	13.1%
_6	Urban population of 2,500 to 19,999, adjacent to an MSA	0.3%	0.7%	4.9%	7.2%
_7	Urban population of 2,500 to 19,999, <b>not adjacent to an MSA</b>	0.2%	0.2%	-2.9%	7.0%
_8	Completely rural or less than 2,500 urban population, adjacent to an MSA	-0.1%	0.7%	7.1%	5.4%
_9	Completely rural or less than 2,500 urban population, <b>not adjacent to an MSA</b>	-0.5%	0.0%	-3.3%	3.8%

Source: <http://www.census.gov/population/www/estimates/countypop.html>

### Defining Sprawl with Commuting Patterns

Migration which creates or exacerbates sprawl would direct population out of workplace counties and into residential counties. Since migration across long distances necessarily involves a change of

workplace, it is only migration within feasible commuting distance which could constitute a pure residential choice decision. Sprawl is generated by the possibility of commuting—commuting from peripheral residences to core jobs. A certain proportion of inter-county migration travels along the grooves defined by inter-county commuting. Since migration against the commuting stream leads to the dispersal of a central place, and swells the flow of persons commuting into the central place, this migration could be described as sprawl-creating.

Table 2 presents summary information on commuting from the 1990 Census. In that year nearly one quarter of all American workers commuted to another county for work. Almost 99 percent of all inter-county commuting is local—i.e., spanning fewer than 150 miles. This distance was chosen since it seemed the maximum feasible daily commuting distance (at least four hours per day by car); distances longer than this would doubtless require temporary accommodations in the workplace county. Local commuting flows almost always have a primary or dominating direction, defined as the direction for which the net flow (=outflow-inflow) is positive. The table shows the aggregate number of persons going with and against the primary direction of outflows. Overall, almost three times as many persons commute in the primary direction as in the opposite direction.

**Table 2: Inter-County Commuting: Number of workers by category 1990 Census Journey to Work Data.**

Category of Flow	Number of Commuters	Percent of Total
Did not commute out of county of residence	87,748,442	76.8%
Long Distance Commuting (Distance ≥ 150 Miles)	332,057	0.3%
Local Commuting (Distance < 150 Miles)	26,113,403	22.9%
Against the Stream	6,829,175	6.0%
With the Stream	19,284,228	16.9%
Total Identified Commuters	114,193,902	100.0%

Source: REIS CD-ROM, 1990 Journey to Work Data, Bureau of Economic Analysis. Distances are miles between county centroids.

The primary direction of commuting defines a relationship between two counties: a source county consisting mainly of residences, a destination county specializing in workplaces. Migration from the workplace county into the predominantly residential county of the pair would amplify this functional distinction, increase the volume of commuting flows, and lead to a more dispersed settlement structure. Thus, migration against the commuting stream creates or reinforces sprawl.

## Migration

In this paper we draw on the two major sources of data on recent U.S. migration: the STP county-to-county migration file from the 1990 Census,<sup>1</sup> and the IRS county-to-county migration data for 1994-1995, 1995-1996, and 1996-1997.<sup>2</sup>

Only local migration is potentially sprawl-creating, since only local migration clearly involves a choice between moving toward workplaces (i.e., with the commuting stream) or toward specialized residential areas (against the commuting stream). What proportion of migration is in fact local? Table 3

addresses this question using the IRS county to county migration files for 1994-1995, 1995-1996, and 1996-1997. These data report flows between each pair of counties with migration greater than 10 tax returns, with the remaining flows aggregated and unspecified as to source county. Other unspecified flows include military and foreign migration.

**Table 3: Migration Distance: Number of persons by category IRS County to County Migration Files (total 1994-1995, 1995-1996, and 1996-1997).**

Miles between Source and Destination Counties	1994-1995	1995-1996	1996-1997	Total
Unspecified	3,406,525	3,366,386	3,558,723	10,331,634
Less than 50	4,853,668	4,775,528	4,865,741	14,494,937
50 to 150	1,557,178	1,533,495	1,569,577	4,660,250
150 to 500	1,178,505	1,155,895	1,164,489	3,498,889
500 to 1,200	1,001,478	963,506	946,160	2,911,144
1,200 to 2,800	636,287	608,977	595,511	1,840,775
All migrating persons	12,633,641	12,403,787	12,700,201	37,737,629
As percent of all migrating persons				
Unspecified	27%	27%	28%	27%
Less than 50	38%	39%	38%	38%
50 to 150	12%	12%	12%	12%
150 to 500	9%	9%	9%	9%
500 to 1,200	8%	8%	7%	8%
1,200 to 2,800	5%	5%	5%	5%

**Note:** Figures are based on identified outflows; distances are between county centroids.

A striking feature of this table is the relative stability of the relationships—both absolute numbers and percent of all migrating persons differ little from year to year. Over one-quarter of all flows are unspecified, and most of these would—in fact—be long-distance, since they include foreign migration, the movement of military personnel, and flows between county pairs where the flows account for fewer than ten households (which in almost every case would be counties fairly far from each other). About half of all flows are known to be of 150 miles or less—the distance which we considered the maximum feasible daily commuting journey.

Table 4 identifies those migration flows linking contiguous counties. Over one third of all out-migration occurs between contiguous counties, about the same proportion as those migrating 50 miles or less in Table 3. Again, it is likely that most of the unspecified flows are between non-contiguous counties, since these are flows involving relatively few persons and are therefore likely to connect counties with distant and tenuous connections.

**Table 4: Migration to Contiguous Counties: Number of persons by category IRS County to County Migration Files (total 1994-1995, 1995-1996, and 1996-1997).**

County Pair	1994-1995	1995-1996	1996-1997	Total
Foreign Destination	212,151	208,694	423,119	843,964
Unspecified Domestic Destination	3,194,374	3,157,692	3,135,604	9,487,670
Non-Contiguous Destination County	4,544,873	4,438,316	4,464,880	13,448,069
Contiguous Destination County	4,682,243	4,599,085	4,676,598	13,957,926
Total Outflows	12,633,641	12,403,787	12,700,201	37,737,629
As percent of total outflows				
Foreign Destination	2%	2%	3%	2%
Unspecified Domestic Destination	25%	25%	25%	25%
Non-Contiguous Destination County	36%	36%	35%	36%
Contiguous Destination County	37%	37%	37%	37%

**Note:** Figures are based on identified outflows; contiguous counties identified using key file found in REIS CD-ROM, Bureau of Economic Analysis.

The STP data from the 1990 Census also track migration; these files show the residence by county for all persons in the two years 1985 and 1989. The differences between the IRS data and the STP are the following: the IRS data are a (non-random) sample of about 80% of the population, the STP represent the entire population; the IRS data include information on income and numbers of persons per household, the STP data give the number of persons by educational status, age, race, gender, poverty status, and nationality; the IRS data give an annual snapshot of person movements, the STP show differences in location at a five year interval (and since some persons may have moved many times in those five years, these data will give a lower migration rate). Table 5 presents the total flows from these data.

**Table 5: Migration: Number of persons by category STP County to County Migration Files (Total 1985-1989 Census 1990 counts, persons above 5 years of age).**

Category	Number of Persons	Percent of Total
Local Migration (Distance <150 Miles)	20,577,840	9.67%
Long Distance Migration (Distance ≥ 150 Miles)	20,390,308	9.44%
Did not migrate out of county	169,647,446	78.58%
Migrated, but source county not specified	4,986,676	2.31%

**Source:** STP 1985-1989 Migration.

These data show too that about half of all migration occurs within a 150 mile radius of the source county. Long-distance migration was probably somewhat different in nature in the late 1980s than in the mid-1990s, since this earlier period was characterized by decline in oil prices and a sharp out-migration from Oil Patch states.

Overall, then, it seems that about half of all inter-county migration occurs within a feasible daily commuting distance (150 miles, measured as a straight line between county centroids), and that over one-third of all migration occurs within 50 miles or between contiguous counties. Thus, at least one-third of all inter-county migration is purely local, shaped by preferences for residences within a local labor market area rather than by major structural factors leading to the rise or decline of whole regions.

## Migration Along Commuting Streams

One would expect migration at the local level to consist largely of people moving out against the commuting stream. In their new residences, these people may continue to work in their original home county. Table 6 classifies migration flows according to how they map unto local commuting flows.

**Table 6: Migration along Commuting Flows: Number of persons by category IRS County to County Migration Files (total 1994-1995, 1995-1996, and 1996-1997).**

Category of Flow	1994-1995	1995-1996	1996-1997	Total
Long Distance Migration	5,550,319	5,405,588	5,693,885	16,649,792
Local: Not Along Commuting Flows	965,170	980,182	889,377	2,834,729
Local: <i>Against</i> Commuting Flows	3,447,266	3,370,420	3,433,097	10,250,783
Local: <i>With</i> Commuting Flows	2,670,886	2,647,597	2,683,842	8,002,325
Net Sprawl-Inducing Migration ( <i>Against</i> minus <i>With</i> )	776,380	722,823	749,255	2,248,458
Total Outflow	12,633,641	12,403,787	12,700,201	37,737,629
Long Distance Migration	43.9%	43.6%	44.8%	44.1%
Local: Not Along Commuting Flows	7.6%	7.9%	7.0%	7.5%
Local: <i>Against</i> Commuting Flows	27.3%	27.2%	27.0%	27.2%
Local: <i>With</i> Commuting Flows	21.1%	21.3%	21.1%	21.2%
Net Sprawl-Inducing Migration ( <i>Against</i> minus <i>With</i> )	6.15%	5.83%	5.90%	5.96%

**Note:** Figures are based on identified outflows. Long distance migration includes foreign outflows, all unspecified outflows except those within the same state, and all specified outflows 150 miles or longer. Unspecified outflows occurring within the same state are classified as "Local: Not Along Commuting Flows," together with all flows of less than 150 miles not along any commuting stream.

The numbers are similar in each of the three years. Migration against the commuting stream (i.e., migration building up the peripheral residential area and thus promoting sprawl) is a bit over a quarter larger than flows with the commuting stream (migration moving residences closer to workplaces). Local migration (that is, migration of less than 150 miles) between counties not connected by a commuting flow amounts to about 13% of all local migration.

Table 7 presents the same information using the STP data. Here, too, the primary flow of migrants at the local level is against the commuting stream—in this case 40% higher than the flow in the reverse direction—and local migration between counties not connected by a commuting flow stands at about 13% of all local migration.

**Table 7: Migration: Number of persons by category STP County to County Migration Files (Total 1985-1989 Census 1990 counts, persons above 5 years of age).**

Category of Flow	Outflow	Percent of Total Outflow
Long Distance Migration	20,390,308	49.41%
Local: Not Along Commuting Flows	2,717,323	6.59%
Local: <i>Against</i> Commuting Flows	10,601,334	25.69%
Local: <i>With</i> Commuting Flows	7,556,382	18.31%
Net Sprawl-Inducing Migration ( <i>Against</i> minus <i>With</i> )	3,044,952	7.38%
Total Outflow	41,265,347	100.00%

**Source:** STP 1985-1989 Migration.

The two sets of data present a fairly consistent picture. Both show that over 85% of migration between counties within 150 miles of each other (centroid to centroid) occurs along commuting flows. Thus, there is at least the potential of commuting for these migrants. Further, at least a quarter more migrants move against commuting flows than move with them. Net sprawl-inducing inter-county migration amounts to about 6% of all U.S. county to county out-migration.

### **Motives for Migration**

Several types of motives for migration can be imagined. Long distance migration may consist of young people leaving for college, military service, or employment in a larger city; older persons moving to a retirement area; specialized workers searching nationally for a job matching their skills. For local migration, the search for affordable housing, or for housing in communities of one's peers, may be an especially important determinant. Whether this search leads to a centrifugal or centripetal movement of population may depend on the characteristics of the migrant, especially the migrant's income. Some information about incomes of migrants and their source and destination counties may be gleaned from the IRS data.

The top left cell in Table 8 shows the number of migrants who both have higher median income than their source county and who are moving to a destination county with higher median income than the source. In other words, these are relatively high income people moving to a relatively high income county; this kind of migration favors the creation of suburban enclaves, with residents attracted by a high income environment and high quality public services. This kind of migration should be predominantly centrifugal.

The top right cell shows the number of relatively low income migrants moving to a high income county. This is the classic migration which builds cities: poor migrants search for better opportunities in a richer part of the world; with luck, they find them. This kind of migration should be predominantly centripetal.

The bottom right cell shows the number of relatively low income migrants who move to a relatively low income county. At the local level, this can be interpreted as a search for affordable housing (and would be predominantly centrifugal); over longer distances, this might well represent much of the migration of young workers to the Sunbelt.

The bottom left cell shows the number of relatively high income migrants moving to a relatively low income county. This is the rarest form of movement. The implications of this migration for sprawl are not clear.

**Table 8: IRS Local Migration, Total 1994-1995, 1995-1996, and 1996-1997 by Income Category**

Local Migration	Migrant Median Income > Source County Median Income	Migrant Median Income < Source County Median Income	Total Migrants
Destination County Median Income > Source County Median Income	3,016,440 (16%)	7,133,982 (37%)	10,150,422 (53%)
Destination County Median Income < Source County Median Income	451,676 (2%)	8,625,524 (45%)	9,077,200 (47%)
Total Migrants	3,468,116 (18%)	15,759,506 (82%)	19,227,622 (100%)

**Source:** IRS County-to-County Migration, 1994-1995, 1995-1996, and 1996-1997

Table 8 thus shows that over half of all local migration is to a county with higher median income than the source county. This pattern is consistent with the familiar migration of rural folk to the big city, and it also fits the view that local migration tends to separate income classes into distinct geographical locations, as higher income persons move to high income enclaves. The table also shows that migrants are overwhelmingly of lower income than their source county average. The largest single cell is that of low income persons moving to a lower income county—suggestive of a search for affordable housing.

Comparing migration in each of these income categories with the commuting flows followed by these migrants produces Table 9. Each row represents one of the four income categories discussed in Table 8 above; each column one of the commuting categories discussed in Table 6. The most surprising feature of this table is that migration against the commuting stream is overwhelmingly a product of persons whose income is above the median income of their source county; that is—higher income persons account for most of the net dispersal of population characteristic of sprawl. Over four times as many high income persons migrate *against* the predominant commuting flow as migrate *with* that flow. As we had hypothesized above, the migration of low income persons to lower income counties also contributes to sprawl, while the migration of low income persons to higher income counties is a centripetal movement.

One, perhaps troubling feature of Table 9 is that migration increasingly segregates income groups: high income persons are more likely to leave for a higher income county, and low income persons are more likely to leave for a lower income county. This segregating tendency involves a strongly centrifugal movement. The two flows which tend to diminish segregation (high income persons migrating to lower income counties, and low income persons migrating to higher income counties) are, when combined, a centripetal flow.

**Table 9: IRS Migration, Total 1994-1995, 1995-1996, and 1996-1997 Income Category by Commuting Flow.**

Income Category	Total	Long Distance Migration	Local: Not Along Commuting Flows	Local: Against Commuting Flows	Local: With Commuting Flows	Against minus With
High income persons migrate to high income counties	4,321,041 (11%)	1,304,601 (3%)	93,619 (0%)	2,384,493 (6%)	538,328 (1%)	1,846,165
High income persons migrate to low income counties	1,114,592 (3%)	662,916 (2%)	36,666 (0%)	333,987 (1%)	81,023 (0%)	252,964
Low income persons migrate to high income counties	9,845,670 (26%)	2,711,688 (7%)	412,442 (1%)	3,151,999 (8%)	3,569,541 (9%)	-417,542
Low income persons migrate to low income counties	12,197,127 (32%)	3,571,603 (9%)	431,787 (1%)	4,380,304 (12%)	3,813,433 (10%)	566,871
Income unspecified	10,259,199 (27%)	8,398,984 (22%)	1,860,215 (5%)	0 (0%)	0 (0%)	0
Total	37,737,629 (100%)	16,649,792 (44%)	2,834,729 (8%)	10,250,783 (27%)	8,002,325 (21%)	2,248,458 (6%)

**Source:** IRS County-to-County Migration, 1994-1995, 1995-1996, and 1996-1997. **Note:** Figures are based on identified outflows. Long distance migration includes foreign outflows, all unspecified outflows except those within the same state, and all specified outflows 150 miles or longer. Unspecified outflows occurring within the same state are classified as “Local: Not Along Commuting Flows,” together with all flows of less than 150 miles not along any commuting stream.

The map in Figure 2 identifies the main recipients of sprawl-fomenting migration between 1995 and 1997. For each county, the number of migrants coming in *with* commuting flows was subtracted from the number entering *against* commuting flows—this gives a measure of net sprawl-inducing migration. The 3,000 or so counties were then ranked, from largest net inflow to smallest, and the top counties were selected, with the cut-off marked by the point where those counties contained 75 percent of total U.S. net sprawl-inducing migration.

### Housing Price and Migration

If local migration flows consist of residence relocation movements, rather than shifts in workplace location, then inter-county differentials in housing quality and price should determine inter-county migration flows. Specifically, migration should occur toward counties with cheaper housing and/or higher quality housing.

Housing price indices are not generally available at the county level. However, using data from tax assessors, we constructed an index for all counties in Tennessee (presented in Appendix A). The procedure is discussed in Eff (1999). The index is hedonic, and evaluates the average home in each county at the “state price.” This state price is compared to the “county price” to obtain the price index. The data were from 1996, the mid-point of the IRS migration data.

Table 10 categorizes each Tennessee migration flow according to the relative price of housing in the

destination and source counties. Since price is known only for Tennessee counties, only intra-Tennessee flows to identified counties are shown; thus, long distance migration is restricted to moves between the further reaches of the state. The parentheses report each flow as a percent of all identified flows within Tennessee.

**Table 10: IRS Migration, Total 1994-1995, 1995-1996, and 1996-1997. Tennessee, by Relative Housing Prices of Destination and Source Counties.**

Income Category	Total	Long Distance Migration	Local: Not Along Commuting Flows	Local: Against Commuting Flows	Local: With Commuting Flows	Against minus With
Destination County has Higher Price	166,782 (47%)	9,218 (3%)	1,748 (0%)	47,040 (13%)	108,776 (30%)	-61,736
Destination County has Lower Price	189,889 (53%)	8,322 (2%)	1,681 (0%)	139,155 (39%)	40,731 (11%)	98,424
Total Outflows	356,671 (100%)	17,540 (5%)	3,429 (1%)	186,195 (52%)	149,507 (42%)	36,688 (10%)

**Sources:** IRS County-to-County Migration, 1994-1995, 1995-1996, and 1996-1997. Price indices obtained from Eff (1999), and presented in Appendix A below.

As expected, the smallest flow is toward counties with higher prices. Flows toward higher prices are—on balance—centripetal, since they carry more migrants with commuting flows than against them. Centrifugal flows, however, predominate, and are characterized by a movement toward lower prices. Net sprawl-inducing migration amounts to 36,688 persons, or 10% of the total persons moving within Tennessee in the three years.

Table 11 attempts the ambitious task of assigning net sprawl-inducing migration to a cross classification of the categories in Tables 10 and 9. Each cell gives the difference between those migrating against commuting flows and those migrating with commuting flows. A negative number indicates that the predominant migration flow is with the commuting flow; a positive number shows that migrants predominantly move against commuting.

**Table 11: Net Sprawl-Inducing Migration, IRS 1994-1995, 1995-1996, and 1996-1997. Tennessee, by Relative Housing Prices of Destination and Source Counties, and Relative Income of Migrants.**

Income Category	High income persons migrate to high income counties	High income persons migrate to low income counties	Low income persons migrate to high income counties	Low income persons migrate to low income counties	Total Net Sprawl-Inducing Flows
Destination County has Higher Price	5,320	335	-52,470	-14,921	-61,736
Destination County has Lower Price	30,980	7,107	4,162	56,175	98,424
Total Net Sprawl-Inducing Flows	36,300	7,442	-48,308	41,254	36,688

**Sources:** IRS County-to-County Migration, 1994-1995, 1995-1996, and 1996-1997. Price indices obtained from Eff (1999), and presented in Appendix A below. **Notes:** The numbers in each cell represent the sum of flows against the commuting stream minus the sum of flows with the commuting stream. A negative number thus shows net movement toward the workplace county; a positive number shows net movement toward the residential county.

The two most important sources of centrifugal migration are high income persons moving to high income counties and low income persons moving to low income counties. In both of these cases, by far the largest flows are toward *lower* price counties. In both cases, then, a search for cheaper housing can explain the dispersion of population. This is significant because it shows that it is not necessary to assume that high income persons migrating to higher income counties are solely motivated by a sense of social exclusiveness.

These data show how difficult it is to reverse sprawl—the only centripetal flows are those of low income persons migrating toward counties with higher housing prices. This is an unenviable situation for a migrant—and it seems rational only when one assumes that the move brings the migrant improved access to jobs.

The movement of low income persons to lower income counties which have higher housing prices is almost entirely a product of the Nashville suburban ring, where lower income persons depart the peripheral counties for Davidson, the lower income core county, with its higher housing prices. This exodus is prompted by the lack of suitable housing for low income persons in some relatively homogenous suburban counties, and an abundance of such housing in large and diverse Davidson County. This suggests that variation in housing prices might be masked by the use of a single price index for a large urban county.

### **Summary and Conclusions**

Migration furthers urban sprawl by draining persons from workplace counties and accumulating them in residential counties. Commuting links workplace and residential counties, and commuting flows can be used to classify migration as contributing to more dispersed or more concentrated settlement patterns. Migration against commuting flows contributes to sprawl, migration with commuting flows promotes more compact settlements.

The results from the two data sources consulted (the STP and the IRS) were very similar, and any differences can be attributed to the time period covered and the ways in which the data were assembled. About half of all county out-migration is within a feasible commuting distance (150 miles) and about one-third is within a reasonable commuting distance (50 miles or between contiguous counties). About 27% of all U.S. county out-migration consists of persons migrating against commuting flows, while about 21% migrate with them. Thus, overall, about 6% of all U.S. county out-migration is net sprawl-inducing.

The IRS data indicate that about 6.5% of the population migrates between counties in any given year. Given the current population of about 250 million, this amounts to over 16 million migrants per year. If 6% of this migration is net sprawl-inducing, then each year sees a net movement of about 975 thousand persons into more dispersed positions in the U.S. settlement pattern. Most of this net movement is focused in relatively few counties, shown on the map in Figure 2. These are largely ring counties in multi-county MSAs.

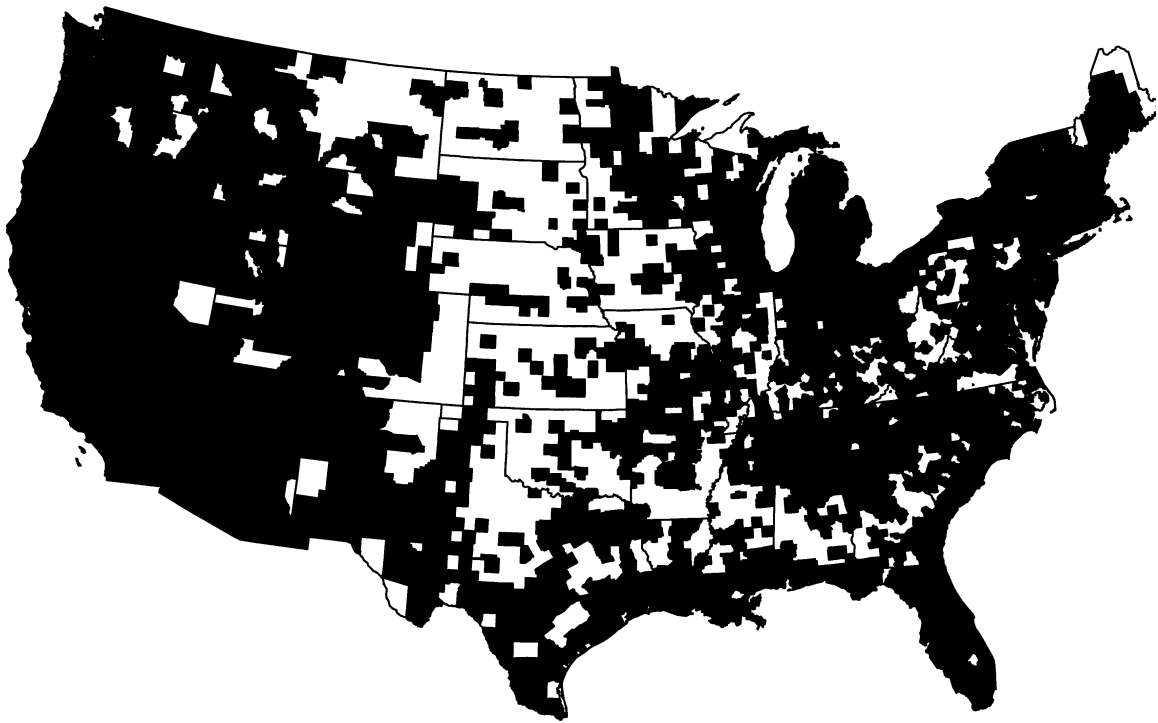
Sprawl-inducing migration is largely the product of households with median income higher than the average in their source county. Without the participation of these relatively affluent migrants, there would be only a weak net tendency toward more dispersed settlements. Sprawl-inducing migration also appears to promote increased segregation on the basis of income: migrants with incomes above their source county average tend to move to a destination county with a higher average income; likewise, lower income migrants tend to move toward a lower income county.

A closer view of migration among Tennessee counties shows that migration against the commuting stream tends to move the migrant to a county with lower house prices, while migration with the commuting stream entails movement toward higher house prices. Net sprawl-creating migration is thus readily interpreted as a search for cheaper housing.

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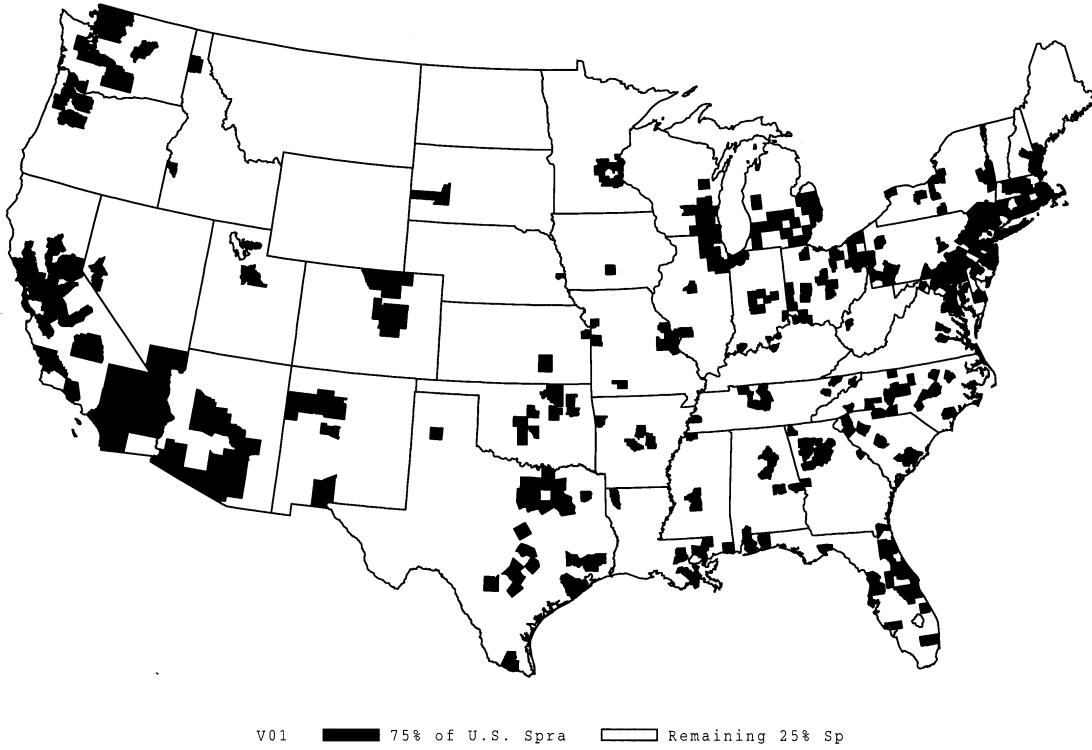
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# Population Change 1930 – 1997



w01    Decline Pop    Increase Pop

# Recipients of Sprawl – Migrants: IRS Data



# Appendix A: Housing Cost Index for Tennessee Counties

Tennessee County	1996 Housing Cost Index (State=1.00)	Tennessee County	1996 Housing Cost Index (State=1.00)
Anderson	1.01	Lauderdale	0.64
Bedford	0.73	Lawrence	0.71
Benton	0.54	Lewis	0.72
Bledsoe	0.65	Lincoln	0.68
Blount	0.94	Loudon	1.10
Bradley	0.88	Macon	0.67
Campbell	0.81	Madison	0.78
Cannon	0.85	Marion	0.88
Carroll	0.62	Marshall	0.83
Carter	0.77	Maury	0.86
Cheatham	0.91	McMinn	0.74
Chester	0.70	McNairy	0.60
Claiborne	0.67	Meigs	0.77
Clay	0.57	Monroe	0.75
Cocke	0.69	Montgomery	0.79
Coffee	0.77	Moore	0.70
Crockett	0.69	Morgan	0.66
Cumberland	0.84	Obion	0.67
Davidson	1.22	Overton	0.76
Decatur	0.59	Perry	0.61
DeKalb	0.86	Pickett	0.76
Dickson	0.83	Polk	0.64
Dyer	0.78	Putnam	0.87
Fayette	0.71	Rhea	0.82
Fentress	0.61	Roane	0.90
Franklin	0.84	Robertson	0.90
Gibson	0.71	Rutherford	0.87
Giles	0.73	Scott	0.64
Grainger	0.81	Sequatchie	0.67
Greene	0.86	Sevier	1.06
Grundy	0.58	Shelby	1.10
Hamblen	0.85	Smith	0.86
Hamilton	1.10	Stewart	0.86
Hancock	0.64	Sullivan	0.87
Hardeman	0.60	Sumner	0.97
Hardin	0.84	Tipton	0.71
Hawkins	0.80	Trousdale	0.72
Haywood	0.70	Unicoi	0.90
Henderson	0.67	Union	0.75
Henry	0.75	Van Buren	0.54
Hickman	0.77	Warren	0.79
Houston	0.74	Washington	0.91
Humphreys	0.74	Wayne	0.60
Jackson	0.61	Weakley	0.70
Jefferson	0.87	White	0.72
Johnson	0.74	Williamson	1.23
Knox	1.03	Wilson	0.99
Lake	0.60	Tennessee	1.00

**Source:** Eff (1999).

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<sup>1</sup> Produced by Henk Meij of CIESIN (Saginaw, MI) and John Blodgett of the University of Missouri at St. Louis (MO SDC); the data, as well as a description of their content and use, are available at <http://www.ciesin.org/datasets/us-demog/stp-home.html>.

<sup>2</sup> Produced from Internal Revenue Service data by the Bureau of the Census, these data may be purchased by following the directions at <http://ftp.fedworld.gov/pub/irs-soi/selprod.txt>. The following description contains extracts from the README file delivered with the data:

“County-to-County Migration Flow Data show migration patterns, from where to where, by county, based on year-to-year changes in the addresses entered on individual income tax returns by taxpayers... These data were processed by the Census Bureau... by matching the records of individual income tax returns filed in a ‘base year’ with the tax returns filed in the following year, using the social security number (SSN) of the ‘primary taxpayer.’... When the SSN of the primary taxpayer on a return filed, for example, in base year 1994 (for the tax year of 1993) matched the SSN of a return filed in the following year of 1995 (for the tax year of 1994), the county residence was compared to decide if they were the same... Only returns for which the SSN (of the primary taxpayer) reported on the return filed in 1994 matched the SSN (of the primary taxpayer) reported on the return filed in 1995 were included in the statistics. Some reasons for non-matches included: (1) people marrying between filings of the tax returns...; (2) divorces; (3) deaths; (4) changes in income levels which resulted in not filing an income tax return for one of the two years; and (5) errors in the SSN's reported by taxpayers or from erroneous transcription by the IRS... For an unspecified number of these returns, the addresses may not actually represent the primary residence of the person(s). Instead, the addresses reported on the tax returns may be Post Office boxes, business addresses, addresses of financial institutions, secondary addresses of persons with dual residences, or addresses of the taxpayers' accountants, for example. Although unknown, it is thought that the data limitation based on reported addresses being different from actual primary residences may affect to a greater degree certain sub-populations, such as people with high incomes... A county-to-county flow is defined as ‘significant’ if it contains at least 10 returns or the flow is at least 0.5 percent of all county migrant exemptions. Only ‘significant’ flows are shown separately in the file. All other county flows are ‘nonsignificant,’ and aggregated into higher-level geographic categories, such as the same State (but different county), or a region of the United States.”

The data report the number of returns (a proxy for the number of households), number of exemptions (a proxy for the number of persons), gross income, and median income. Our comparisons with the Census county population figures indicate that the compared returns comprise about 80% of the actual population.