

**TECHNICAL DESCRIPTION of the  
WOODS & POOLE ECONOMICS, INC.  
2016 REGIONAL PROJECTIONS  
and DATABASE**

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## Introduction

The Woods & Poole Economics, Inc. database contains more than 900 economic and demographic variables for every county in the United States for every year from 1970 to 2050. This comprehensive database includes detailed population data by age, sex, and race; employment and earnings by major industry; personal income by source of income; retail sales by kind of business; and data on the number of households, their size, and their income. All of these variables are projected for each year through 2050. In total, there are over 200 million statistics in the regional database. The regional model that produces the projection component of this database was developed by Woods & Poole. The regional projection methods are revised somewhat year to year to reflect new computational techniques and new sources of regional economic and demographic information. Each year, a new projection is produced based on an updated historical database and revised assumptions.

The fact that the proprietary Woods & Poole economic and demographic projections rely on a very detailed database, makes them one of the most comprehensive county-level projections available. A description of some characteristics of the database and projection model is contained in this chapter.

## Overview of the Projection Methods

The strength of Woods & Poole's economic and demographic projections stems from the comprehensive historical county database and the integrated nature of the projection model. The projection for each county in the United States is done simultaneously so that changes in one county will affect growth or decline in other counties. For example, growth in employment and population in Houston will affect growth in other metropolitan areas, such as Cleveland. This reflects the flow of economic activity around the country as new industries emerge or relocate in growing areas and as people migrate, in part because of job opportunities. The county projections are developed within the framework of the United States projection made by Woods & Poole. The U.S. projection is the control total for the 2016 regional projections and is described in the "Overview of the 2016 Projections" chapter included in Woods & Poole publications.

The regional projection technique used by Woods & Poole — linking the counties together to capture regional flows and constraining the results to a previously determined United States total — avoids a common pitfall in regional projections. Regional projections are sometimes made for a city or county without regard for potential growth in surrounding areas or other areas in the country. Such projections may be simple extrapolations of recent historical trends and, as a result, may be too optimistic or pessimistic. If these county projections were added together, the total might differ considerably from any conceivable national forecast scenario; this is the result of each regional projection being generated independently without interactive procedures and without being integrated into a consistent national projection.

*Woods & Poole Economics, Inc. is a small, independent corporation that specializes in long-term county economic and demographic projections. Woods & Poole's database for every county in the U.S. contains projections through 2050 for more than 900 variables.*

The methods used by Woods & Poole to generate the county projections proceed in four stages. First, forecasts to 2050 of total United States personal income, earnings by industry, employment by industry, population, inflation, and other variables are made. Second, the country is divided into 179 Economic Areas (EAs) as defined by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA). The EAs are aggregates of contiguous counties that attempt to measure cohesive economic regions in the United States (a list of all EAs and their component counties can be found in Appendix 6 following this chapter); in the 2016 Woods & Poole model, EA definitions released by the BEA in May 2007 are used. For each EA, a projection is made for employment, using an “export-base” approach; in some cases the employment projections are adjusted to reflect the results of individual EA models or exogenous information and assumptions about the EA economy. The employment projection for each EA is then used to estimate earnings in each EA. The employment and earnings projections then become the principal explanatory variables used to estimate population and number of households in each EA.

The third stage is to project population by age, sex, and race for each EA on the basis of net migration rates projected from employment opportunities. For stages two and three, the U.S. projection is the control total for the EA projections. The fourth stage replicates stages two and three except that it is performed at the county level, using the EAs as the control total for the county projections.

***U.S. PROJECTIONS***



***ECONOMIC AREA  
BASIC SECTOR  
PROJECTIONS***



***ECONOMIC AREA  
NON-BASIC SECTOR  
PROJECTIONS***



***COUNTY BASIC  
SECTOR PROJECTIONS***



***COUNTY NON-BASIC  
SECTOR PROJECTIONS***

**The “Export-Base” Approach**

The economic projection techniques used by Woods & Poole to generate the employment, earnings, and income estimates for each county in the United States generally follow a standard economic “export-base” approach. This relatively simple approach to regional employment projections is one that has been used by a number of researchers (see [5] and [9]). Although this approach has been criticized by several empirical studies (e.g., [8]), given the availability of regional data it remains one of the most feasible theoretical methodologies.

Certain industrial sectors at the regional level are considered “basic.” This means that these sectors produce output that is not consumed locally but is “exported” out of the region for national or international consumption. This assumption allows these sectors to be linked closely to the national economy, and hence follow national trends in productivity and output growth. Normally, the “basic” sectors are mining, agriculture, manufacturing, and the Federal government. In contrast, “non-basic” sectors are those such as retail trade, utilities, real estate, and construction, the output of which is usually consumed locally. The growth of the “non-basic” sectors depends largely on the growth of the “basic” sectors that form the basis of the region’s economy.

Intuitively, this approach has great appeal and there are numerous examples that seem to support the “export-base” theory. Automobile production in Detroit, for instance, is obviously much more sensitive to national and international price and demand for transportation equipment than to local demand. In Texas, oil and natural gas exploration and

production are tied closely to the worldwide demand and supply of petroleum resources and not tied primarily to energy consumption in Texas.

Although the theory is appealing, some shortcomings do exist in the “export-base” approach. For example, some “basic” commodities produced locally are consumed locally. Producers of durable equipment used in other manufacturing processes are often affected not by the national demand for their product but by the regional demand. Machine tool makers that supply the local automobile industry in Detroit will prosper to the extent Detroit’s automobile producers prosper. In Houston, the strength of the local oil industry will affect the demand and production of equipment for oil and natural gas production and exploration. In both of these instances, some durable manufacturing industries exist to serve local, not national, markets.

However, despite the shortcomings, the availability of relatively clean data for sub-national geographic areas makes the “export-base” approach very useful. The analytical framework for projections using the “export-base” approach entails estimating either demand equations or calculating historical growth rate differentials for output by sector. The principal explanatory variable, or the comparative data series for growth rate differentials, is the national demand for the output of that sector. Employment-by-sector data are often used as a surrogate variable since county output-by-sector data are not available; employment-by-sector data are used by Woods & Poole. Earnings projections are then obtained by using earnings-per-employee data either estimated as part of the model or imposed exogenously on the system. The complementary relationship could also be estimated, i.e., using an earnings forecast to derive employment based on earnings-per-employee data; this procedure has been used previously in some Woods & Poole regional models.

A modification of the “export-base” approach is used by Woods & Poole to account for regional variants to normal “basic”/“non-basic” industry definitions. Some “non-basic” sectors can be more appropriately modeled as “basic” sectors in certain regional economies. The finance and insurance sector or wholesale trade sector in New York City, for example, and the accommodation and food services sector in Las Vegas, are cases in which traditionally “non-basic” sectors are really “basic.” New York is a worldwide financial and trade center and thus “exports” these services outside of the region; Las Vegas, as a vacation and entertainment center, similarly “exports” the output of its accommodation and food services sector to other parts of the country. Activity in these sectors, in these specific geographic areas, is therefore linked more closely to the performance of these same sectors in the surrounding regions and the nation as a whole than to the other “basic” industries in the region.

A list of Economic Areas that have traditionally “non-basic” sectors modeled as “basic” sectors is presented in Table 1. Areas with “non-basic” sectors modeled as “basic” are those areas with a proportion of “non-basic” sector employment relative to total employment greater than 1.5 standard deviations above the national mean for a specific sector. With the exception of two sectors that are always considered “non-basic,” construction and state and local government, all “non-basic” sectors are evaluated for each EA using this method (see [5]).

**Table 1. Economic Area "Non-Basic" Sectors Considered as "Basic" in the 2016 Woods & Poole Regional Model**

<p><b>UTILITIES</b> Billings, MT Birmingham-Hoover-Cullman, AL Bismarck, ND Casper, WY Clarksburg, WV + Morgantown, WV Duluth, MN-WI Farmington, NM Gulfport-Biloxi-Pascagoula, MS Helena, MT</p> <p><b>WHOLESALE TRADE</b> Atlanta-Sandy Springs-Gainesville, GA-AL Charlotte-Gastonia-Salisbury, NC-SC Chicago-Naperville-Michigan City, IL-IN-WI Dallas-Fort Worth, TX  Fargo-Wahpeton, ND-MN Houston-Baytown-Huntsville, TX Idaho Falls-Blackfoot, ID Memphis, TN-MS-AR New York-Newark-Bridgeport, NY-NJ-CT-PA</p> <p><b>RETAIL TRADE</b> Alpena, MI Bangor, ME Cape Girardeau-Jackson, MO-IL Duluth, MN-WI Eugene-Springfield, OR Kearney, NE Marinette, WI-MI McAllen-Edinburg-Pharr, TX Missoula, MT Sarasota-Bradenton-Venice, FL Tampa-St. Petersburg-Clearwater, FL Wausau-Merrill, WI</p> <p><b>TRANSPORTATION and WAREHOUSING</b> Anchorage, AK Corpus Christi-Kingsville, TX Fayetteville-Springdale-Rogers, AR-MO Jacksonville, FL Joplin, MO Kearney, NE Louisville-Elizabethtown-Scottsburg, KY-IN Memphis, TN-MS-AR New Orleans-Metairie-Bogalusa, LA Pendleton-Hermiston, OR Redding, CA Scotts Bluff, NE State College, PA</p> <p><b>INFORMATION</b> Atlanta-Sandy Springs-Gainesville, GA-AL Austin-Round Rock, TX Boston-Worcester-Manchester, MA-NH Cedar Rapids, IA Colorado Springs, CO Columbus-Auburn-Opelika, GA-AL Dallas-Fort Worth, TX Denver-Aurora-Boulder, CO Kansas City-Overland Park-Kansas City, MO-KS Los Angeles-Long Beach-Riverside, CA New York-Newark-Bridgeport, NY-NJ-CT-PA Omaha-Council Bluffs-Fremont, NE-IA Salt Lake City-Ogden-Clearfield, UT San Angelo, TX San Jose-San Francisco-Oakland, CA Seattle-Tacoma-Olympia, WA Tampa-St. Petersburg-Clearwater, FL Washington-Baltimore-Northern Virginia, DC-MD-VA-WV</p> <p><b>FINANCE and INSURANCE</b> Chicago-Naperville-Michigan City, IL-IN-WI Dallas-Fort Worth, TX Denver-Aurora-Boulder, CO Des Moines-Newton-Pella, IA Hartford-West Hartford-Willimantic, CT Jacksonville, FL Kansas City-Overland Park-Kansas City, MO-KS</p>	<p><b>FINANCE and INSURANCE (continued)</b> New York-Newark-Bridgeport, NY-NJ-CT-PA Omaha-Council Bluffs-Fremont, NE-IA Philadelphia-Camden-Vineland, PA-NJ-DE-MD Phoenix-Mesa-Scottsdale, AZ San Antonio, TX Sioux Falls, SD Tampa-St. Petersburg-Clearwater, FL</p> <p><b>REAL ESTATE and RENTAL and LEASING</b> Austin-Round Rock, TX Bend-Prineville, OR Denver-Aurora-Boulder, CO Honolulu, HI Las Vegas-Paradise-Pahrump, NV Los Angeles-Long Beach-Riverside, CA Miami-Fort Lauderdale-Miami Beach, FL Orlando-The Villages, FL Pensacola-Ferry Pass-Brent, FL Phoenix-Mesa-Scottsdale, AZ Reno-Sparks, NV San Diego-Carlsbad-San Marcos, CA San Jose-San Francisco-Oakland, CA Sarasota-Bradenton-Venice, FL Tucson, AZ</p> <p><b>PROFESSIONAL and TECHNICAL SERVICES</b> Albuquerque, NM Austin-Round Rock, TX Boston-Worcester-Manchester, MA-NH Chicago-Naperville-Michigan City, IL-IN-WI Colorado Springs, CO Denver-Aurora-Boulder, CO Detroit-Warren-Flint, MI Houston-Baytown-Huntsville, TX Idaho Falls-Blackfoot, ID Los Angeles-Long Beach-Riverside, CA New York-Newark-Bridgeport, NY-NJ-CT-PA Philadelphia-Camden-Vineland, PA-NJ-DE-MD San Diego-Carlsbad-San Marcos, CA San Jose-San Francisco-Oakland, CA Santa Fe-Espanola, NM Washington-Baltimore-Northern Virginia, DC-MD-VA-WV</p> <p><b>MANAGEMENT of COMPANIES and ENTERPRISES</b> Charlotte-Gastonia-Salisbury, NC-SC Cincinnati-Middletown-Wilmington, OH-KY-IN Fayetteville-Springdale-Rogers, AR-MO Minneapolis-St. Paul-St. Cloud, MN-WI Richmond, VA Salt Lake City-Ogden-Clearfield, UT San Jose-San Francisco-Oakland, CA St. Louis-St. Charles-Farmington, MO-IL</p> <p><b>ADMINISTRATIVE and WASTE SERVICES</b> Augusta-Richmond County, GA-SC Jacksonville, FL Las Vegas-Paradise-Pahrump, NV Los Angeles-Long Beach-Riverside, CA Miami-Fort Lauderdale-Miami Beach, FL Orlando-The Villages, FL Phoenix-Mesa-Scottsdale, AZ Sarasota-Bradenton-Venice, FL Tampa-St. Petersburg-Clearwater, FL</p> <p><b>EDUCATIONAL SERVICES</b> Albany-Schenectady-Amsterdam, NY Boston-Worcester-Manchester, MA-NH Burlington-South Burlington, VT Hartford-West Hartford-Willimantic, CT New Orleans-Metairie-Bogalusa, LA New York-Newark-Bridgeport, NY-NJ-CT-PA Philadelphia-Camden-Vineland, PA-NJ-DE-MD Pittsburgh-New Castle, PA Rochester-Batavia-Seneca Falls, NY</p>	<p><b>EDUCATIONAL SERVICES (continued)</b> Scranton-Wilkes-Barre, PA South Bend-Mishawaka, IN-MI St. Louis-St. Charles-Farmington, MO-IL Syracuse-Auburn, NY Washington-Baltimore-Northern Virginia, DC-MD-VA-WV</p> <p><b>HEALTH CARE and SOCIAL ASSISTANCE</b> Albany-Schenectady-Amsterdam, NY Bangor, ME Duluth, MN-WI Erie, PA McAllen-Edinburg-Pharr, TX Monroe-Bastrop, LA Philadelphia-Camden-Vineland, PA-NJ-DE-MD Pittsburgh-New Castle, PA Pueblo, CO Scranton-Wilkes-Barre, PA Springfield, IL</p> <p><b>ARTS, ENTERTAINMENT, and RECREATION</b> Flagstaff, AZ Gulfport-Biloxi-Pascagoula, MS Helena, MT Las Vegas-Paradise-Pahrump, NV Los Angeles-Long Beach-Riverside, CA Missoula, MT Orlando-The Villages, FL Reno-Sparks, NV Santa Fe-Espanola, NM Sarasota-Bradenton-Venice, FL Shreveport-Bossier City-Minden, LA</p> <p><b>ACCOMMODATION and FOOD SERVICES</b> Alpena, MI Flagstaff, AZ Honolulu, HI Las Vegas-Paradise-Pahrump, NV Reno-Sparks, NV</p> <p><b>OTHER SERVICES, EXCEPT PUBLIC ADMIN.</b> Abilene, TX Alpena, MI Amarillo, TX Beaumont-Port Arthur, TX Los Angeles-Long Beach-Riverside, CA Lubbock-Levelland, TX McAllen-Edinburg-Pharr, TX Miami-Fort Lauderdale-Miami Beach, FL Midland-Odessa, TX Mobile-Daphne-Fairhope, AL Monroe-Bastrop, LA Montgomery-Alexander City, AL Redding, CA San Angelo, TX Sarasota-Bradenton-Venice, FL Springfield, IL Wichita Falls, TX</p> <p><b>FEDERAL CIVILIAN GOVERNMENT</b> Anchorage, AK Charleston-North Charleston, SC El Paso, TX Flagstaff, AZ Gulfport-Biloxi-Pascagoula, MS Honolulu, HI Huntsville-Decatur, AL Killeen-Temple-Fort Hood, TX Macon-Warner Robins-Fort Valley, GA Pensacola-Ferry Pass-Brent, FL San Antonio, TX Texarkana, TX-Texarkana, AR Virginia Beach-Norfolk-Newport News, VA-NC Washington-Baltimore-Northern Virginia, DC-MD-VA-WV</p>
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In addition to following an “export-base” approach, Woods & Poole uses exogenous information and assumptions about EA economic growth as well as some individual EA models to make projections. Although almost all EAs are not modeled individually, since most are assumed to fit a normative structure, certain EAs that have interesting features can be modeled separately. Areas that have had rapid growth (such as Houston) or severe economic recessions as in some heavy-industry EAs (such as Cleveland) lend themselves to individual models. These regional economies, at least in part, can be modeled separately. This is a simple “bottom-up” approach that can take into account the idiosyncrasies of individual areas (see [2], [3], [7]).

An example of a “bottom-up” approach is shown with the equations for Cleveland, Houston, Sioux City IA, and Seattle, presented in Table 2. The Cleveland-Akron-Elyria OH-PA Economic Area is defined as Ashland, Ashtabula, Carroll, Columbiana, Crawford, Cuyahoga, Erie, Geauga, Harrison, Holmes, Huron, Lake, Lorain, Mahoning, Medina,

Portage, Richland, Stark, Summit, Trumbull, Tuscarawas, and Wayne counties in Ohio; and Mercer county in Pennsylvania. The Houston-Baytown-Huntsville TX Economic Area is defined as Angelina, Austin, Brazoria, Brazos, Burleson, Calhoun, Chambers, Colorado, DeWitt, Fayette, Fort Bend, Galveston, Goliad, Grimes, Harris, Houston, Jackson, Lavaca, Leon, Liberty, Madison, Matagorda, Montgomery, Nacogdoches, Polk, Robertson, Sabine, San Augustine, San Jacinto, Shelby, Trinity, Victoria, Walker, Waller, Washington, and Wharton counties. The Sioux City-Vermillion IA-NE-SD Economic Area is defined as Monona, O'Brien, Osceola, Plymouth, Sioux, and Woodbury counties in Iowa; Antelope, Boyd, Cedar, Dakota, Dixon, Holt, Knox, Madison, Pierce, Stanton, Thurston, Wayne, and Wheeler counties in Nebraska; and Bon Homme, Clay, Union and Yankton counties in South Dakota. The Seattle-Tacoma-Olympia WA Economic Area is defined as Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Kittitas, Lewis, Mason, Pacific, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom counties.

The following discussion of these equations illustrates some of the logic and assumptions that go into the Woods & Poole model. The historical data used in the model equations is defined and explained in a later section of this chapter. Figure 1 illustrates graphically the degree of fit for several of the equations.

In equation (1) Cleveland manufacturing employment is a function of total U.S. manufacturing employment, the wages of Cleveland manufacturing workers relative to manufacturing workers for the U.S. as a whole, and a lagged dependent variable. All the coefficients are significant at a 95% confidence level, and together clearly explain historical manufacturing in Cleveland. It is interesting to note that the coefficient for relative wages is significant and negative. The ratio of earnings per manufacturing worker in Cleveland to U.S. earnings per manufacturing worker (this is the definition of relative wages) historically has always been greater than one, with a mean of 1.09 for the period 1970 to 2014. Relatively high wages explain, in part, the decline in manufacturing employment in areas such as Cleveland. Faced with relatively high wages, manufacturers have an incentive to increase the productivity of existing plants and save labor, move plants to other areas where wages are lower, or close plants permanently because of competition from other facilities able to produce the same goods more efficiently.

Equation (2) explains Houston manufacturing employment as a function of total U.S. mining earnings, a dummy variable for the years 1982 to 1989 and 2000 to 2014, U.S. manufacturing earnings, and a lagged dependent variable. U.S. mining earnings measures the expansion of domestic mining activity as oil and natural gas prices increased during the 1970s. Historically the largest manufacturing sectors in the Houston Economic Area were the production of equipment used in the exploration and extraction of petroleum resources and the production of refined fuels and chemicals from oil; both of these manufacturing sectors were dependent on the output of the mining sector for the U.S. as a whole. As the price of oil increased during the 1970s, demand for new extraction and exploration increased.

**Table 2. Sample Equations for Economic Areas**

[T-statistics in brackets]

<b>(1) Cleveland manufacturing employment</b>					$\bar{R}^2=0.969$
$CA_t$	=	$0.01043 \times UA_t$	-	$114920 \times CB_{t-2}$	+ $0.8764 \times CA_{t-1}$
		[2.83]		[2.44]	[18.70]
<b>(2) Houston manufacturing employment</b>					$\bar{R}^2=0.919$
$HA_t$	=	$-22112 \times DA8214_t$	+ $0.0627 \times UE_t$	+ $0.3220 \times UB_t$	+ $0.7468 \times HA_{t-1}$
		[6.16]	[4.36]	[5.72]	[13.37]
<b>(3) Houston mining employment</b>					$\bar{R}^2=0.960$
$HB_t$	=	$0.207 \times UB_t$	+ $0.8482 \times HB_{t-1}$		
		[5.45]	[24.26]		
<b>(4) Sioux City IA farm employment</b>					$\bar{R}^2=0.991$
$XA_t$	=	-3734	+ $0.003294 \times UC_t$	+ $0.7099 \times XA_{t-1}$	
		[3.95]	[4.05]	[9.84]	
<b>(5) Sioux City IA non-basic employment</b>					$\bar{R}^2=0.995$
$XB_t$	=	-10800	+ $0.2589 \times XC_t$	+ $0.9877 \times XB_{t-1}$	
		[2.06]	[2.86]	[94.11]	
<b>(6) Seattle manufacturing employment</b>					$\bar{R}^2=0.902$
$SA_t$	=	65807	- $3145 \times UD_t$	- $32730 \times DA7072_t$	+ $0.8105 \times SA_{t-1}$
		[4.04]	[2.72]	[4.50]	[15.28]
<b>(7) Seattle non-basic employment</b>					$\bar{R}^2=0.995$
$SB$	=	-735572	+ $0.7337 \times SC$	- $92582 \times DA7072$	- $27236 \times UD$
		[16.88]	[85.25]	[3.13]	[6.25]

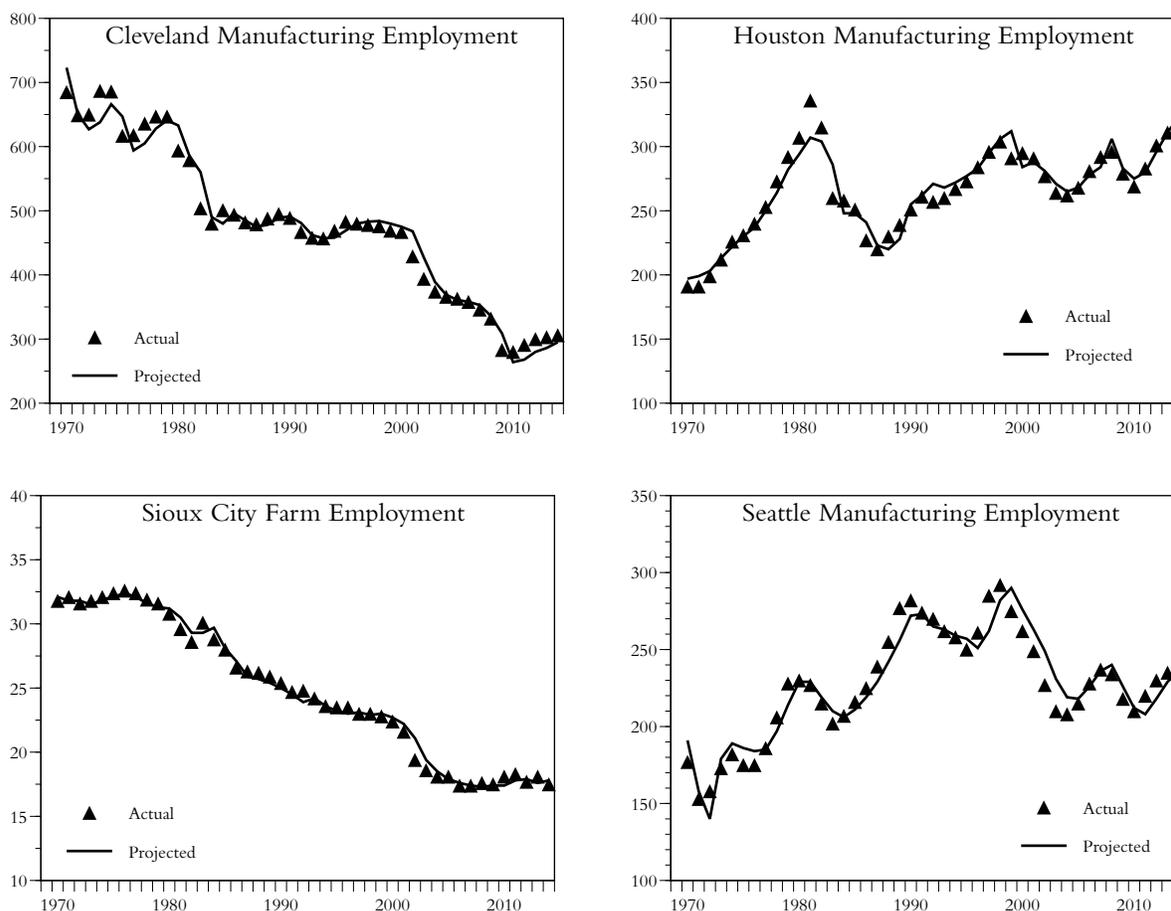
**Variables:**

DA = dummy variable	SA = Seattle manufacturing employment
HA = Houston manufacturing employment	SB = Seattle non-basic employment
HB = Houston mining employment	SC = Seattle population
XA = Sioux City farm employment	UA = U.S. manufacturing employment
XB = Sioux City non-basic employment	UB = U.S. mining earnings
XC = Sioux City basic employment	UC = U.S. farm employment
CA = Cleveland manufacturing employment	UD = U.S. unemployment rate
CB = Cleveland relative manufacturing wages	UE = U.S. manufacturing earnings

Similarly, as prices fell in the 1980s, demand for new exploration waned. Both of these phenomena have affected Houston's manufacturing employment base.

Equation (3) measures Houston mining employment as a function of U.S. mining earnings and the dependent variable lagged one year. Mining employment in Houston, another "basic" sector, depends on total demand for domestic mining output. As the price of oil rises, marginal U.S. reserves, which are relatively more expensive to produce or refine, become competitive, and Houston (and U.S.) production increases. In addition, increased mining revenues allow more capital to be used in the production of oil when prices are high. When prices are low, Houston (and U.S.) production declines and imports generally rise.

In equation (4) Sioux City IA farm employment is a function of U.S. farm employment, the dependent variable lagged one year, and an intercept term. Farming, the largest "basic" sector in Sioux City, has experienced significant employment declines in recent years. Sioux City farm employment is related to U.S. farm employment in this equation because the reasons for job losses in Sioux City are related to nationwide changes in agriculture. In every decade this century, farm employment in the U.S. has declined as farm productivity has increased. The experience of Sioux City is like that of most other farming areas: employment has declined as output has remained steady or increased. The national projections of agricultural productivity growth are important to expected farm employment in Sioux City.

**Figure 1. Employment Projections for Selected Economic Areas, 1970-2014**

**Note:** Employment in thousands of jobs; historical data, 1970-2014, from U.S. Department of Commerce; projected data, 1970-2050, from Woods & Poole Economics, Inc.

Equation (5) explains Sioux “non-basic” employment as a function of Sioux City “basic” employment, the dependent variable lagged one year, and an intercept term. This equation illustrates the relationship between “basic” employment losses and subsequent “non-basic” employment losses. As “basic” employment declined in Sioux City, so did “non-basic” employment.

In equation (6) Seattle manufacturing employment is a function of an intercept term, the U.S. unemployment rate, a dummy variable for 1970 to 1972, and a lagged dependent variable. The largest manufacturing sectors in Seattle — aircraft, lumber, and wood products — are sensitive to U.S. business cycles. U.S. business cycles are measured by the civilian unemployment rate, which has a negative coefficient in equation (6). The negative coefficient of the dummy variable for 1970 to 1972 adjusts the specification of the equation for the severe regional recession during that time.

Equation (7) explains Seattle “non-basic” employment as a function of an intercept term, Seattle population, a dummy variable for the 1970-72 regional recession, and the U.S. unemployment rate. The unemployment rate measures the sensitivity of Seattle employment to U.S. business cycles. “Non-basic” employment is also a function of the population of the region; as the population of Seattle has grown, the demand for “non-basic” sector employment has also increased. It is interesting that population is contemporaneous with the dependent variable, “non-basic” employment, in equation (7). In rapidly growing areas, such as Seattle, population increases have an immediate effect on employment growth in “non-basic” industries. In some very rapidly growing areas of Texas in the late 1970s,

population growth actually preceded “non-basic” employment growth. This is analogous to “boom towns” of the Old West as the economy catches up to the demand created by the new population growth and new businesses locate in the fast-growing area. However, in areas losing population, “non-basic” employment does not decline in step with population losses. Many “non-basic” businesses in a declining area will hang on as long as possible in anticipation of an upturn in the region’s economy. This reflects the local nature of most “non-basic” businesses and the desire of firms to protect their capital investment in a specific site.

### **The Demographic Model**

The demographic portion of the regional model follows a traditional cohort-component analysis based on calculated fertility and mortality in each county or EA. The “demand” for total population is estimated from the economic model: if the demand for labor is forecast to rise for a particular county or EA, then either the labor force participation rate is assumed to rise or population in-migration is assumed to be positive. The inverse is assumed for counties and EAs with projected declines in employment. Therefore, future EA and county migration patterns for population by age, sex, and race are generally based on employment opportunities. Working age individuals and their families are assumed to migrate, at least in part, in response to employment opportunities (see [1], [4], and [6].) For population aged 65 and over and for college or military-aged population, migration patterns over the forecast period are generally based on historical net migration and not economic conditions. The integration of economic and demographic regional analysis is a significant strength of the Woods & Poole approach.

The age, sex, and race distribution of the population is projected by aging the population by single year of age by sex and by race for each year through 2050 based on county or EA specific mortality, fertility, and migration rates estimated from historical data. In the Woods & Poole model, projected net mortality and migration are estimated based on the historical net change in population by age, race, and sex for a particular county or EA. Similarly, projected net births and migration of age zero population by race are estimated based on the historical change in age zero population by race per female population age 15 to 44 by race for a particular county or EA.

The United States population by age, sex, and race projections, 2015–2050, are based on Bureau of the Census population estimates for 1990 through 2014. Woods & Poole forecasts these U.S. estimates with a cohort-component model based on the year to year change in U.S. population by single year of age, race, and sex. Forecast fertility, mortality, and international migration are estimated from Bureau of the Census population projections and are used in the Woods & Poole U.S. population projections. Woods & Poole produces only a “middle” U.S. population forecast — this forecast is similar to the Census “middle” forecast scenario for the U.S. population. The U.S. population by age, sex, and race forecast is the control total for the EA projections. Each EA projection serves as the control totals for the county projections.

*In the Woods & Poole model  
population migration is a function of  
employment opportunities.*

## The Accuracy of the Projections

Unlike other sciences, economics and demographics cannot rely on experimentation to test theories and verify hypotheses. Rather, historical data are analyzed and theories are developed that explain the historical data. The resulting models and assumptions are then used to make a projection. Woods & Poole projections, like all economic and demographic projections, utilize this approach: analyzing historical data to make estimates of future data. There are, of course, inherent limitations to projections, and the Woods & Poole projections should never be interpreted as a prediction of the future; future data may differ significantly from Woods & Poole projections and Woods & Poole does not guarantee the accuracy of the projections. In all Woods & Poole publications, the word “forecast” is used as a synonym for “projection” and refers to Woods & Poole estimated data for any year from 2015 to 2050; in Woods & Poole publications “projections”, or “forecasts”, both mean estimates of future data (2015 to 2050).

One key limitation to all projections, and Woods & Poole projections in particular, is that the future is never known with any certainty. The model and assumptions on which the projections are based may not accurately reflect future events. In addition, there is always the possibility of an unanticipated shock to the economy, or of some other event that was not foreseen from historical data. For instance, a local government may enact a new industrial policy that has an unexpected, beneficial effect on employment growth. Or an abrupt economic change, although anticipated, may occur with much greater intensity or in a shorter time period than expected. For example, the projection may assume an increase in the price of a commodity, such as oil, over a five-year period, but an embargo may raise the price to that level in only one year. In addition, the projections may not be accurate because historical data are revised; or because the projection models and assumptions do not accurately reflect demographic or economic phenomena; or because the projections contain errors; or because the smooth growth path of the long-term projections inaccurately reflects important variance in economic or demographic growth for particular regions; or because assumptions about national or regional growth, upon which the projections are based, turn out to be incorrect. In addition, there are many other types of economic and demographic events that could create outcomes far different from Woods & Poole’s projections.

Another limitation results from doing forecasts for small geographic areas for small data series. Statistically, models are more reliable the larger the area and/or the series being studied. Small area forecasts, such as county population for White men age 84, are subject to more error because of the small sample size. This error can be reduced, although never eliminated, by constraining the small area forecasts to the forecast totals for a larger area or series; this is the method used by Woods & Poole.

One way to evaluate the effectiveness of a projection method is to compare previous projections to current data; although such a comparison does not indicate the potential accuracy of current or future projections, it can be useful to measure the magnitude of error of previous projections.

*Comparing previous Woods & Poole projections to historical data does not give any indication of the accuracy of current or future projections.*

**Table 3. Percent Errors of Previous Woods & Poole Projections**

		Employment			Personal Income			Population		
		AAPE	APE	SD	AAPE	APE	SD	AAPE	APE	SD
<b>United States</b>										
1-year projection	(n=28)	1.3%	-0.1%	2.3%	4.2%	-4.1%	2.4%	0.6%	-0.3%	0.9%
2-year projection	(n=28)	1.6	-0.4	2.5	4.7	-4.5	2.7	0.8	-0.3	1.0
3-year projection	(n=27)	2.5	-0.4	3.3	5.1	-4.6	3.3	1.0	-0.3	1.2
4-year projection	(n=26)	3.3	-0.4	4.0	5.3	-4.2	4.1	1.1	-0.4	1.4
5-year projection	(n=25)	3.6	-0.6	4.6	5.4	-4.1	4.6	1.3	-0.5	1.5
6-year projection	(n=24)	4.0	-0.7	5.0	5.5	-3.8	5.1	1.5	-0.6	1.6
7-year projection	(n=23)	4.4	-0.7	5.4	5.6	-3.0	5.6	1.6	-0.8	1.8
8-year projection	(n=22)	4.7	-0.8	5.7	5.1	-2.5	5.4	1.8	-1.0	1.8
9-year projection	(n=21)	5.1	-1.0	5.9	4.4	-2.1	4.9	1.9	-1.2	1.9
10-year projection	(n=20)	5.5	-1.5	6.0	4.1	-1.3	4.9	2.0	-1.5	1.8
<b>States</b>										
1-year projection	(n=1428)	1.9%	0.0%	2.8%	4.6%	-4.2%	3.5%	1.0%	-0.3%	1.4%
2-year projection	(n=1428)	2.4	-0.3	3.3	5.2	-4.7	4.0	1.3	-0.3	1.8
3-year projection	(n=1377)	3.4	-0.2	4.4	5.7	-4.8	4.9	1.7	-0.3	2.4
4-year projection	(n=1326)	4.3	-0.3	5.4	6.2	-4.4	6.1	2.1	-0.3	2.9
5-year projection	(n=1275)	5.0	-0.5	6.3	6.8	-4.2	7.2	2.4	-0.4	3.4
6-year projection	(n=1224)	5.7	-0.6	7.1	7.4	-3.9	8.2	2.8	-0.5	4.0
7-year projection	(n=1173)	6.3	-0.7	7.8	7.7	-3.2	9.0	3.1	-0.6	4.5
8-year projection	(n=1122)	6.9	-0.9	8.3	7.7	-2.7	9.4	3.4	-0.7	5.0
9-year projection	(n=1071)	7.3	-1.2	8.8	7.6	-2.4	9.8	3.7	-0.9	5.3
10-year projection	(n=1020)	7.6	-1.7	9.2	7.7	-1.7	10.4	4.0	-1.2	5.7
<b>Metropolitan Areas</b>										
1-year projection	(n=10668)	2.3%	-0.1%	3.5%	5.3%	-4.3%	5.2%	1.3%	-0.4%	2.0%
2-year projection	(n=10668)	3.1	-0.4	4.4	6.0	-4.8	6.0	1.7	-0.4	2.5
3-year projection	(n=10287)	4.2	-0.4	5.6	6.6	-4.8	6.8	2.2	-0.4	3.2
4-year projection	(n=9906)	5.2	-0.4	6.9	7.1	-4.3	7.9	2.8	-0.6	3.9
5-year projection	(n=9525)	6.0	-0.6	7.9	7.6	-4.1	9.0	3.3	-0.7	4.6
6-year projection	(n=9144)	6.8	-0.8	8.8	8.1	-3.8	9.9	3.8	-0.9	5.3
7-year projection	(n=8763)	7.6	-0.9	9.7	8.5	-3.0	10.7	4.3	-1.1	6.1
8-year projection	(n=8382)	8.3	-1.1	10.5	8.8	-2.4	11.3	4.8	-1.4	6.8
9-year projection	(n=8001)	8.9	-1.5	11.2	8.9	-1.9	11.9	5.3	-1.6	7.3
10-year projection	(n=7620)	9.5	-2.0	11.8	9.2	-1.1	12.5	5.7	-1.9	7.9
<b>Counties</b>										
1-year projection	(n=86548)	4.0%	0.2%	6.6%	7.2%	-3.4%	10.1%	1.9%	0.0%	3.1%
2-year projection	(n=86548)	5.1	0.2	7.8	8.0	-4.0	10.4	2.5	0.2	3.9
3-year projection	(n=83457)	6.4	0.5	9.3	8.6	-3.9	11.2	3.3	0.4	5.0
4-year projection	(n=80366)	7.6	0.6	10.6	9.3	-3.2	12.6	4.0	0.5	6.0
5-year projection	(n=77275)	8.6	0.7	11.9	10.1	-2.7	13.9	4.7	0.5	7.1
6-year projection	(n=74184)	9.7	0.8	13.2	10.7	-2.1	15.1	5.4	0.6	8.1
7-year projection	(n=71093)	10.7	0.9	14.4	11.4	-1.1	16.4	6.2	0.7	9.2
8-year projection	(n=69002)	11.6	0.9	15.6	12.2	-0.1	17.9	6.9	0.7	10.3
9-year projection	(n=64911)	12.5	0.7	16.8	12.9	1.0	19.2	7.5	0.7	11.2
10-year projection	(n=61820)	13.2	0.4	17.8	13.7	1.9	20.6	8.1	0.6	12.2

**Note:** This table shows the Average Absolute Percent Error (AAPE), the Average Percent Error (APE), and the Standard Deviation of the APE (SD) for Woods & Poole's 1-year to 10-year projections of employment, personal income, and population for the U.S., states, Metropolitan Areas (MSAs), and counties. This table represents all Woods & Poole projections done since 1984. AAPEs are the average absolute value of the percent difference of projected data to actual historical data as defined in the 2016 Woods & Poole model; APEs are the average value of the percent difference of projected data to actual historical data; and the SDs are for the APEs. The data in this table cover all Woods & Poole projections. The AAPEs and APEs shown for each projection period are the average of all Woods & Poole projections for that projection period: there were twenty-eight 1-year projections (therefore, the 1-year projection AAPE and APE for county employment were calculated based on n=28x3091=86,548 observations); twenty-eight 2-year projections; twenty-seven 3-year projections; twenty-six 4-year projections; twenty-five 5-year projections; twenty-four 6-year projections; twenty-three 7-year projections; twenty-two 8-year projections; twenty-one 9-year projections; and twenty 10-year projections. AAPEs and APEs are based on geographic area definitions from the 2016 Woods & Poole model. AAPEs and APEs are calculated based on historical data as defined in the 2016 Woods & Poole model. AAPEs and APEs for employment are based on total employment by place of work (numbers of jobs). AAPEs and APEs for total personal income are based on current dollar personal income, unadjusted for inflation. AAPEs and APEs for population are based on residential population. The percent errors in this table are not an indicator of the accuracy of current or future Woods & Poole projections.

Table 3 illustrates how well Woods & Poole projected employment, population, and personal income over a 1-year to 10-year forecast horizon for various geographies.

One statistic used to evaluate the projections is the Average Absolute Percent Error (AAPE), which is the average of the absolute values of the percent difference from the projected data to the actual data. The lower the AAPE, the more accurate the projection (e.g., Woods & Poole's 3-year population projections have been accurate within  $\pm 1.7\%$  for states and  $\pm 3.3\%$  for counties). All Woods & Poole projections are evaluated for each projection horizon; thus, the AAPE for 1-year projections are calculated based on all Woods & Poole one-year projections (there have been twenty-eight 1-year projections and twenty 10-year projections). Changes to historical data are not adjusted when calculating the AAPEs. Thus, if a projection was made using historical data that were subsequently revised, the AAPE are

calculated based on the revised data, probably inflating the AAPE, particularly for short-term projections. For example, projections of 1993 employment done in 1984 were made using a different definition of employment; in the 1984 forecast, U.S. total employment in 1980 was estimated to be 106.4 million jobs. However, since then, the definition of employment has been revised several times by the Department of Commerce and now U.S. total employment in 1980 is estimated to be 114.0 million jobs; therefore, the AAPEs are calculated based on revised data so they incorporate not only forecast error but definitional changes as well, probably inflating the AAPEs.

The longer the forecast horizon, the larger the AAPE. Thus for all Metropolitan Statistical Areas (MSAs), 1-year population projections have been accurate within  $\pm 1.3\%$  compared to  $\pm 5.7\%$  for the 10-year projection. In addition, population projections, the most stable series and the data least subject to historical revision, have the lowest AAPEs.

Personal income has the highest AAPE for all geographies because, in addition to projecting the level of personal income, there is an implicit price inflation forecast built into the income projections. In the early 1980s after a period of rapid inflation, the Woods & Poole personal income projections had relatively high AAPEs (the 10-year personal income forecast had an AAPE of  $\pm 13.7\%$  for counties). As inflation mitigated in the 1980s, the AAPEs for personal income dropped sharply; the 5-year AAPE dropped to  $\pm 10.1\%$  for counties.

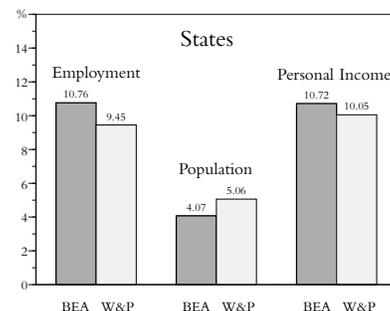
Generally, the smaller the geography, the larger the AAPEs for all variables. For all counties, the AAPE for 8-year population projections was  $\pm 6.9\%$ . However, for counties with population under 50,000 in 2010, the 8-year projection AAPE was  $\pm 7.3\%$ . Similarly, for larger geographies, the AAPEs are usually lower. The AAPE for counties with 2010 population between 50,000 and 100,000 was  $\pm 6.1\%$ ; for counties with population over 100,000 the AAPE was  $\pm 5.7\%$ . AAPEs for smaller variables tend to be much higher than AAPEs for larger variables. Thus, the AAPE for retail trade employment would probably be much higher than the AAPE for total employment, conditional on geographic area size and forecast horizon.

The accuracy of Woods & Poole's projections has been comparable to the accuracy of other regional forecasting programs. Figure 2 compares Woods & Poole's projections to Department of Commerce Bureau of Economic Analysis (BEA) and Census Bureau projections over comparable forecast horizons. The Woods & Poole 8-year forecast AAPEs for states for the year 1990 for employment and personal income were slightly below the BEA AAPEs, and slightly above the BEA for population. Similarly, the Woods & Poole 1-year to 5-year population projections AAPE for states were slightly below the Census AAPEs.

Other statistics are sometimes used to evaluate forecasts. The AAPE is most commonly used as a measure of accuracy for projections when the units being compared are of different sizes (e.g., county population, the base of which can range from 100 for Loving, TX to 8 million for Los Angeles, CA). It has the advantage of being able to compare units of different sizes equally. In some models, the Root Mean Squared Error (RMSE) is used to measure accuracy. The RMSE has the disadvantage of giving modest errors for large units a greater weight than modest errors for small units (i.e., an

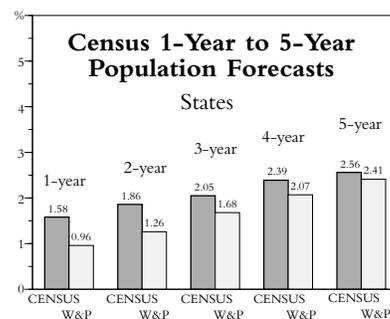
**Figure 2. Woods & Poole AAPEs Compared to BEA and Census**

**BEA 8-Year Forecast for 1990**



**8-Year State Forecast for 1990**

<b>Employment AAPE</b>	
BEA	10.76%
Woods & Poole	9.45%
<b>Population AAPE</b>	
BEA	4.07%
Woods & Poole	5.06%
<b>Personal Income AAPE</b>	
BEA	10.72%
Woods & Poole	10.05%



**State Population AAPEs**

<b>1-Year forecast</b>	
Census	1.58%
Woods & Poole	0.96%
<b>2-Year forecast</b>	
Census	1.86%
Woods & Poole	1.26%
<b>3-Year forecast</b>	
Census	2.05%
Woods & Poole	1.68%
<b>4-Year forecast</b>	
Census	2.39%
Woods & Poole	2.07%
<b>5-Year forecast</b>	
Census	2.56%
Woods & Poole	2.41%

**Note:** BEA 8-year forecast AAPEs for 1990 were calculated from data in 1985 *OBERS BEA Regional Projections*, Vol. 1; Woods & Poole 8-year forecast AAPEs for 1990 were calculated from the 1986 Regional Model; Census forecast AAPEs were calculated from all 1-year through 5-year projections contained in *Projections of the Population of States by Age, Sex, and Race: 1988 to 2010* (CPR, P-25, No. 1017) and *Projections of the Population of States by Age, Sex, and Race: 1989 to 2010* (CPR, P-25, No. 1053).

error of 10,000 on a base of 2 million is given greater weight than an error of 1,000 on a base of 20,000, just the opposite of the AAPE).

Another useful statistic in evaluating forecasts is the simple average of all the percent errors: the Average Percent Error (APE). This measures the bias of the forecast. In Woods & Poole projections, employment for counties have usually had an upward bias (the APE has been positive). The APE for all 10-year Woods & Poole county employment projections is +0.4% with a standard deviation of 17.8% (see Table 3). Similarly, the county population projections have always had an upward bias (the APE has been positive). The APE for all 10-year Woods & Poole county population projections is +0.6% with a standard deviation of 12.2%.

### **Historical Data**

Much of the historical economic data in the Woods & Poole regional databases are obtained from the Bureau of Economic Analysis (BEA) of the Department of Commerce. The historical data from the BEA include county-level data for each year 1969 through 2014 for employment and earnings by one-digit Standard Industrial Classification (SIC) code (1969 to 2000) and by one-digit North American Industry Classification System (NAICS) code (2001 to 2014), and personal income by source of income. Other sources of data include the 1970, 1980, 1990, 2000, and 2010 Censuses and post-Censal reports for population and household data, and the quinquennial Census of Retail Trade for retail sales data. Woods & Poole generally accepts the government data as given unless indicated otherwise in this chapter. The discussion which follows, of the historical data used by Woods & Poole, is not intended to be a complete explanation of the historical data; the user should consult the government sources of the historical data for a complete explanation. Some of the sources of government data used by Woods & Poole have technical explanations of how the historical data are collected, how the data can be used, and limitations to the data; the documentation may contain important information on the applicability of the data for particular applications and should be reviewed by users of the historical data; the documentation can be obtained from the U.S. Dept. of Commerce, the Government Printing Office or many public libraries. All data for the years 2015–2050 are projected by Woods & Poole.

Historical data are subject to revision from time to time. Historical employment and income data from the Bureau of Economic Analysis are revised on a regular basis. For example, historical data released by the Bureau of Economic Analysis in 1984 showed total employment for the United States in 1980 to be 106.4 million jobs; the current estimate of 1980 U.S. total employment is 114.0 million jobs. When using the historical data, it is important to use the current revision and not combine this data with previous versions since there may be definitional changes in the data.

*Historical data used by Woods & Poole are subject to significant revisions.*

*Gross Domestic Product by State (formerly Gross State Product or GSP) is called Gross Regional Product (GRP) in the Woods & Poole database.*

### **Gross Domestic Product by State**

Gross Domestic Product by State, formerly Gross State Product (GSP), is called Gross Regional Product (GRP) in the Woods & Poole database. GRP data are historical for the United States total, regions, and states for the years 1969–2013 from the Bureau of Economic Analysis Gross Domestic Product

by State series. All county, and metropolitan area, historical GRP data, 1969–2013, are estimated by Woods & Poole by allocating state GRP in a particular year to counties within the state based on the proportion of total state earnings of employees originating in a particular county. County GRP estimates are constrained to state totals for the years 1969–2013. All GRP data are establishment based.

## Employment

The employment data in the Woods & Poole database are a complete measure of the number of full- and part-time jobs by place of work. Historical data, 1969–2014, are from the U.S. Department of Commerce, Bureau of Economic Analysis. The employment data include wage and salary workers, proprietors, private household employees, and miscellaneous workers. Wage and salary employment data are based on an establishment survey in which employers are asked the number of full- and part-time workers at a given establishment. Because part-time workers are included, a person holding two part-time jobs would be counted twice. Also, since the wage and salary employment data are based on an establishment survey, jobs are counted by place of work and not place of residence of the worker; thus, a job in the New York Metropolitan Area is counted in the New York Metropolitan Area regardless of where the worker lives.

Data on proprietors include farm and non-farm proprietors by sector. Proprietors include not only those people who devote the majority of their time to their proprietorship, but people who devote any time at all to a proprietorship. Thus, a person who has a full-time wage and salary job and on nights and weekends runs a small business legally defined as a proprietorship would be counted twice. The employment data therefore include full- and part-time proprietors.

Private household employment data include persons employed by a household on the premises, such as full-time baby-sitters, housekeepers, gardeners, and butlers. Miscellaneous employment data include judges and all elected officials, persons working only on commission in sectors such as real estate and insurance, students employed by the colleges or universities in which they are enrolled, and unincorporated subcontractors in sectors such as construction.

The employment data used by Woods & Poole comprise the most complete definition of the number of jobs by county. Woods & Poole data may be higher than that from other sources because they measure more kinds of employment. There are three other commonly used government sources for employment data: the Bureau of Labor Statistics (BLS), the Bureau of the Census, and the National Income and Product Accounts (NIPA). These sources of employment data differ from the data used by Woods & Poole. **The BLS establishment data** are generally much lower than the Woods & Poole data because agricultural workers, the military, proprietors, households, and miscellaneous employment are not included; the exclusion of proprietors from the BLS data are the most significant difference. **Data from the Census** (and some survey data from the BLS) are based on employment by place of residence and differ fundamentally in concept from the Woods & Poole employment data by place of work; Census employment data are

*Employment data are historical for the years 1969–2014 and projected for the years 2015–2050.*

*Employment data by NAICS industries are estimated for the years 1969–2000.*

*Employment data in the Woods & Poole database are usually much higher than BLS employment data because Woods & Poole includes proprietors and military employment.*

*Historical data in the Woods & Poole database are revised each year.*

generally lower than Woods & Poole data, but not always. Since Census data are based on a household survey, persons holding two jobs would be counted only once, and, therefore, the data would be lower than Woods & Poole. However, Census survey data for counties that have a large number of commuters and relatively few jobs within the county could yield employment data higher than Woods & Poole. Employment data in the *National Income and Product Accounts* are close to Woods & Poole data, except that part-time proprietors and certain miscellaneous employees are excluded; therefore, these data are usually lower.

### **Employment by Sector**

The employment data are by two-digit North American Industry Classification System (NAICS) industry. The two-digit industries are defined in the 2002 North American Industry Classification System Manual. The employment data in the 2016 Woods & Poole database are no longer based on the Standard Industrial Classification (SIC) system definitions. For the years 1969–2000 BEA provided employment industry data by SIC rather than by NAICS; Woods & Poole has estimated the NAICS industry data for 1969–2000 from the BEA SIC 1969–2000 employment industry data and the NAICS employment industry data for the years 2001–2014.

*Government employees are classified in Federal civilian, Federal military, or state and local government employment, regardless of the NAICS classification of the establishment in which they work.*

As a rule, employment is classified in a given industry depending on the primary activity of the establishment. For example, employees of a large oil company are classified in many different sectors depending on the specific establishment in which they worked, even though the company as a whole would be considered a mining company: employees at a refinery are in manufacturing; employees at the company headquarters are in management; pipeline operators are in transportation; and oil field workers are in mining. If a given establishment is engaged in activities in different sectors, all employees are classified according to the primary activity of the establishment regardless of their actual occupations; thus, a secretary for a trucking company is a transportation worker and an accountant at a small plumbing company is a construction worker. The main exception to this rule is the classification of government workers in the Woods & Poole database: all government employees are classified in Federal civilian, Federal military, or state and local government employment, regardless of the usual classification of the establishment in which they work. Definitions for each sector, based on NAICS industries, in the Woods & Poole database are as follows:

**Farming** includes establishments such as farms, orchards, greenhouses, and nurseries primarily engaged in the production of crops, plants, vines, trees (excluding forestry operations), and specialties such as Christmas trees, sod, bulbs, and flower seed. It also includes establishments such as ranches, dairies, feedlots, egg production facilities, and poultry hatcheries primarily engaged in the keeping, grazing, or feeding of cattle, hogs, sheep, goats, poultry of all kinds, and special animals such as horses, bees, pets, fish farming, and animals raised for fur.

*"Other" includes jobs of U.S. residents working for international organizations.*

**Forestry, fishing, related activities, and other** includes establishments primarily engaged in harvesting timber, and harvesting fish and other animals from their natural habitats. The sector also includes agricultural support establishments that perform one or more activities associated with farm

operation, such as soil preparation, planting, harvesting, and management, on a contract or fee basis. Excluded are establishments primarily engaged in agricultural research and establishments primarily engaged in administering programs for regulating and conserving land, mineral, wildlife, and forest use. Other consists of jobs held by U.S. residents who are employed by international organizations and by foreign embassies and consulates in the United States.

**Mining** includes establishments that extract naturally occurring mineral solids (e.g. coal and ores), liquid minerals (e.g. crude petroleum), and gases (e.g. natural gas.) Mining includes quarrying, well operations, beneficiating (e.g., crushing, screening, washing, and flotation), and other preparation customarily performed at the mine site, or as a part of mining activity.

**Utilities** includes establishments engaged in the provision of electric power, natural gas, steam supply, water supply, and sewage removal. Utilities include electric power generation, electric power transmission, electric power distribution, natural gas distribution, steam supply provision, steam supply distribution, water treatment, water distribution, sewage collection, sewage treatment, and disposal of waste through sewer systems and sewage treatment facilities. Excluded from this sector are establishments primarily engaged in waste management services that collect, treat, and dispose of waste materials but do not use sewer systems or sewage treatment facilities. Also excluded from this sector are federal or state or local government operated establishments.

#### ***Utilities employment.***

**Construction** includes establishments primarily engaged in building new structures and roads, alterations, additions, reconstruction, installations, and repairs. It includes general contractors engaged in building residential and nonresidential structures; contractors engaged in heavy construction, such as bridges, roads, tunnels, and pipelines; and special trade contracting, such as plumbing, electrical work, masonry, and carpentry. Construction includes establishments primarily engaged in the preparation of sites for new construction, including demolition, and establishments primarily engaged in subdividing land for sale as building sites. Construction work done may include new work, additions, alterations, or maintenance and repairs.

**Manufacturing** includes establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. The assembling of component parts of manufactured products is considered manufacturing, except in cases where the component parts are associated with structures. Manufacturing establishments can be plants, factories, or mills as well as bakeries, candy stores, and custom tailors. Manufacturing establishments may either process materials or may contract with other establishments to process their materials for them. Broadly defined, manufacturing industries include the following: food processing, such as canning, baking, meat processing, and beverages; tobacco products; textile mill products, such as fabric, carpets and rugs; apparel; wood products, including logging, sawmills, prefabricated homes, and mobile homes; furniture; paper; printing; chemicals, such as plastics, paints, and drugs; petroleum refining; rubber and plastics; leather products; stone, clay, and glass; primary metals, such as steel, copper, aluminum, and including finished products such as wire, beams, and pipe; fabricated metals, such as

#### ***Manufacturing employment.***

cans, sheet metal, cutlery, and ordnance; industrial machinery, including computers, office equipment, and engines; electronics and electrical equipment; transportation equipment, such as cars, trucks, ships, and airplanes; instruments; and miscellaneous industries, such as jewelry, musical instruments, and toys. Excluded from manufacturing is publishing of printed materials.

**Wholesale trade** includes establishments engaged in wholesaling merchandise, generally without transformation, and rendering services incidental to the sale of merchandise. The merchandise described in this sector includes the outputs of agriculture, mining, manufacturing, and certain information industries, such as publishing. Wholesale establishments are primarily engaged in selling merchandise to retailers; or to industrial, commercial, institutional, farm, construction contractors; or to professional business users; or to other wholesalers or brokers. The merchandise sold by wholesalers includes all goods used by institutions, such as schools and hospitals, as well as virtually all goods sold at the retail level. Wholesalers can be merchant wholesalers who purchase goods from manufacturers or other wholesalers and sell them; sales branches of manufacturing, mining, or farm companies engaged in marketing the products of the company to retail establishments; or agents, merchandise or commodity brokers, and commission merchants.

**Retail trade** includes establishments engaged in retailing merchandise, generally without transformation, and rendering services incidental to the sale of merchandise. Retail trade includes store retailers such as motor vehicle and parts dealers including automobile, motorcycle and boat dealers as well as tire and automobile parts stores; furniture and home furnishing stores; electronics and appliance stores; food and beverage stores, including supermarkets, convenience stores, butchers, and bakeries; health and personal care stores such as pharmacies and optical goods stores; gasoline stations; clothing and clothing accessory stores; sporting goods, hobby, book and music stores; department stores; and miscellaneous establishments, including office supply stores, mobile home dealers, thrift shops, florists, tobacco stores, and pet shops. Retail trade also includes nonstore retailers such as Internet and catalog sellers, as well as home delivery establishments such as heating oil dealers. Retail trade excludes eating and drinking places, including restaurants, bars, and take-out stands.

#### ***Retail trade employment.***

#### ***Transportation and warehousing employment.***

**Transportation and warehousing** includes industries providing transportation of passengers and cargo and warehousing and storage for goods. Establishments in these industries use transportation equipment or transportation related facilities as a productive asset. Transportation includes railroads, highway passenger transportation, trucking, shipping, air transportation, pipelines, and transportation services. Transportation also includes private postal services, and courier services but excludes the U.S. Postal Service. Warehousing includes refrigerated storage and grain elevators.

**Information** includes establishments engaged in producing and distributing information and cultural products; providing the means to transmit or distribute these products as well as data or communications; and processing data. The main components of this sector are the publishing industries, including software publishing, and both traditional publishing and

publishing exclusively on the Internet; the motion picture and sound recording industries; movie theaters; the broadcasting industries, including traditional broadcasting and those broadcasting exclusively over the Internet; the telecommunications industries; the industries known as Internet service providers and Web search portals; data processing industries; and the information services industries.

**Finance and insurance** includes establishments primarily either engaged in or facilitating financial transactions (e.g. transactions involving the creation, liquidation, or change in ownership of financial assets.) Establishments include depository institutions, such as commercial banks, credit unions savings and loans, and foreign banks; credit institutions; credit card processing; investment companies; brokers and dealers in securities and commodity contracts; security and commodity exchanges; carriers of all types of insurance; insurance agents and insurance brokers. Also included are central banks and monetary authorities charged with monetary control.

**Real estate and rental and leasing** includes establishments primarily engaged in renting, leasing, or otherwise allowing the use of tangible or intangible assets, and establishments providing related services. Real estate includes real estate leasing establishments, real estate agencies and brokerages, property management establishments, appraisals establishments, and escrow agencies. Rental and leasing includes car and truck rental, consumer goods rentals such as video stores and and formal wear rental stores, and commercial equipment renting and leasing construction, transportation, office and farm equipment. Also included are establishments that lease nonfinancial and noncopyrighted intangible assets such are patents and trademarks.

**Real estate and rental and leasing.**

**Professional and technical services** includes establishments that specialize in performing professional, scientific, and technical activities for others. These activities include legal advice and representation; accounting, bookkeeping, and payroll services; architectural, engineering, and specialized design services; computer services; consulting services; research services; advertising services; photographic services; translation and interpretation services; veterinary services; and other professional, scientific, and technical services. Excluded are establishments primarily engaged in providing office administrative services, such as financial planning, billing and recordkeeping, personnel, and physical distribution and logistics.

**Professional and technical services.**

**Management of companies and enterprises** includes bank holding establishments, other holding establishments, corporate management establishments as well as regional and subsidiary management establishments. Company or enterprise headquarters are included.

**Administrative and waste management** includes establishments engaged in office administration, hiring and placing of personnel, document preparation and similar clerical services, solicitation, collection, security and surveillance services, cleaning, and waste disposal services. Among many other establishments administrative includes call centers, tele-marketers, janitorial services, armored cars, temporary employment agencies, locksmiths, landscaping, and travel agencies. Waste management includes, among other establishments, solid waste collections and disposal, landfill operations and septic tank maintenance. Excluded from administrative and waste management are establishments involved in administering, overseeing, and

**Administrative and waste management.**

managing other establishments of the company or enterprise. Also excluded are government establishments engaged in administering, overseeing, and managing governmental programs.

***Public education employment is counted in state and local government.***

***Educational services*** includes private elementary schools, junior colleges, colleges, universities, and professional schools. Also included are trade and vocational schools, business and secretarial schools, computer training services, language schools, fine arts training, sports training establishments, driving schools, flight schools and establishments that provide test preparation and tutoring. Educational services may be provided imparted in educational institutions, the workplace, or the home through correspondence, television, or other means. Public schools, including colleges and universities, are excluded from educational services.

***Local public hospitals are included in state and local government. Department of Veterans Affairs hospitals are included in Federal civilian government.***

***Health care and social assistance*** includes establishments providing health care and social assistance for individuals. Health care establishments include ambulatory care services (e.g. physician offices, dentists, specialists, HMOs, dialysis centers, blood banks, ambulance services), hospitals, and nursing and residential care facilities. Social assistance establishments include individual and family services (e.g. adoption agencies and youth centers) and community services such as food banks and homeless shelters. Excluded from this sector are aerobic classes and nonmedical diet and weight reducing centers. Also excluded are public hospitals and clinics.

***Arts, entertainment, and recreation*** includes establishments that are involved in producing, promoting, or participating in live performances, events, or exhibits intended for public viewing; establishments that preserve and exhibit objects and sites of historical, cultural, or educational interest; and establishments that operate facilities or provide services that enable patrons to participate in recreational activities or pursue amusement, hobby, and leisure time interests. The sector includes establishments engaged in the performing arts, sporting events, museums, zoos, amusement and theme parks, golf courses, marinas, casinos, and gambling establishments. Excluded are movie theaters.

***Accommodation and food services*** includes hotels, motels, casino hotels, bed and breakfasts, campgrounds and recreational vehicle parks and other lodging places as well as eating and drinking places, including restaurants, bars, and take-out stands. Also included are caterers and food service contractors.

***Other services, except public administration*** includes churches and establishments engaged in equipment and machinery repairing, promoting or administering religious activities, grantmaking, advocacy, and establishments providing drycleaning and laundry services, personal care services, death care services, pet care services, photofinishing services, temporary parking services, and dating services. Private households that engage in employing workers on or about the premises in activities primarily concerned with the operation of the household are included in this sector.

***Federal civilian includes all Federal workers regardless of their establishment classification.***

***Federal civilian*** includes all Federal government workers regardless of their establishment classification. Federal civilian employment includes executive offices and legislative bodies; courts; public order and safety; correctional institutions; taxation; administration and delivery of human resource programs, such as health, education, and public assistance services;

housing and urban development programs; environmental programs; regulators, including air traffic controllers and public service commissions; the U.S. Postal Service; and other Federal government agencies.

**Federal military** includes Air Force, Army, Coast Guard, Marine Corps, Merchant Marine, National Guard, and Navy. Personnel deployed abroad are counted in their home base or port. Reserves who receive regular training are included. Civilians working on a military base are classified in the sector appropriate to their occupation.

**State and local government** is defined the same as Federal civilian except that the activities are run by state and local governments. At the local level, this includes all public schools as well as police and fire departments; at the state level, it includes all public junior colleges, colleges, and universities.

## Earnings

Earnings of employees are the sum of wages and salaries, other labor income, and proprietors' income. Earnings also include personal contributions for social insurance, but does not include residence adjustment; each of these components is defined in the discussion of total personal income that follows. As with employment, the historical earnings data (1969-2014) are from the U.S. Department of Commerce, Bureau of Economic Analysis. Also, like employment, earnings data are by place of work, so that earnings of an employee who works in one county but resides in another are counted in the county where the job is.

The two-digit NAICS sectors for earnings are defined the same as for employment in the preceding section. The two-digit industries are defined in the 2002 North American Industry Classification System Manual. As with employment, earnings data in the 2016 Woods & Poole database are no longer based on the Standard Industrial Classification (SIC) system definitions. For the years 1969-2000 BEA provided earnings industry data by SIC rather than by NAICS; Woods & Poole has estimated the NAICS industry data for 1969-2000 from the BEA SIC 1969-2000 earnings industry data and the NAICS earnings industry data for the years 2001-2014.

Earnings relates to workers' compensation and is not a measure of company earnings or profits. Earnings-by-sector data are sometimes used as a surrogate variable for output by sector at the regional level where output data are not generally available.

## Personal Income

The historical data (1969-2014) for total personal income are from the U.S. Department of Commerce, Bureau of Economic Analysis. Total personal income is the income received by persons from all sources, that is, from participation in production, from both government and business transfer payments, and from government interest, which is treated like a transfer payment. Persons consist of individuals, nonprofit institutions serving individuals, private uninsured welfare funds, and private trust funds. Personal income is the sum of wages and salaries, other labor income, proprietors' income, rental income of persons, dividend income, personal interest income,

*Earnings data are historical for the years 1969-2014 and projected for the years 2015-2050. Earnings data by NAICS industries are estimated for the years 1969-2000.*

*Personal income data are historical for the years 1969-2014 and projected for the years 2015-2050.*

and transfer payments less personal contributions for social insurance. Definitions for the sources of personal income follow:

**Wages and salaries** consists of monetary remuneration of employees, including compensation of corporate officers; commissions, tips, and bonuses; and receipts-in-kind that represent income to the recipients.

**Other labor income.**

**Other labor income** consists of employer payments to private and government employee retirement plans, private group health and life insurance plans, privately administered workers' compensation plans, and supplemental unemployment benefit plans.

**Proprietors' income** includes inventory valuation and capital consumption adjustments and is defined as the income, including income-in-kind, of proprietorships and partnerships, and of tax-exempt cooperatives. Inventory valuation adjustment is the difference between the cost of inventory withdrawals as valued in determining profits before tax, and the cost of withdrawals valued at current replacement costs. Capital consumption adjustment is depreciation and damage to a proprietor's fixed capital less the value of the current services of the fixed capital assets owned by and used by the proprietor.

**Dividends, interest, and rent.**

**Dividend income** consists of the payments in cash or other assets, excluding the corporation's own stock, made by corporations located in the United States or abroad to persons who are U.S. residents; it excludes that portion of dividends paid by regulated investment companies (mutual funds) related to capital gains distributions. **Interest** is the interest income (monetary and imputed) of persons from all sources. **Rental income** is the net income of persons from the rental of real property except for the income of persons primarily engaged in the real estate business; the imputed net rental income of the owner-occupants of nonfarm dwellings; and the royalties received from patents, copyrights, and the right to natural resources. The **imputed net rental income** component of **rental income** is based on the accounting assumption that owner occupants are in the rental business and that they are renting the house in which they live to themselves; expenses, taxes, mortgage interest, and depreciation are deducted from imputed rental income.

**Imputed net rental income of owner occupied nonfarm dwellings is a significant portion of rental income and total personal income.**

**Transfer payments to persons** are payments to persons for which no current services are performed. They consist of payments to individuals by Federal, state, and local governments and by businesses. Government payments to individuals include retirement and disability insurance benefits, medical payments (mainly Medicare and Medicaid), income maintenance benefits, unemployment insurance benefits, veterans benefits, and Federal grants and loans to students. Business payments to persons consists primarily of liability payments for personal injury.

**Personal social insurance contributions** are subtracted in the calculation of personal income and consist of the contributions, or payments, by employees, by the self-employed, and by other individuals who participate in the following government programs: Old-age, survivors, and disability insurance (social security); hospital insurance; supplementary medical insurance; unemployment insurance; railroad retirement; veterans life insurance; and temporary disability insurance. These contributions are excluded from personal income by definition, but the components of personal income upon

which these contributions are based—mainly wage and salary disbursements and proprietors' income—are presented gross of these contributions.

**Residence adjustment** is the net amount of personal income of persons residing in a specific geographic area but receiving the income outside that geographic area. For example, a person who earns income in one county but lives in a different county would have that income counted under residence adjustment; the county in which the person lives would have a positive residence adjustment and the county in which the person works would have a negative adjustment. Residence adjustment adjusts the earned component of personal income, which is establishment-based by place of work, to population, which is by place of residence. When total personal income is adjusted this way, personal income per capita can be calculated. Residence adjustment is a net number for a given county; if it is negative, it means that there is net commuting into the county; if it is positive, it means that there is net commuting out of the county.

As with employment, the definition of total personal income used by Woods & Poole is the most comprehensive one available. Another commonly used measure of income is money income of persons. **Money income** is the concept used by the Bureau of the Census and is widely used in other sources. When Woods & Poole's income data are higher than data from another source, once inflation adjustments are taken into account, it is probably because the other source uses money income base data. Total personal income includes all of money income plus the exclusions to money income. Money income excludes payments-in-kind such as food stamps, agricultural payments-in-kind, and the value of in-kind medical payments; the imputed rental value of owner-occupied housing; the imputed value of certain interest payments such as the value to consumers of free non-interest bearing checking accounts; all other labor income; capital consumption adjustments for proprietors; inventory valuation adjustments, although sometimes this is negative; and lump-sum payments such as liability judgments and consumer defaults on debts to businesses. For the U.S. as a whole, money income is about 25% less than total personal income; at the regional level, the difference varies depending on the specific composition of total personal income.

Another commonly used measure of income is **disposable income**, which is defined as total personal income less personal tax and non-tax payments. Disposable income is the income available to persons for spending or saving. Tax payments are payments, net of refunds, made by persons to the government; it includes taxes such as income, estate and gift, and personal property taxes, but it excludes personal contributions to social insurance. Non-tax payments include tuition and fees paid to schools and hospitals operated mainly by the government, donations to such institutions, passport fees, and fines and penalties.

### **Retail Sales and Food Services Sales**

Data for retail sales by kind of business are from the 1972, 1977, 1982, 1987, 1992, 1997, 2002, 2007, 2012 Census of Retail Trade (U.S. Department of Commerce, Bureau of the Census). Retail sales data for 1972, 1977, 1982, 1987, 1992, and 1997 have been changed by Woods & Poole from SIC

*Personal income (and income per capita) data used by Woods & Poole are usually much higher than money income data used by the Census because money income excludes some forms of income.*

*Retail sales data are historical for the years 1972, 1977, 1982, 1987, 1992, 1997, 2002, 2007, and 2012; estimated for all other years 1969–2011; and projected for the years 2013–2050.*

*Retail sales by kind of business are based on NAICS classifications. Total retail sales includes food services and drinking places.*

classifications to estimated NAICS kind of business classifications to be consistent with 2002 Census of Retail Trade data. The intervening historical data for the years 1969-71, 1973-76, 1978-81, 1983-86, 1988-91, 1993-96, 1998-2001, 2003-06, and 2008-11 are also estimated by Woods & Poole. These estimates are made by interpolating retail sales by kind of business per capita for the intervening years (e.g., 1973-76). These proportions are then multiplied by population for the intervening years to estimate retail sales by kind of business. The estimates are then constrained to U.S. retail sales by kind of business for the intervening years. U.S. retail sales data for 1969-2012 are from the Bureau of Economic Analysis but are revised by Woods & Poole to be consistent with the sum of the county retail sales data for the Census years. Therefore, retail sales data for the U.S. are the sum of county retail sales as published in the Census of Retail Trade and differ from the U.S. data published monthly by the Department of Commerce.

Some county data from the Census of Retail Trade are withheld because of Federal information disclosure policies. All withheld data have been estimated by Woods & Poole; the techniques used to make these estimates are described below in the section titled “Estimation of Missing Historical Data.”

In the 2016 Woods & Poole database total retail sales are modified to include food services and drinking places sales (NAICS 722). The inclusion of food services and drinking places sales makes total retail sales more consistent with the SIC definition.

Retail sales are counted, as are employment and earnings, on an establishment basis. Mail-order sales are counted at the point from which the merchandise is sent and not at the point at which it is received. Retail sales are classified by kind of business according to the principal lines of commodities sold (e.g., groceries or hardware) or the usual trade designation (e.g., drug store or cigar store). In some cases, an establishment sells goods in several different business groups, such as a convenience store with gasoline pumps. In these cases, all the establishment’s sales are classified in the business group that is the primary activity of the establishment; therefore, the retail sales data by kind of business does not reflect retail sales by merchandise line. The specific kinds of business, on an NAICS basis, are described as follows:

***Motor vehicle and parts dealers retail sales.***

***Motor vehicle and parts dealers*** include establishments selling new and used cars and trucks, boats, recreational vehicles, utility trailers, aircraft, snowmobiles, motorcycles, snowmobiles, and mopeds. It also includes dealers selling new automobile parts and accessories, such as tires, as well as automobile repair shops maintained by establishments engaged in the sale of new automobiles. Establishments selling medium and heavy-duty trucks are generally excluded.

***Furniture and home furnishings stores*** include establishments primarily selling new furniture, floor coverings, draperies and window treatments, glassware and china. Bath, linen, mattress and lamp stores are included. Used furniture, appliance, and electronics stores are excluded.

***Electronics and appliance stores*** include establishments selling new consumer electronics, televisions, radios, home appliances, computers, cameras and photography supplies.

**Building material and garden equipment and supplies dealers** include retail establishments primarily engaged in selling lumber and other building materials; paint, glass, and wallpaper; hardware; nursery stock; lawn and garden supplies; and outdoor power equipment. It includes lumber and other building materials dealers, and paint, glass, and wallpaper stores selling to the general public, even if sales to contractors account for a larger proportion of total sales. Dealers selling mobile homes are excluded.

**Food and beverage stores** include establishments primarily engaged in selling for home preparation and consumption. Food stores include grocery stores, such as supermarkets and convenience stores; meat and fish markets; fruit and vegetable markets; candy, nut, and confectionery stores; dairy product stores; retail bakers; and miscellaneous stores such as beer, wine and liquor stores, health food stores, and coffee and tea stores.

**Health and personal care stores** include pharmacies and drug stores; cosmetic, beauty supplies and perfume stores; optical goods stores; health supplement stores; and convalescent supply stores.

**Gasoline stations** include establishments primarily selling gasoline and automotive lubricants. These establishments frequently sell other merchandise, such as tires, batteries, accessories, and other automobile parts, or perform minor repair work. Establishments called garages but deriving more than half of their receipts from the sale of gasoline and automotive lubricants are included. Gasoline stations combined with other activities such as convenience stores or car washes are classified by their primary activity as determined by sales.

**Clothing and clothing accessories** include retail stores primarily engaged in selling clothing of all kinds and related articles for personal wear and adornment. These establishments include men's, boys', women's, infants' and girls' clothing stores; shoe stores; and specialty stores, such as swimwear, wigs, lingerie, luggage and handbags. Establishments that meet the diversity criterion for department stores are not included. Excluded are custom tailors and athletic uniform stores

**Clothing and clothing accessories  
retail sales.**

**Sporting goods, hobby, book, and music stores** include sporting good stores (including bicycle stores, golf pro shops, exercise equipment stores and gun shops); hobby, toy and game stores; sewing and needlework stores; musical instrument and supply stores; book stores, newsstands, and music stores. Excluded are used book stores.

**General merchandise stores** include department stores, general discount stores, variety stores, warehouse clubs, and miscellaneous general merchandise stores. These stores all sell a number of lines of merchandise, such as dry goods, apparel and accessories, furniture and home furnishings, small wares, hardware, and food in one establishment.

**Miscellaneous retail stores** include florists; office supply, stationery and gift stores; used merchandise stores such as thrift stores, used book stores, and antique shops; pet shops; art dealers; mobile home dealers; swimming pool stores; and tobacco stores.

**Nonstore retailers** include Internet sellers; mail order and catalog sellers; television and infomercial sellers; door-to-door sellers; vending machine

**Table 4. Personal Consumption Expenditure Price Index (2009 = 100)**

1969	21.33	1997	79.33	2025	133.68
1970	22.33	1998	79.94	2026	137.99
1971	23.27	1999	81.11	2027	142.66
1972	24.07	2000	83.13	2028	147.64
1973	25.37	2001	84.74	2029	152.86
1974	28.01	2002	85.87	2030	158.44
1975	30.35	2003	87.57	2031	164.32
1976	32.01	2004	89.70	2032	170.50
1977	34.09	2005	92.26	2033	176.96
1978	36.48	2006	94.73	2034	183.69
1979	39.71	2007	97.10	2035	190.70
1980	43.98	2008	100.07	2036	198.01
1981	47.91	2009	100.00	2037	205.61
1982	50.55	2010	101.65	2038	213.53
1983	52.73	2011	104.15	2039	221.77
1984	54.72	2012	106.12	2040	230.35
1985	56.66	2013	107.57	2041	239.29
1986	57.89	2014	109.11	2042	248.60
1987	59.65	2015	109.43	2043	258.29
1988	61.97	2016	110.37	2044	268.39
1989	64.64	2017	111.77	2045	278.88
1990	67.44	2018	113.42	2046	289.79
1991	69.65	2019	115.43	2047	301.12
1992	71.49	2020	117.75	2048	312.89
1993	73.28	2021	120.36	2049	325.13
1994	74.80	2022	123.20	2050	337.84
1995	76.36	2023	126.22		
1996	77.98	2024	129.73		

**Note:** Historical data, 1969–2014, from U.S. Dept. of Commerce; projected data, 2015–2050, from Woods & Poole Economics, Inc.

operators; and direct selling establishments such as heating oil dealers, bottled gas dealers, newspaper delivery, and bottled water providers.

**Food services and drinking places** includes establishments selling prepared food and drinks for consumption on the premises; it also includes lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption. These establishments include restaurants and lunchrooms; social caterers; cafeterias; refreshment places, such as take-out hamburger and chicken stands; contract feeding, such as institutional food service; ice cream and frozen yogurt stands; and drinking places, such as bars and lounges.

### Constant and Current Dollars

All earnings, personal income, and retail sales data in the Woods & Poole database are presented in 2009 dollars. These are called “constant” dollars and are used to measure the “real” change in earnings and income when inflation is taken into account. For example, it would be incorrect to assume that Americans were more than twice as wealthy in 1980 as in 1970 even though income per capita increased from \$4,192 to \$10,153; during those ten years the general price level increased more than 97%, and \$10,153 in 1980 could not buy as much as \$10,153 could in 1970. When adjusted for the rate of inflation by making income per capita “constant” in 2009 dollars, the increase from 1970 to 1980 was only 23% (\$18,777 to \$23,080).

In the Woods & Poole database, the personal consumption expenditure price index is used to convert current dollars into constant dollars; the price index, revised by the BEA in 2009, is used by Woods & Poole. The personal consumption expenditure price index for each year from 1969 to 2050 is listed in Table 4. To convert current dollar data to 2009 dollars, divide the current dollars by the price index for the appropriate year in Table 4 divided by 100. To convert constant 2009 dollar data into current dollars, multiply the constant dollars by the price index for the appropriate year in Table 4 divided by 100. The formulas in the side-bar box on this page outline the procedure to convert constant dollars to current dollars and vice versa. The same price index is used for the U.S. and all counties in the Woods & Poole database; hence, the rate of inflation (the percent difference year to year in the price index) is assumed to be constant for all parts of the country.

## Population

The historical population data for the years 1969 to 2014 are from the U.S. Department of Commerce, Bureau of the Census. The historical population data in the 2016 Woods & Poole database includes 2010 Census results. The historical county total population and population by single year of age by race and sex data for the years 1991-1999, 2001-2009, and 2011-2014 are based on Bureau of the Census intercensal and Vintage 2014 postcensal estimates. The historical county population data by single year of age by race and sex for the years 1971-1979 and 1981-1989 are estimated by using single year of age data from the 1970, 1980, and 1990 Census of Population for counties, and U.S. annual population by single year of age by race and sex.

Population is defined as July 1 residential population and includes: civilian population; military population except personnel stationed overseas; college residents; institutional populations, such as prison inmates and residents of mental institutions, nursing homes, and hospitals; and estimates of undocumented aliens. Excluded are persons residing in Puerto Rico, U.S. territories and possessions, and U.S. citizens living abroad.

For the years 1990 to 2050 the population data are broken down by five race/ethnic groups: White not including Hispanic or Latino (i.e. Non-Hispanic), Black Non-Hispanic, Native American or American Indian Non-Hispanic, Asian American and Pacific Islanders Non-Hispanic, and Hispanic or Latino. Population by race as defined by the Census Bureau reflects self-identification by respondents and does not denote any clear-cut scientific definition of biological stock. **White population** includes people who identify themselves as White and people who do not identify themselves by any race but identify themselves by nationality, such as Canadian, German, Italian, Arab, Lebanese, Near Eastern, or Polish. **Black population** includes people who identify themselves as Black and people who do not identify themselves by any race but identify themselves by nationality, such as African American, Afro-American, Black Puerto Rican, Jamaican, Nigerian, West Indian, or Haitian. **Native American population** includes people who identify themselves as Alaska Native or American Indian by Indian tribe or classify themselves as Canadian Indian, French American Indian, Spanish-American Indian, Eskimos, Aleuts, and Alaska Indians. **Asian American and Pacific**

**To convert a current dollar series to constant dollars:**

$$\text{current \$} \div \text{price index} = \text{constant \$}$$

**To convert a constant dollar series to current dollars:**

$$\text{constant \$} \times \text{price index} = \text{current \$}$$

**To convert the price index to a different base year (e.g. 2007):**

$$\text{index}_{(2009=100)} \div \text{2007 index} = \text{price index}_{(2007=100)}$$

**Total population data are historical for the years 1969-2014, and projected for the years 2015-2050.**

**Total population is the sum of White, Black, Native American, Asian American and Pacific Islander, and Hispanic or Latino.**

**Islander population** are people who identify themselves as having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, Vietnam, Hawaii, Guam, Samoa, or other Pacific Islands.

**Hispanic or Latino population** are people whose origins are from Spain, the Spanish-speaking countries of Central or South America, the Dominican Republic, and who identify themselves generally as Spanish, Spanish-American, Hispanic, Hispano, Latino, and so on. Hispanic population is not a race group but rather a description of ethnic origin. Although Hispanics are part of the other four race groups they split out separately in the Woods & Poole database so that the four race groups plus Hispanic equals total population.

Hispanic data are historical for 1970, 1980, and 1990–2010 from the decennial censuses, adjusted to July 1, and from Census Bureau intercensal and postcensal population estimates. For counties with Hispanic population greater than 40,000, actual historical data for 1981–1985 from a special Census Bureau report are included. Census Bureau data are also included for the U.S. for 1969–1990, and for states for 1981–1985 and 1990. Hispanic data for all other years are estimated. The Woods & Poole Hispanic population data for 1980 differ significantly from the final 1980 Census for some states, e.g., Alabama and Mississippi; this is because of post-1980 Census Bureau revisions to the 1980 Census that are incorporated in the Woods & Poole data.

For the years 1970 to 1989 the population in the Woods & Poole database is available in three race groups which sum to total population: White, Black, and Other. All three of these race groups include Hispanic population. The Hispanic data for 1970 to 1989 are provided separately. Although the total Hispanic population and the population by age and gender for the years 1970 to 1989 are consistent with the data 1990 to 2050, the population by race data are not.

*Although the Woods & Poole database reflects the 2000 and 2010 Census race classifications, the race groups “Some Other Race” and “Two or More Races” are allocated to the other race groups to create data consistent with data for 1990–1999.*

The Woods & Poole database includes **2010 Census** population data, adjusted to July 1, for total population by single year of age, race and sex. Census 2010 data are adjusted to July 1, for total population by single year of age, race and sex. However, the 2010 Census race classifications were adjusted to create a consistent time-series for the years 1990 to 2010. The 2010 Census classification **Some Other Race** was distributed as follows: of the 19.11 million people classifying themselves as Some Other Race, 18.50 million were Hispanic and were therefore added to Hispanic population; the remaining 610,000 were distributed to the other four race groups proportionally by age and gender. The 2010 Census classifications for **Two or More Races** were distributed as follows: of the 9.01 million people classifying themselves as Two or More Races, 3.04 million were Hispanic and were added to the Hispanic population; the remaining 5.97 million were distributed to the other four race groups proportionally by age and gender.

*Population data are July-1 based in each year, 1969–2050.*

The population data in the Woods & Poole database are generally consistent with data from other sources, including the Census Bureau. The most significant difference between the Census Bureau data used by Woods & Poole and the actual 1970, 1980, 1990, 2000, and 2010 Census results is

that Woods & Poole data are July 1-based and the decennial census data are April 1-based. Decennial census data were adjusted forward from April 1 to July 1 to make them consistent with population data for other years as well as with the employment and income data, which are also July 1-based.

## Households

The data for households are from Census Bureau counts in 1970, 1980, 1990, 2000, and 2010 and Census Bureau estimates for 1985. As with population, the household data from the decennial censuses were adjusted from April 1 to July 1. The 1985 Census Bureau estimate was already July 1-based. All other years of county household data (i.e., 1969, 1971-1979, 1981-1984, 1986-1989, and 1991-1999) are estimates. Household data for the U.S., 1969-2010, are based on Census Bureau data.

Household data for total number of households, group quarters population, and average size of households from the **1990, 2000, and 2010 Census**, adjusted to a July-1 base, are included in the Woods & Poole database.

Households are defined as occupied housing units. A housing unit is a house, an apartment, a group of rooms, or a single room occupied as separate living quarters. The occupants of a housing unit may be a single family, one person living alone, two or more families living together, or any group of related or unrelated persons who share living quarters. All people are part of a household except those who reside in group quarters. Group quarters include living arrangements such as prisons, homes for the aged, rooming houses, college dormitories, and military barracks. The average size of households is defined as total population less group quarters population divided by the number of households. Mean household income is defined as total personal income less estimated income of group quarters population divided by the number of households.

## Households by Income Bracket

The number of households by income bracket is historical only for 1990, 2000 and 2010 and are based on Census and American Community Survey (ACS) data for household income in the years 1989, 1999, and, 2009 respectively. The income brackets are in 2009 dollars and since the brackets themselves are not adjusted over the projection horizon all brackets from 1990 to 2050 are also in 2009 dollars. The 2010 ACS income brackets are retained for the projection years; as a result, in the Woods & Poole projections, there is a heaping of households into the higher income brackets because of projected real increases in total personal income. The projection of the number of households by income bracket is made simply by changing the median income for the years 2011 to 2050 in relation to projected mean household income, and retaining the income distribution around the 2010 median. The lack of historical time series data for county households by income bracket means that the projections are based on a single observation point; projections based on extrapolations from a single data point are less reliable than projections based on time-series data.

*Household data are historical for the years 1970, 1980, 1985 1990, 2000, and 2010; estimated for all other years 1969-1999; and projected for the years 2012-2050.*

*The 2016 Woods & Poole database includes 2010 Census household data.*

*The projections of households by income bracket are based only on data from the 2010 American Community Survey. The brackets for all years are in 2009 dollars.*

*The Woods & Poole Wealth Index is a weighted measure of Personal Income per Capita by source of income.*

### **Woods & Poole Wealth Index**

The Woods & Poole Wealth Index is a measure of relative total personal income per capita weighted by the source of income. The Wealth Index is the weighted average of regional income per capita divided by U.S. income per capita (80% of the index); plus the regional proportion of income from dividends/interest/rent divided by the U.S. proportion (10% of the index); plus the U.S. proportion of income from transfers divided by the regional proportion (10% of the index). Thus, relative income per capita is weighted positively for a relatively high proportion of income from dividends, interest, and rent, and negatively for a relatively high proportion of income from transfer payments. Because the imputed rent of owner-occupied homes is added to rental income of persons in calculating total personal income, some of the appreciated value of owner-occupied homes is included in rental income. Since dividends, interest, and rent income are a good indicator of assets, the Woods & Poole Wealth Index attempts to measure relative wealth.

### **Comparative Data**

Some Woods & Poole statistical tables and data files contain summary data on unemployment, number of business establishments, and educational attainment. These data are provided for comparison purposes and are not part of the Woods & Poole forecasting model.

**Labor force and unemployment** data are from the Bureau of Labor Statistics. Data are provided for the civilian labor force, employment, unemployment, and the unemployment rate for 2005 to 2014. Employment is defined by the Bureau of Labor Statistics and excludes military employment and proprietors. Civilian labor force is defined as people who are either employed or who are unemployed and looking for work; civilian labor force is the sum of the employed and unemployed. The unemployment rate is the number of people unemployed divided by the civilian labor force. The monthly data are not seasonally adjusted. The labor force, employment, and unemployment data are all by place of residence and not by place of work.

**Business establishments** by size and industry is from the Bureau of the Census. Data are provided for the total number of business establishments and the number with fewer than fifty employees and the number with fifty or more employees by one-digit NAICS industries. The data are for March 2012 and March 2013 and are not an annual average. The number of business establishments excludes proprietors and government. The industry groups are based on 2002 North American Industry Classification System (NAICS) definitions. The data on the number of business establishments includes establishments by industry that are statewide and not part of any particular county. In the Woods & Poole database, statewide establishments are distributed proportionally to counties within the state based on the number of establishments by industry within a particular county; therefore, Woods & Poole county data may differ from other published data.

**Educational attainment** data for the years 1970, 1980, 1990, and 2000 are from decennial Census data and 2010 data are from the American Community Survey. The percent of the population age 25 or more not completing high school, completing high school, and completing four or

*Number of establishments by size and industry for 2012 and 2013. Number of establishments by industry are based on NAICS classifications.*

*Educational attainment.*

more years of college is reported. The educational attainment data are based on self-reporting by decennial Census respondents and are not matched to actual school enrollment or graduation data.

**Land area** is from the 2010 Census and is in square miles. The data are for all U.S. counties; the land area for geographic units larger than county (including the U.S. as a whole) is calculated by summing county land area.

### **Estimation of Missing Historical Data**

Some historical earnings and employment data by sector was withheld by the Department of Commerce because of Federal information disclosure policies. Data are usually withheld in small sectors in a specific county; the reporting of this data would divulge confidential employment and earnings information about specific companies in that area. In order to make the database consistent, and facilitate the forecasting model, all missing data points were estimated by Woods & Poole. In sum, approximately 4% of all data in the historical database were withheld and had to be estimated.

*Some historical data in the Woods & Poole database are estimated.*

The algorithms used to estimate the missing data were applied in two stages. First, a “best guess” of the missing data was obtained. For example, in the case of mining employment, missing data for a county were estimated by observing the relationship between that county’s mining employment in reported years and statewide mining employment for the same years. This method took into account, when possible, fluctuations in a series because of business cycles during the historical period. When sufficient years in a series were reported to provide statistical reliability (this occurred in approximately 33% of the cases where data were withheld), business cycles were all estimated separately, thus enabling reliable estimates to be made of the missing data points. In other cases, where too many years in a series were withheld, business cycles were not taken into account, but the same method of observing the relationship between county series, in reported years, to the state series in the same years was used (this occurred in approximately 61% of the cases). In approximately 6% of the cases, the data for a county series, such as mining employment, were withheld for every year, and the relational method would not work. In these cases, the relationship between total economic activity in the county to the state, in a non-cyclical manner, was used to derive “best guess” results.

Once the “best guess” results were estimated, an iterative procedure was used to simultaneously constrain the “best guess” to the county control total, (i.e., total employment in the above example) and the state total for the series (i.e., state mining employment in the above example). This iterative procedure, beginning with the “best guess” solution, produced, for all missing data points, a convergence point that is used as historical data. However, since the data are truly withheld by the government, there is no mathematically tractable solution to the problem of missing data. Estimated withheld data are indicated for employment and earnings of employees in the Woods & Poole database printed tables with an “e” following the estimated data; estimated withheld data for retail sales by kind of business and other data series is not indicated in the Woods & Poole database.

**Table 5. Woods & Poole Special County Definitions (FIPS codes in Parentheses)**

<b>Northwest Arctic Borough, AK</b> (02188) Kobuk, AK (02140)	<b>Albemarle + Charlottesville, VA</b> (51901) Albemarle, VA (51003) Charlottesville City, VA (51540)	<b>Pittsylvania + Danville, VA</b> (51939) Pittsylvania, VA (51143) Danville City, VA (51590)
<b>Remainder of Alaska, AK</b> (02999) Aleutian Islands, AK (02010) Aleutian Islands East Borough, AK (02013) Aleutian Islands West Census Area, AK (02016) Bethel Census Area, AK (02050) Denali Borough, AK (02068) Dillingham Census Area, AK (02070) Haines Borough, AK (02100) Hoonah-Angoon Census Area, AK (02105) Kenai Peninsula Borough, AK (02122) Lake and Peninsula Borough, AK (02164) North Slope Borough, AK (02185) Petersburg Census Area, AK (02195) Prince of Wales-Hyder Census Area, AK (02198) Prince of Wales-Outer Ketchikan, AK (02201) Sitka Borough, AK (02220) Skagway Municipality, AK (02230) Skagway-Yukatat-Angoon, AK (02231) Skagway-Hoonah-Angoon Census Area, AK (02232) Southeast Fairbanks Census Area, AK (02240) Valdez-Cordova Census Area, AK (02261) Wrangell City and Borough, AK (02275) Wrangell-Petersburg Census Area, AK (02280) Yakutat Borough, AK (02282) Yukon-Koyukuk, AK (02290)	<b>Alleghany + Clifton Forge + Covington, VA</b> (51903) Alleghany, VA (51005) Clifton Forge City, VA (51560) Covington City, VA (51580)	<b>Prince George + Hopewell, VA</b> (51941) Prince George, VA (51149) Hopewell City, VA (51670)
<b>Yuma + La Paz, AZ</b> (04027) La Paz, AZ (04012) Yuma, AZ (04027)	<b>Augusta + Staunton + Waynesboro, VA</b> (51907) Augusta, VA (51015) Staunton City, VA (51790) Waynesboro City, VA (51820)	<b>Prince William + Manassas + Manassas Park, VA</b> (51942) Prince William, VA (51153) Manassas City, VA (51683) Manassas Park City, VA (51685)
<b>Miami-Dade, FL</b> (12086) Dade, FL (12025)	<b>Bedford + Bedford City, VA</b> (51909) Bedford, VA (51019) Bedford City, VA (51515)	<b>Roanoke + Salem, VA</b> (51944) Roanoke, VA (51161) Salem City, VA (51775)
<b>Maui + Kalawao, HI</b> (15901) Kalawao, HI (15005) Maui, HI (15009)	<b>Campbell + Lynchburg, VA</b> (51911) Campbell, VA (51031) Lynchburg City, VA (51680)	<b>Rockbridge + Buena Vista + Lexington, VA</b> (51945) Rockbridge, VA (51163) Buena Vista City, VA (51530) Lexington City, VA (51678)
<b>Fremont, ID</b> (16043) Fremont, ID (16043) Yellowstone Park, ID	<b>Carroll + Galax, VA</b> (51913) Carroll, VA (51035) Galax City, VA (51640)	<b>Rockingham + Harrisonburg, VA</b> (51947) Rockingham, VA (51165) Harrisonburg City, VA (51660)
<b>Park, MT</b> (30067) Park, MT (30067) Yellowstone Park, MT (30113)	<b>Dinwiddie + Colonial Heights + Petersburg, VA</b> (51918) Dinwiddie, VA (51053) Colonial Heights City, VA (51570) Petersburg City, VA (51730)	<b>Southampton + Franklin, VA</b> (51949) Southampton, VA (51175) Franklin City, VA (51620)
<b>Valencia + Cibola, NM</b> (35061) Cibola, NM (35006) Valencia, NM (35061)	<b>Fairfax + Fairfax City + Falls Church City, VA</b> (51919) Fairfax, VA (51059) Fairfax City, VA (51600) Falls Church City, VA (51610)	<b>Spotsylvania + Fredericksburg, VA</b> (51951) Spotsylvania, VA (51177) Fredericksburg City, VA (51630)
<b>Shannon, SD</b> (46113) Oglala Lakota, SD (46102)	<b>Frederick + Winchester, VA</b> (51921) Frederick, VA (51069) Winchester City, VA (51840)	<b>Washington + Bristol, VA</b> (51953) Washington, VA (51191) Bristol City, VA (51520)
<b>Halifax, VA</b> (51083) Halifax, VA (51083) South Boston City, VA (51780)	<b>Greensville + Emporia, VA</b> (51923) Greensville, VA (51081) Emporia City, VA (51595)	<b>Wise + Norton, VA</b> (51955) Wise, VA (51195) Norton City, VA (51720)
	<b>Henry + Martinsville, VA</b> (51929) Henry, VA (51089) Martinsville City, VA (51690)	<b>York + Poquoson, VA</b> (51958) York, VA (51199) Poquoson City, VA (51735)
	<b>James City + Williamsburg, VA</b> (51931) James City County, VA (51095) Williamsburg City, VA (51830)	
	<b>Montgomery + Radford, VA</b> (51933) Montgomery, VA (51121) Radford City, VA (51750)	<b>Shawano (includes Menominee), WI</b> (55901) Menominee, WI (55078) Shawano, WI (55115)

## County Definitions

The county definitions and county-equivalent definitions used in the Woods & Poole database are defined by the BEA. In New England, counties were created by summing townships and creating county-equivalent areas. Parishes in Louisiana, Boroughs in Alaska, and Independent Cities in Maryland, Missouri, and Nevada are called counties in the Woods & Poole database. In some states, notably Virginia, counties exist with independent cities. In cases where boundaries between counties and independent cities (or counties and other counties) have changed since 1969, new county groups are created to maintain the consistency of the historical data. Table 5 lists all the special county groupings in the Woods & Poole database.

Broomfield County Colorado (FIPS 08014) is a new county created after the 2000 Census from portions of Boulder, Adams, Jefferson and Weld counties; it is not included separately in the 2016 Woods & Poole database.

**Federal Information Processing Standards (FIPS)** codes are defined by the National Institute of Standards and Technology to give numeric “names” to geographic areas such as states and counties. Each state has a two-digit FIPS code (Alabama is 01 and Wyoming is 56) and counties have five-digit codes with the first two digits being the state code: Autauga AL is 01001 and Weston WY is 56045.

### Average Annual Rate of Growth

In some statistical tables in Woods & Poole publications, data are presented for the average annual rate of growth for a particular variable over a specified time period. The average annual rate of growth is the compounded growth of a variable over time. Thus, a 3.0% average annual rate of growth between 1970 and 1980 for population would mean that, on average, the population increased 3.0% each year between 1970 and 1980.

An average annual rate of growth can be calculated by dividing the data year  $t+n$  by data year  $t$  and calculating the  $n$ th root of the quotient (where  $n$  is the number of years between  $t$  and  $t+n$ ). Subtract one and multiply by 100 to convert the growth into percent. A negative average annual rate of growth would mean a decline in the variable over time.

*Average annual rate of growth for variable  $x$  between year  $t$  and year  $t+n$  is:*

$$((x_{t+n} \div x_t)^{1/n}) - 1 \times 100$$

### Rounding of Data

Data for the U.S., states, Metropolitan Statistical Areas (MSAs), and other regions are the sum of counties. Due to rounding, the subtotals in Woods & Poole data tables may not exactly equal the components. Special calculations in some data tables (e.g., population growth rates) also may not exactly equal the data because of rounding. Since the U.S. and state data are based on county estimates, they may differ from U.S. and state data available from other sources.

### Metropolitan Area Definitions

Metropolitan Statistical Areas (MSAs), Combined Metropolitan Statistical Areas (CSAs), Micropolitan Statistical Areas (MICROS), and Metropolitan Divisions (MDIVs) in the Woods & Poole database are as defined in the February 2013, Office of Management and Budget (OMB BULLETIN NO. 13-01), *Update of Statistical Area Definitions and Guidance on Their Uses*.

All Woods & Poole historical data back to 1969 is revised to reflect the new 2013 OMB Metropolitan Area (MSA, CSA, MICRO, and MDIV) definitions. There are 381 MSAs, 166 CSAs, 536 MICROS, and 31 MDIVs in the 2015 Woods & Poole database. A list of all CSAs, MSAs, MICROS, and MDIVs and their component counties can be found in Appendices 2, 3, 4 and 5, respectively. These Appendices follow this chapter and begin on page 40. Although CSAs can be defined in terms of MSAs and MICROS, in the Woods & Poole database, and in Appendix 2, they are defined in terms of counties.

*In the 2016 Woods & Poole database the revised 2013 Metropolitan Area definitions are used.*

*There are now four Metropolitan Area classifications: CSAs, MSAs, MICROS, and MDIVs.*

New England City and Town Areas (NECTAs) and Combined New England City and Town Areas (CNECTAs) are not in the Woods & Poole database because they are defined with geographic units smaller than

counties. The 19 MSAs, CSAs, and MICROS in Puerto Rico are also not included in the Woods & Poole database.

*All Core Based Statistical Areas (CBSAs) are included in the Woods & Poole database.*

All Core Based Statistical Areas (CBSAs) are included in the Woods & Poole database. CBSAs are MSAs or MICROS and CBSA is a collective term for both of these geographies. There are 917 CBSAs in the Woods & Poole database, based on the 2013 OMB definitions.

MSAs, as defined by the OMB, have at least one urbanized area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. Micropolitan Statistical Areas — a new set of statistical areas — have at least one urban cluster of at least 10,000 but less than 50,000 population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. The central cities that form the basis on MSAs and MICROS are generally included in their titles, as well as the name of each state into which the MSA or MICRO extends. MSAs and MICROS are defined in terms of whole counties (or equivalent entities), including in the six New England States. If the specified criteria are met, a MSA containing a single core with a population of 2.5 million or more may be subdivided to form smaller groupings of counties referred to as Metropolitan Divisions. MDIVs are not comparable to either MSAs or MICROS and should not be ranked together.

According to the OMB if specified criteria are met, adjacent MSAs and MICROS, in various combinations, may become the components of a new set of areas called Combined Statistical Areas. For instance, a CSA may comprise two or more MSAs, a MSA and a MICRO, two or more MICROS, or multiple MSAs and MICROS. In the Woods & Poole database CSAs are defined in terms of counties. According to the OMB combinations for adjacent areas with an employment interchange of 25 or more are automatic. Combinations for adjacent areas with an employment interchange of at least 15 but less than 25 are based on local opinion as expressed through the Congressional delegations.

## **Regions**

The eight *regions* in the Woods & Poole database are aggregates of states and are defined by the Bureau of Economic Analysis. A list of all BEA regions and their component states can be found in Appendix 1 following this chapter. The BEA regions used by Woods & Poole differ from the nine regions defined by the Census Bureau and used in their publications.

### References

1. Carlino, Gerald A., and Edwin S. Mills, "The Determinants of County Growth," *Journal of Regional Science*, Regional Science Research Institute, Philadelphia, Vol. 27, No. 1, 1987.
2. Crow, R.T., "A Nationally Linked Regional Model," *Journal of Regional Science*, Vol. 13, 1973.
3. Hall, O.P., and J.A. Licari, "Building Small Region Econometric Models: Extension of Glickman's Structure to Los Angeles," *Journal of Regional Science*, Vol. 14, 1977.
4. Holdrich, Martin, "Future Regional Employment and Its Impact on Population, Income, and Consumer Spending," unpublished paper presented to the Southern Regional Demographics Group, October 1985.
5. Johnson, K.P., and H.L. Friedenberg, "Regional and State Projections of Income, Employment, and Population to the Year 2000," *Survey of Current Business*, U.S. Government Printing Office, Washington, D.C., Vol. 65, No. 5, May 1985.
6. Kahley, William J., "Population Migration in the United States: A Survey of Research," *Economic Review*, Federal Reserve Bank of Atlanta, Vol. 76, No. 1, 1991.
7. Klein, L.R., and N.J. Glickman, "Econometric Model Building at the Regional Level," *Regional Science and Urban Economics*, Vol. 7, 1977.
8. Plaut, T.R., "A Supply-Side Model of Texas Manufacturing Growth," *Journal of Regional Science*, Vol. 24, No. 3, August 1984.
9. U.S. Department of Commerce, Bureau of Economic Analysis, *1985 OBERS BEA Regional Projections*, U.S. Government Printing Office, Washington, D.C., Vol. 1, 1985.