

# METHODOLOGY

## STATE, REGIONAL & COUNTY ECONOMIC FORECASTS

### Overview

The forecasting methodology described here was developed by the Center for Business and Economic Forecasting, Inc. (**CBEF**) in close cooperation with the State Demography Office (**SDO**). The forecasts cover employment, labor force and population variables and are primarily generated by economic factors. They are described as “economic forecasts” to distinguish them from **SDO**’s demographic projections of population. The latter are driven by demographic factors such as mortality and fertility. The two views of the future are related in that the **CBEF** economic forecasts rely upon the **SDO** results for such parameters as labor force participation, birth and death rates, and the age distribution of population. The **SDO** projections take account of the economic forecasts in estimating net migration. The **SDO** and **CBEF** results are roughly consistent with one another.

**CBEF**’s state/regional/county forecasting system combines econometric relationships among economic variables, multiplier-based estimates of the effects from funds flowing into the region and demographic elements. The models in the system generate forecasts for the state of Colorado, its Planning and Management Regions, and its counties. The critical inputs to these models include a detailed US forecast and key demographic parameters. The forecasts for the regions and counties are consistent with each other and with the state forecasts. The forecasts for the state as a whole and for its regions and counties balance the demand for labor and the supply of workers. First, labor demand is forecast. It is largely determined by projected job growth, which, in turn, results from new jobs in basic industries. Basic industries are those dependent on exports, or outside dollars flowing into the state or region. The supply of workers to fill these jobs is then calculated. The initial supply forecast is based on the **SDO** population projections, including changes in the age and gender mix of the population, and projected patterns of labor force participation. The labor market imbalance or the difference between projected labor supply and demand is filled through commuting of workers into or out of the region. If the initial forecast of commuting seems unreasonable, then both the supply and demand projections are re-examined and adjusted as necessary.

## Concepts and Data Sources

### Geographic, Industrial and Job Classifications

The estimates and forecasts cover the state of Colorado, 14 planning and management regions and 58 counties or metro areas. The 7 counties in Metro Denver are treated as a single county. Two different industrial classifications of jobs are used<sup>1</sup>. These are the 70 “Gcode” industries and 17 industry groups based on the North American Industrial Classification System (NAICS).<sup>2</sup> The jobs estimates are based on data compiled by the Colorado Department of Labor and Employment, Labor Market Information (**LMI**) and the Bureau of Labor Statistics (**BLS**), and the US Department of Commerce, Bureau of Economic Analysis (**BEA**). The Gcode classification was developed by the **SDO** and is based on the NAICS classification. The NAICS system organizes industrial types into a hierarchical system consisting of five levels of detail represented by two- to six-digit numbers. The Gcode system is quite similar to the 3-digit NAICS categorization although several 3-digit categories have been eliminated or combined due to the paucity of jobs in these categories in Colorado. In addition, some 3-digit categories have been sub-divided based on the 4-digit NAICS categories when such detail seemed warranted either by the number of jobs in the finer categories or their importance in the state or regional economies. The 17 industry groups are similar to the NAICS 2-digit categories with some sectors combined.

Within these two classification categories jobs are further broken down into those filled by wage and salary workers and those filled by self-employed persons. Direct basic jobs<sup>3</sup> are classified into industry groups such as agriculture, tourism or jobs due to spending by retirees. These industry groups are broken down further into subgroups such as agricultural processing. All of these categories are used in the preparation of the forecasts although not all are forecast for all geographic areas.

### Jobs Estimates

The core concept in the demand forecast is the number of jobs. The job measure covers all jobs, including civilian nonfarm wage and salary jobs, uniformed military, farm jobs, household jobs and self-employed proprietors and all positions both full-time and part-time. The jobs measure used here differs from those reported by the **BLS** or the **BEA**. The **BLS** concepts cover either payroll jobs, which include only civilian nonfarm wage and salary employees, or civilian employment. Civilian employment includes all civilian

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<sup>1</sup> The term “jobs” as used here covers positions with firms or government entities and includes those filled by self-employed persons. “Employment” refers to persons filling these jobs.

<sup>2</sup> Lists of both sets of industrial categories are included in the Appendix.

<sup>3</sup> See discussion of direct basic jobs below.

workers but is based on place of residence rather than place of work. The civilian employment measure also differs from the job estimates in that it counts a person holding more than one job only once. The **BEA** estimates are similar to the **SDO** Gcode series for wage and salary employment but include a much broader measure of jobs held by the self-employed.

Job estimates for all of Colorado's counties were developed by the **SDO** and currently cover the years 2001-2005. (References to availability dates for various series will change as more recent data become availability. Dates in this document are applicable to the summer of 2007.) Wage and salary jobs were based on the **BEA** wage and salary job figures for years through 2004. The estimate of jobs filled by the self-employed was based on the US Census Bureau's estimates of non-employers. The 2005 estimates were based on growth between 2004 and 2005 for each industry in each county reported in the **LMI** Quarterly Census of Employment and Wages (QCEW) for most industries. For a few industries such as agriculture or railroads other data sources were used.<sup>4</sup>

**CBEF** developed estimates consistent with the 2001-05 **SDO** jobs estimates for additional years to be used in fitting equations in the models and to provide historical context for the forecasts. Estimates were developed at the state level for years prior to 2001 and for 2006 at the same level of detail as described above, i.e. wage and salary and proprietors jobs for 70 Gcode industry groups. Wage and salary jobs between 1990 and 1999 were based on the **LMI** non-farm employment estimates with the Gcode categories matched as closely as possible to the NAICS categories in the **LMI** data. Estimates for earlier years were based on **BEA** wage and salary employment estimates with Gcode categories again matched with those in **BEA**.<sup>5</sup>

State proprietor's jobs estimates were based on **BEA**'s employment series for all years from 1975 through 2000. The 2006 estimates initially assumed that proprietors jobs in each industry grew at the same rate as wage and salary jobs. Each industry's proprietors' jobs were then adjusted to consistency with estimated state totals.

**SDO**'s county and regional job estimates for all Gcode industries were extended from 2001 backward to 2000. These estimates were calculated in a manner similar to that used for the base industry forecasts, i.e. using historical relationships of local growth to state growth in each industry and then forcing to state totals. County and regional estimates of total jobs, total wage and salary jobs and total proprietors jobs covering the years 1990 through 1999 were also prepared. These estimates were based on the **BEA** employment series for each county and were forced to state totals.

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<sup>4</sup> A detailed description of the jobs estimates is available on the SDO website <http://dola.colorado.gov/dlg/demog/leifadocumentation.html>.

<sup>5</sup> For the BEA categories prior to 2001, Gcode categories were matched with SIC categories.

## Conceptual Basis for the Labor Demand Forecasts

The forces driving labor demand in the forecasting models are outside funds flowing into the region. Such funds include sales of exported goods or services to nonresidents which generate resident jobs and earnings. The purchase of supplies and services by the exporting industries result in additional regional jobs and earnings. Outside funds also include earnings from investments outside the region, pensions and various government payments. The expenditure of all the moneys outlined above generate additional jobs and earnings with further multiplier effects from their spending.<sup>6</sup>

The theoretical framework for this process is the input-output table, an accounting construct that for each industry shows purchases from and sales to all other industries within the region. In this framework households are treated as an additional industry with funds going to households through earnings or from other sources viewed as purchases from the household. In turn, household expenditures within a region are purchases from various regional industries. If the spending patterns of the industries are reasonably stable then the input-output table reflects the regional industrial structure and trading patterns. The input-output table can be used to estimate parameters, or multipliers, which show the effects on earnings or employment of changes in output in any industry.<sup>7</sup> In the model the multipliers derived from the input-output table show the effects of a change a change in exports or other funds flowing into the economy.

In the model, the flows described above are represented by jobs rather than by income or physical measures of output. Job measures were selected because they: (1) more closely reflect the view of the local economy held by local planners and officials, (2) are more readily available on a timely basis and over a longer time period and (3) more directly relate to demographic measures of labor supply. Exports of goods or services are measured by jobs in the exporting industry. Other funds flowing into the regional economy are represented by the jobs in the local industries where these funds are initially spent. Such jobs are direct basic jobs. The impact of changes in direct basic jobs on total jobs in the economy is estimated by direct-effect employment multipliers. These multipliers indicate, for each industry, the total change in employment in the region resulting from one direct basic job in that industry. The estimated change in jobs includes that in suppliers to the direct basic industry or indirect basic jobs and the change resulting from expenditures on local consumer goods or induced jobs.

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<sup>6</sup> A fuller explanation of the economic base concept and its application to the regional economies in Colorado is found in SDO's LEFIA documentation at <http://dola.colorado.gov/dlg/demog/leifadocumentation.html>

<sup>7</sup> See US Department of Commerce, Bureau of Economic Analysis, Regional Multipliers, A User Handbook for the Regional Input-Output Modeling System (RIMS II) Third Edition (1997) and the references cited therein for a fuller explanation of the input-output structure and multipliers.

For example, consider a hypothetical manufacturing industry. Each direct basic job due to exports by that industry results in 0.3 indirect basic jobs in other regional industries providing material and services. In addition, spending by the each worker in the export industry plus that by the 0.3 workers in the supplying industries will generate additional jobs. Spending by workers holding these additional jobs will result in yet more jobs which will cause further spending and yet more jobs. Suppose that this multiplier process generates 0.8 induced jobs. The direct-effect employment multiplier is 2.1, the sum of the direct basic job, the 0.3 indirect basic jobs and the 0.8 induced jobs.

A second example is receipt of retirement funds. Some of these funds are spent locally and generate jobs. The jobs resulting from the initial expenditure are considered direct basic jobs. The direct-effect employment multiplier can be calculated from the multipliers of industries where the direct basic jobs are found. It is the sum of the multipliers in the industries where the funds are spent weighted by each industry's share of expenditures.

In the models direct basic jobs are of two kinds. Industrial direct basic jobs are those due to the sale of goods or services to nonresidents. Household direct basic jobs are those due to expenditures by resident households of outside funds. Indirect basic jobs and induced jobs are combined in the category non-basic resident service jobs.

### **Direct Basic Jobs**

Different methodologies were used to estimate the industrial basic jobs, i.e. those in the 70 Gcode industries and household basic jobs. The latter are not distributed by industry. Estimates of direct basic jobs in the 70 Gode industries were prepared for the year 2005 by **SDO** for all counties from economic base analyses performed at the county level. The economic base analyses included several procedures: sampling firms in the county to determine the share of their sales within the county, consultation with local economic experts and consistency checks with other local economic information such as **BEA**'s Regional Input-output Modeling System (RIMS) multipliers or income estimates.<sup>8</sup> The results of an in-depth analysis of the state's tourist industry were also incorporated in the estimates. The **SDO** prepared separate estimates of direct basic jobs and indirect basic jobs in each of the 70 industry categories. For some industries, notably those in agriculture, tourism or some service categories the distinction between direct basic and indirect basic jobs was difficult to draw. For example, most agricultural output is ultimately exported but the available information makes it difficult to determine how much of such output is sold directly to outsiders and how much to other farmers where it is incorporated into the value of exports. For example, locally produced hay might be

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<sup>8</sup> The economic base analyses are an ongoing process for the SDO and have been underway for several years. Results of earlier years' analyses were updated to 2005 based on latest available data. A detailed description of the development of the base industry estimates can be found on the SDO web site: <http://dola.colorado.gov/dlg/demog/leifadocumentation.html>.

sold to local farmers or to farmers elsewhere. Thus, in some industries, the direct basic jobs estimate also includes some indirect basic jobs.<sup>9</sup>

Direct basic jobs within each Gcode industry were allocated among six industry groups: agriculture, mining, manufacturing, government, regional and national services, and tourism. This allocation was done as a part of the base analysis. Subgroups, e.g. agricultural production, were estimated by assuming that all jobs in a Gcode industry in a particular industry group were in the same subgroup. For example, all crop and livestock production jobs (Gcode 1010) in the agriculture industry group were allocated to agricultural production.

**CBEF** prepared historical estimates of direct basic jobs for 2000-2004 and 2006 using the 2005 ratio of basic jobs to total jobs within each Gcode industry for each county.<sup>10</sup> This was done in order to provide some historical context for the forecasts. Statewide estimates for direct basic jobs were developed by estimating the share direct basic jobs in each of the 6 industry groups in each Gcode industry that results from exports from the state and from intra-state trade. This was necessary because exports within the state offset one another and thus have no net effect on the state economy.<sup>11</sup> State jobs classified by Gcode by industry group were estimated as far back as 1970 by assuming that the share of direct basic jobs in each Gcode industry category remained constant.

Estimates of household direct basic jobs in 2005 were prepared by the **SDO** in four categories: retiree jobs, commuter jobs, jobs resulting from public assistance funds and jobs due to investment income. For all categories direct basic jobs were estimated by first calculating income received by relevant households. Income estimates were based on the **BEA** personal income series. Then the portion of this income spent and resulting local earnings were estimated. The share of income spent varied by recipient and type of income. It was assumed that local earning amounted to 35 percent of expenditures. The ratio of these earnings to total household earnings was computed and this ratio was applied to all jobs except industrial direct and indirect basic jobs, i.e. to all jobs resulting from resident household spending. Preparation of estimates of expenditures in each category is described in the following paragraphs.

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<sup>9</sup> When the forecast were prepared the multipliers for some industries were adjusted to account for the inclusion of indirect basic jobs.

<sup>10</sup> 2000 estimates of county jobs by Gcode were prepared in a manner similar to that used for County forecasts of basic jobs.

<sup>11</sup> The estimated shares state-export of jobs for each industry are shown in the Appendix.

Retiree household jobs include those associated with expenditures made by retirees for local resident services. Retiree's income includes transfer receipts from the federal government and dividends, interest, and rental income. A portion of personal income in these categories was allocated the elderly population based **BLS** consumer expenditure survey data for persons over age 60.<sup>12</sup> All transfer income was estimated to be spent; spending of dividends, interest and rent was estimated based on the consumer expenditure surveys.

Public assistance jobs are associated with expenditures made by households who received their income from public assistance payments made by the federal government. Payments include food stamps, SSI, AFDC, etc. and were based on **BEA** personal income estimates. All payments are assumed to be spent.

Property income jobs are those due to expenditures of dividends, interest and rent excluding that spent by retirees. Property income as reported in the **BEA** personal income estimates and not allocated to retirees was estimated to be spent in a manner similar to that used for retirees, i.e. households at different income levels were assumed to spend different shares of their income.

Commuter household jobs are those resulting from expenditures made by households who earned their income from jobs outside of their county of residence, but who made local resident service purchases with those outside dollars. All of the adjustment for residence series was assumed to be spent. Commuter jobs were then adjusted in several counties where commuters spend a relatively large share of their earnings outside their county of residence. Such counties were identified by comparing commuter jobs as estimated above with all jobs in the county except industrial direct basic jobs. Park County is an example of such a county where retail and local service business are limited and most resident commuters spend a large share of their earnings in Metro Denver or Summit County where they work. For these counties, commuting jobs were shifted from the county of residence to the county of employment. In the case of Park County, commuter jobs were reduced and commuting jobs in Metro Denver and Summit County were increased.

Household basic jobs in years prior to 2005 and for 2006 were estimated by **CBEF** using the same equations used in the forecasting models. For all categories except commuters these involved changes in the relevant income category and in the population with an adjustment for changes in the number of jobs per unit of output. For example, public assistance jobs were based on changes in population under 65 and in transfer payments.

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<sup>12</sup> Data limitations mandated use of the over-60 category.

Commuter jobs were initially assumed be unchanged. Historical estimates for the counties were forced to state totals. County household basic jobs were estimated for 2000-04 while those for the state were estimated back to 1990.

### **Non-basic resident service jobs**

Non-basic resident service jobs include all indirect and induced jobs, i.e. jobs from suppliers to basic industries and those caused by spending of workers in basic industries. All such jobs<sup>13</sup> were lumped into the “non-basic resident service jobs” category which is equal to total jobs less industrial and household direct basic jobs.

### **Demographic and Labor Force Variables**

Historic values of demographic and labor force variables were prepared by **SDO** for all counties. Two population estimates were prepared. The first was based on the decennial Census, although estimates for post-Census years were estimated by **SDO** and may differ from those published by the Census Bureau. These estimates include a distribution of the population by age and sex. The second population estimate, “adjusted population”, includes the undercount or persons not counted in the Census. The estimate of undercount, prepared by **SDO**, differs widely among counties. The civilian adult non-institutional population is the number of persons 16 and over not in the military or institutions and is estimated by **SDO** based on the age distribution of the population and estimates of institutional and military population in the counties.

Civilian labor force participation rates were estimated by **SDO**. These estimates were derived using data from the 2000 Census and the Current Population Survey for different age/sex groups. Participation rates were estimated for various age/sex groups, e.g. women 18-24, and then applied to projected population in these groups to compute the overall participation rate. The **SDO** estimates for 2001-05 are based on participation rates for various age/sex groups reported in the 2000 Census. These are trend estimates that do not take account of changes in labor force participation over the business cycle. In particular, during the economic downturn beginning in 2001 labor force participation fell as weak labor demand caused persons to drop out of the labor force. The **CBEF** estimates used in the models include adjustments of the **SDO** figures to take account of this phenomenon. The overall participation rate was adjusted at the state level. Then the **SDO** county estimates were forced to state totals. The civilian labor force is calculated from participation rates and the estimates of civilian adult non-institutional population.

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<sup>13</sup> As noted earlier, the direct basic jobs estimates include some indirect basic jobs in a number of industries.

These labor force estimates differ from those produced by the **BLS**; the **BLS** figures are based on household surveys. Unemployment rates are from **BLS** but the number of unemployed and employed persons is calculated based on the labor force estimate described above. Multiple job holding was estimated by **SDO** for each county based on Public Use Microdata Samples (PUMS) data from the 1990 Census.<sup>14</sup> Commuting in 2000 was based on Census estimates. For subsequent years, commuting was calculated as a residual between labor supply and demand as described below. Projections of labor force participation and other demographic parameters are used in the forecast as described below.

### **Other Variables**

Other variables include personal income for counties, regions and the state which are estimated by **BEA**. For the state only the Denver-Boulder-Greeley CPIU, single and multiple-family housing permits and retail sales are also included in the model. These estimates are provided by **BLS**, the Census Bureau and the Colorado Revenue Department, respectively.

### **Matching Supply and Demand Forecasts**

In most of Colorado population changes are closely related to development in the local economy. Such economic and population changes are linked through the labor market. Table 1 below displays the calculation of labor supply and demand. The relationship shown in Table 1 is described as a “forecasting worksheet” by **SDO**. This relationship is used in the forecasting models at the state, regional and county levels. The top several items opposite the downward pointing arrow show the calculation of labor demand. Total Jobs is the sum of Industrial Basic Jobs, Household Basic Jobs and Non-basic Resident Service Jobs. Military Jobs are deducted from Total Jobs in order to arrive at Civilian Jobs or total labor demand expressed in number of jobs needed to be filled by nonmilitary persons.

The supply calculation begins with population. Census Population, the bottom item the Table, is consistent with 2000 Census estimates. Estimated Undercount is the number of persons not counted in the Census. Adjusted Population is total population, including undercount. The relationship between population and jobs supplied by residents depends on several key parameters. These result from demographic, economic and behavioral patterns. The Adult Share of Population, or the number of potential labor force participants, largely depends on the age distribution of the population. Civilian Adult

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<sup>14</sup> Employment data from the 2000 Census were not considered reliable.

Non-institutional Population is the number of persons 16 and over not in the military or institutions such as prisons or nursing homes. Another critical parameter is the Labor Force Participation Rate or the proportion of the civilian adult population either working or looking for work. The civilian Labor Force (Residents) is equal to the overall participation rate times the civilian adult population. Unemployed Persons are in the labor force but not holding jobs. Employed Persons equals civilian labor force less unemployed persons. Some of workers will hold more than one job, thus increasing the number of jobs filled by residents. Jobs Multiply Held measure the number of such jobs held by persons already holding another job and is equal to the multiple-job-holding rate times the labor force. Jobs Held by Residents is the estimated number of workers supplied from the resident population.

**Table 1**

<b>ELEMENTS IN LABOR DEMAND AND SUPPLY</b>	
<b>Labor Demand</b>	TOTAL INDUSTRIAL BASIC JOBS
	+ TOTAL HOUSEHOLD BASIC JOBS
	= TOTAL BASIC JOBS
	+ NON-BASIC RESIDENT SV. JOBS
	= TOTAL JOBS
	- MILITARY JOBS
	= CIVILIAN JOBS (DEMAND)
	STATISTICAL DISCREPANCY
	= CIVILIAN JOBS HELD (SUPPLY)
	+ COMMUTING (+ = IN)
	= JOBS HELD BY RESIDENTS
	+ JOBS MULTIPLY HELD
	= EMPLOYED PERSONS (RESIDENTS)
	- UNEMPLOYED PERSONS
	= LABOR FORCE (RESIDENTS)
	X LABOR FORCE PARTICIPATION RATE
	= CIVILIAN ADULT NON-INSTITUTIONAL POPULATION
	X ADULT SHARE OF POPULATION
	= TRUE POPULATION
	+ POPULATION UNDERCOUNT
<b>Labor Supply</b>	POPULATION - CENSUS BASED

If the resident labor force is insufficient to meet demand, workers must be attracted from elsewhere. Conversely, an excess labor force will result in workers commuting to jobs elsewhere. Net Commuting is estimated as a residual, reflecting the difference between jobs held by residents and the total number of jobs held. The Statistical Discrepancy is a measure of the fact that in the base year supply, including commuting estimated from the Census, does not precisely match demand. The statistical discrepancy is held approximately constant after 2000<sup>15</sup>. Changes in commuting patterns after 2000 for the state as well as for the regions and counties were calculated as a residual based on job and labor force growth.

## **Forecasts**

The forecast are prepared in three stages. The state forecast is followed by consistent forecasts for the 14 planning and management regions. Finally county forecasts, consistent with the forecast for each county's region, are generated.

### **Critical Parameters in the Forecast**

The labor supply forecasts at all geographic levels include several critical parameters involved in the relationship between population and the number of jobs held by residents. The first of these is the population undercount. The 2000 estimate of undercount was estimated by **SDO**. For subsequent years the undercount as a proportion of total population is assumed to decline by roughly 30 percent. Civilian non-institutional adult population as a share of total population largely depends on the age mix of the population. Institutional population was forecast by **SDO** based on the planned development of prisons, colleges, military bases and other institutions and the rates of institutionalization by age and sex. Trend labor force participation rates were calculated from the projected age/sex mix of the population and changes in participation rates for various groups.<sup>16</sup> Participation rates were assumed to remain near their current levels for younger workers and to increase somewhat for older workers, particularly for women. The overall labor force participation rate declines somewhat over the next 30 years. Unemployment rates at the county level vary with the state rate. Multiple jobs holding rates were based on the 2000 Census were assumed to remain constant thereafter for all counties; this means that the rates for the state and regions change somewhat as the counties grow at different rates. Birth and death rates at the state level were projected by **SDO**. Birth rates are calculated by applying age-specific fertility rates to the projected female population. The total fertility rate for the state was projected to remain constant over the forecast period. Death rates are calculated in a similar manner, applying survival rates to the each age-sex group. Both female and male survival rates are projected to increase approximately 3 years over the forecast horizon. The age-sex distribution of

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<sup>15</sup> The statistical discrepancy varies slightly to accommodate some smoothing of the net commuting series.

<sup>16</sup> In the forecast the trend labor force participation rates are adjusted for variation over the business cycle.

migrants was estimated by **SDO** and was based on the distribution of migrants during the 1990s.

State and regional multipliers are critical to the forecast. The **BEA** has prepared direct-effect employment multipliers for the state and for 9 regions within the state based on its Regional Industrial Multiplier System (RIMS II).<sup>17</sup> The multipliers for industrial direct basic jobs for the state and regions were derived by matching the industries in the RIMS II system as closely as possible to the 70 Gcode industries. Multipliers for jobs due to household spending were based on assessments of spending patterns of households in each category. For example, since retirees spend a significant portion of their budgets on medical care, the multiplier for medical services was weighted heavily in determining the retiree multiplier. The RIMS II regions were matched as closely as possible with the state Planning and Management Regions. For more sparsely populated regions this sometimes meant that the same multipliers were used for several regions.<sup>18</sup>

## **The State Forecast**

The structure of the state model is summarized in Chart 1 below. The state forecast depends heavily on the national forecast. The US forecast is that most recent prepared by Economy.com. In general, the Economy.com macro model forecasts aggregate economic activity by equating aggregate supply and aggregate demand in the economy. Short-term fluctuations are modeled as shifts in aggregate demand and longer-term movements in the economy are determined on the supply side with expansions in the technological and resource base of the economy as the primary driver of aggregate supply.

The state model includes both econometric relationships among various state and national variables and demographic relationships. The model forecasts labor demand and supply. Imbalances in the labor market are corrected through adjustments in migration into the state.

## **Labor Demand**

Industrial direct basic jobs in each industry are forecast from econometric relationships with detailed national measures of such factors as production, employment or sales. For example, the equation for basic mining employment in oil and gas extraction is:

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<sup>17</sup> See US Department of Commerce, Bureau of Economic Analysis, Regional Multipliers, A User Handbook for the Regional Input-Output Modeling System (RIMS II) Third Edition (1997)

<sup>18</sup> State and regional multipliers are listed in the Appendix.

$$\text{BASMIN2010STATE} = 1223.851323 + 16390.29041 * \text{FCPWTI}(-2) / \text{FPDIGDP}(-2)$$

Where:

**BASMIN2010STATE** is base jobs in the mining segment of industry 2010, oil and gas extraction

**FCPWTI(-2)** is Petroleum Crude Oil Price: West Texas Intermediate lagged 2 years  
**FPDIGDP(-2)** is the GDP Implicit price deflator lagged 2 years

Similar equations are fit for all industry groups in each of the 70 Gcode industries. Many of the Gcode/industry group combinations are empty, i.e. they have not jobs and are therefore not included in the model

Household basic jobs depend on growth in the relevant portions of the population and income, adjusted for productivity gains. Forecast jobs in the retiree category are based on projections of the elderly population, transfer and property income and the output per worker. Those due to spending of property income or wealth appreciation are based on changes dividends, interest and rent, the population under 65 and productivity. Similarly, public assistance jobs depend on transfer payments, the population under 65 and productivity. Jobs due to commuter earnings are initially assumed to be unchanged.

Non-basic resident service jobs generated by the direct basic jobs in 70 industries are based on the multipliers for each industry. The change in total jobs for a given period is equal to the change in basic jobs for all industries plus the sum of indirect and induced jobs generated by basic jobs in each industry. This is summarized in the formula below.

$$\Delta E = \sum_j (M_j \times \Delta B_j)$$

Where:

$\Delta E$  is the change in total number of jobs

$M_j$  is the multiplier for industry j

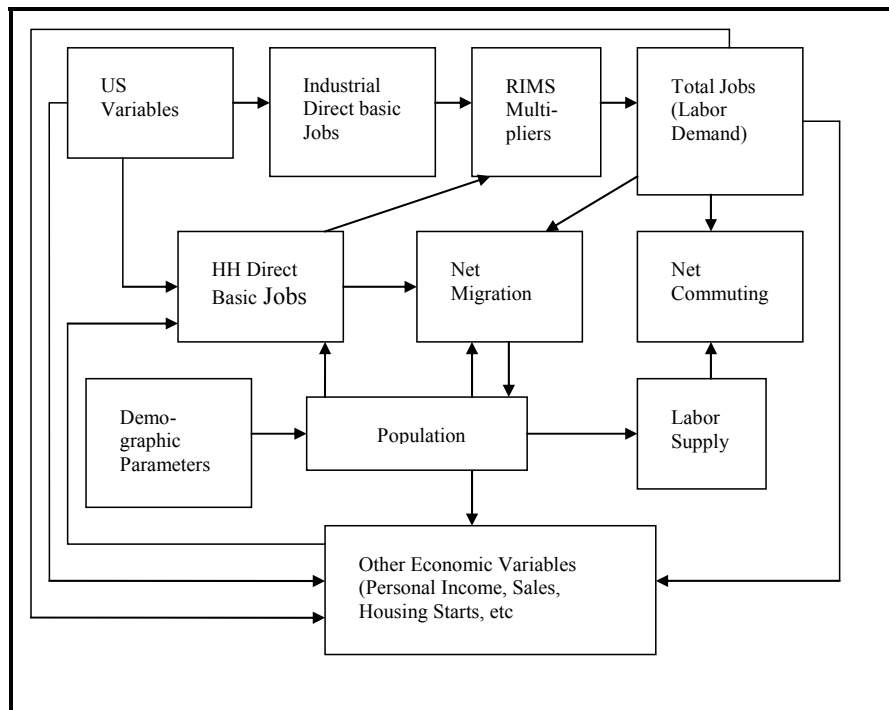
$\Delta B_j$  is the change in basic employment in industry j

### **Labor Supply**

Labor supply is determined by population and the share of population working or seeking work. Demographic relationships, including labor force participation and household formation, are based on changes in the age-distribution of the population and behavioral trends. Population change is equal to births less deaths plus net migration. Births and death rates are specified as described earlier. Migration depends upon the imbalance in

the labor market. Excess demand for labor is made up of two elements. The first is the difference between trend growth in labor demand and the natural increase in the labor force, i.e. the natural increase in the population adjusted for adult civilian share of the population and labor force participation. The second is current labor supply less demand. Net migration into or out of the state is gradually adjusted to eliminate excess demand. The forecast of labor force participation includes a trend element, based on the age-sex mix of the population and long-term trends in worker behavior described earlier, and a cyclical adjustment, which accounts for changes in participation as the labor market tightens or loosens over the business cycle. Finally, net commuting is computed as a residual between labor supply and demand.

**Chart 1**  
**State Forecast Model Flow Chart**



**Other Variables**

Total jobs are forecast in 17 NAICS categories.<sup>19</sup> Industrial direct basic jobs are distributed by NAICS industry category based on their Gcode industry. The remaining jobs are distributed based on econometric relationships involving state and national variables. The share of proprietors' jobs in each NAICS category is also based on econometric relationships. Non-agricultural wage and salary jobs (**BLS** concept) are also estimated based on historical relationship with Gcode jobs. Personal income is forecast

<sup>19</sup> Total jobs in the 70 Gcode industries are not forecast.

by major component such as wages and salaries or transfer payments based on stochastic relationships with other state and national economic variables. For example, wage and salary disbursement depend on Colorado wage and salary employment the ratio of US wage and salary disbursements to employment. State unemployment depends on US unemployment and relative state and national growth.

## **Regional Forecasts**

The structure of the regional and county models is summarized in Chart 2. Both regional and county forecasts are constrained by the need to be consistent with the forecast of larger geographic area. For example, the total of jobs in all of regions must be equal to the state total. Similarly, the forecasts for all the counties in a region must be consistent with that for the region as a whole. In the forecasting models this is accomplished by solving for smaller areas and then forcing the sum of the smaller areas to the total for the larger area.

### **Labor Demand Forecast**

Regional direct basic jobs in each of the 70 Gcode industries are forecast based on the relationship with state-wide direct basic jobs in the same industry. Suppose, for example, that the historical growth rate for jobs in professional and technical services (Gcode11020) in Region 4 was 1 percent per year faster than growth in the same industry for the state as a whole. At the beginning of the forecast, annual job growth in that industry in region 4 would be 1 percent faster than forecast for the state. Regional growth rates are assumed to converge toward the state rate, i.e. the difference between regional and state growth in each industry gradually narrows.

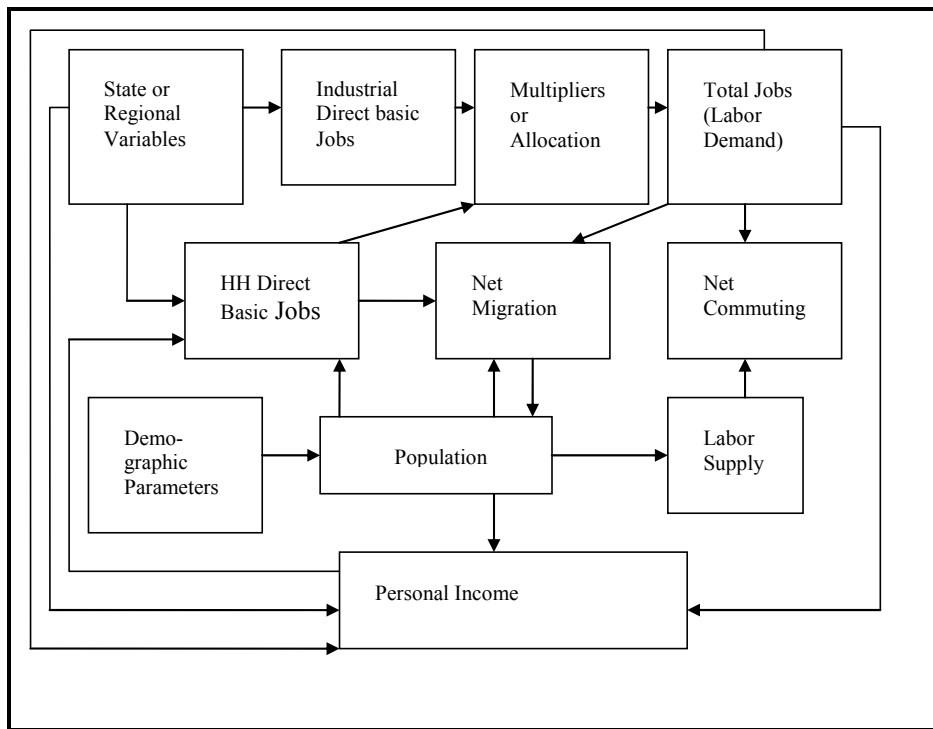
Household basic jobs are calculated from relationships similar to those in the state forecasts. Growth in each category of household basic jobs depends upon growth in the relevant population group and their income. Regional non-basic resident service jobs are calculated in a manner similar to that used in the state forecast. Regional multipliers for each industry are applied to growth in regional direct basic jobs for that industry.

### **Labor Supply Forecast**

In the initial solution of the regional models, labor supply is based on population forecasts for regions and counties prepared by **SDO** adjusted to totals from the state forecasts. The development of the **SDO** forecasts is an iterative process involving both the **CBEF** economic models and **SDO's** population models. The **SDO** cohort survival models generate age-sex specific population forecasts for each county. The assumptions

underlying births and death projections are described above. The age-sex distribution of migrants is estimated based on the distribution of migrants during the 1990s. Independent projections are made for “special populations” including military, college students, prison inmates and seasonal workers. Labor supply is calculated by applying the various demographic and labor supply parameters to the initial population forecast. Regional unemployment rates change in the same proportion as the state rate. Commuting is calculated as a residual based on labor supply and demand. Labor force, employed persons and other variables are forced to state totals and then the parameters are recalculated. The effect of this is that the regional parameters reflect any adjustments made at the state level. Both population and labor demand forecasts are reviewed and adjusted as necessary to make them consistent with expected commuting patterns.

**Chart 2  
Regional and County Forecast Flow Chart**



**Other Variables**

Personal income components are calculated based on changes in the same component at the state level and differences between growth of the driver of that variable at the state and regional levels. For example, the percentage change in wage and salary income for a region is equal to the change for the state plus change in regional wage and salary employment less that for the state. Similar relationships are used to calculate total wage and salary and proprietors jobs. Jobs by NAICS industry category are calculated as the sum of direct basic industrial jobs in that category and an estimate of non-basic resident

service jobs plus household direct basic jobs in the group. This estimate is based on change in direct basic industrial jobs in the region and the relationship at the state level between direct basic industrial jobs and all other jobs in that category.

### County Forecasts

The county forecasts are prepared in a manner similar to the regions with one important difference. Multipliers are not available at the county level. For counties within a region, the region's total growth in non-basic resident service jobs is allocated based on the counties share of regional growth in basic jobs as shown in the formula below.

$$\Delta E_c = \Delta B_c + \Delta NBR S_R \times \Delta B_c / \Delta B_R$$

Where:

$\Delta E_c$  is the change in total number of jobs in county C

$\Delta NBR S_R$  is the change in non-basic regional service jobs in the region

$\Delta B_c$  is the change in direct basic jobs in county C

$\Delta B_R$  is the change in direct basic jobs in the region

Forecasts of jobs by NAICS category were not prepared for counties. The county forecasts are adjusted for consistency with the regional forecasts. This means that the sums of values for counties within a region equaled the regional total.

## APPENDIX

### Appendix Contents

**List of Output Summary Tables**

**List of Industry Sub-groups**

**List of NAICS Industry Groups**

**List of Gcode Industries**

**Table-State Direct Basic Jobs as Share of County Totals**

**Table-State and Regional Multipliers**

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**List of Output Summary Tables**-These tables are excel files that are linked to other excel files that are generated by the Eviews programs listed above and contain tables summarizing the forecasts. Both the tables and the input files are all in the OUTPUT folder.

Tab1s-State labor force supply and demand

Tab2s-State direct basic jobs

Tab3s-Selected state economic variables

Tab4s-State jobs by NAICS industry group

Tab5s-State industrial direct basic jobs by Gcode industry

Regtab1a & Regtab1b-Regional and county labor force supply and demand

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Regtab4-Regional jobs by NAICS industry group

Regtab5-Regional industrial direct basic jobs by Gcode industry

Tabvar1-Tables by Region and County for several key variables

## **List of Industry Sub-groups**

### Agriculture

- 201 Agricultural Production
- 202 Agricultural Inputs
- 203 Agricultural Processing

### Tourism

- 401 Resorts, recreation and lodging
- 402 Tourist-related services
- 403 Tourism-related transportation
- 404 Second home construction and real estate

### Regional and National Service

- 601 Retail
- 602 Health Services
- 603 Business Services
- 604 Construction
- 605 Tech
- 606 Other

### Manufacturing

- 301 Durable Tech
- 302 Durable Other
- 303 Nondurable

### Government

- 501 Federal Civilian
- 502 Federal Military
- 503 State & Local

## **List of NAICS Industry Groups**

- 1 Agriculture
- 2 Mining and Utilities
- 3 Construction
- 4 Manufacturing
- 5 Wholesale and Retail
- 6 Transportation and Warehousing
- 7 Information Services
- 8 Finance and Insurance
- 9 Real Estate
- 10 Professional, Scientific, and Technical Services
- 11 Management of Companies
- 12 Administrative and support and waste Services
- 13 Education, Health Care and Social Assistance
- 14 Arts, Entertainment, and Recreation
- 15 Accommodation and Food Services
- 16 Other Services
- 17 Government

## List of Gcode Industries

<b>Industry Descrip</b>	<b>G code</b>	<b>Industry Descrip</b>	<b>G code</b>
Crops and livestock production	1010	Support for transportation	8040
Farm services	1020	Transit and ground passenger transportation	8050
Oil and gas extraction	2010	Pipeline transportation	8060
Mining (except oil and gas)	2020	Scenic, sightseeing, and water transportation	8070
Support Activities for mining	2030	Couriers and messengers and postal service assista	8080
Utilities	3030	Warehousing and storage	8090
Construction of buildings	4010	Publishing industries	9010
Heavy and civil engineering construction	4020	Motion picture and broadcasting, except internet	9030
Special trade contractors	4030	Internet publishing	9041
Wood product and furniture manufacturing	5010	Other Telecommunications	9042
Nonmetallic mineral product manufacturing	5020	ISPs, search portals, and data processing	9050
Primary and fabricated metal manufacturing	5030	Monetary authorities and credit intermediation, ex	10010
Machinery manufacturing	5040	Securities, commodity contracts and investments	10020
Computer and electrical equipment manufacturing	5050	Insurance carriers, funds, trusts, and other relat	10100
Motor vehicle and transportation manufacturing	5060	Real estate	10200
Miscellaneous manufacturing	5070	Professional and technical services	11020
Food and beverage product manufacturing	5080	Management of companies and enterprises	11030
Textile mills and product, apparel, and leather ma	5090	Administrative and support services	11090
Paper and printing manufacturing	5100	Waste management and remediation services	11100
Chemical manufacturing	5110	Private Educational services	12010
Plastics and rubber products manufacturing	5120	Ambulatory health care services	12020
Wholesale	6010	Hospitals	12030
Motor vehicle and parts dealers	7010	Nursing and residential care facilities	12040
Furniture, electronics, appliances, and building m	7020	Social assistance	12050
Food and beverage stores	7030	Arts, entertainment, and recreation	13010
Health and personal care stores	7040	Accommodation	13020
Gasoline stations	7050	Food services and drinking places	13030
Clothing and clothing accessories stores	7060	Automotive and other repair and maintenance	14010
Sporting goods, hobby, book and music stores	7070	Personal and laundry services	14020
General merchandise stores	7080	Membership associations and organizations	14030
Miscellaneous store retailers	7090	Private households	14040
Nonstore retailers	7100	Federal government, civilian	15010
Air transportation	8010	Military	15014
Rail transportation	8020	State Government	15020
Truck transportation	8030	Local Government	15030

**STATE DIRECT BASIC JOBS AS % OF COUNTY TOTALS**

<u>G code</u>	<u>Industry Description</u>	<u>Regional</u>						<u>Tourism</u>
		<u>Agribusines</u>	<u>Mining</u>	<u>Manufactu</u>	<u>Governme</u>	<u>onal</u>	<u>Indirect</u>	
		<u>ss</u>	<u>Jobs</u>	<u>ring</u>	<u>nt</u>	<u>Services</u>	<u>Basic</u>	<u>Jobs</u>
		<u>Jobs</u>	<u>Jobs</u>	<u>Jobs</u>	<u>Jobs</u>	<u>Jobs</u>	<u>Jobs</u>	<u>Jobs</u>
1010	Crops and livestock production	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
1020	Farm services	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
2010	Oil and gas extraction	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
2020	Mining (except oil and gas)	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
2030	Support Activities for mining	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
3030	Utilities	90.0%	90.0%	90.0%	90.0%	100.0%	90.0%	67.0%
4010	Construction of buildings	90.0%	90.0%	90.0%	90.0%	33.0%	90.0%	67.0%
4020	Heavy and civil engineering construction	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	67.0%
4030	Special trade contractors	90.0%	90.0%	90.0%	90.0%	33.0%	90.0%	67.0%
5010	Wood product and furniture manufacturing	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
5020	Nonmetallic mineral product manufacturing	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
5030	Primary and fabricated metal manufacturing	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
5040	Machinery manufacturing	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
5050	Computer and electrical equipment manufacturing	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
5060	Motor vehicle and transportation manufacturing	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
5070	Miscellaneous manufacturing	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
5080	Food and beverage product manufacturing	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
5090	Textile mills and product, apparel, and leather ma	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
5100	Paper and printing manufacturing	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
5110	Chemical manufacturing	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
5120	Plastics and rubber products manufacturing	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
6010	Wholesale	90.0%	90.0%	90.0%	90.0%	50.0%	90.0%	67.0%
7010	Motor vehicle and parts dealers	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
7020	Furniture, electronics, appliances, and building m	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
7030	Food and beverage stores	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
7040	Health and personal care stores	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
7050	Gasoline stations	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
7060	Clothing and clothing accessories stores	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
7070	Sporting goods, hobby, book and music stores	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
7080	General merchandise stores	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
7090	Miscellaneous store retailers	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
7100	Nonstore retailers	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
8010	Air transportation	90.0%	90.0%	90.0%	90.0%	80.0%	90.0%	67.0%
8020	Rail transportation	90.0%	90.0%	90.0%	90.0%	67.0%	90.0%	67.0%
8030	Truck transportation	90.0%	90.0%	90.0%	90.0%	50.0%	90.0%	67.0%
8040	Support for transportation	90.0%	90.0%	90.0%	90.0%	80.0%	90.0%	67.0%

**STATE DIRECT BASIC JOBS AS % OF COUNTY TOTALS**

<u>G code</u>	<u>Industry Description</u>	<u>Regional</u>						<u>Tourism</u>
		<u>Agribusines</u>	<u>Mining</u>	<u>Manufacturing</u>	<u>Government</u>	<u>onal</u>	<u>Indirect</u>	
		<u>ss</u>	<u>Jobs</u>	<u>ring</u>	<u>nt</u>	<u>Services</u>	<u>Basic</u>	<u>Jobs</u>
		<u>Jobs</u>	<u>Jobs</u>	<u>Jobs</u>	<u>Jobs</u>	<u>Jobs</u>	<u>Jobs</u>	<u>Jobs</u>
8050	Transit and ground passenger transportation	90.0%	90.0%	90.0%	90.0%	100.0%	90.0%	67.0%
8060	Pipeline transportation	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
8070	Scenic, sightseeing, and water transportation	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
8080	Couriers and messengers and postal service assista	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
8090	Warehousing and storage	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
9010	Publishing industries	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
9030	Motion picture and broadcasting, except internet	90.0%	90.0%	90.0%	90.0%	100.0%	90.0%	67.0%
9041	Internet publishing	90.0%	90.0%	90.0%	90.0%	100.0%	90.0%	67.0%
9042	Other Telecommunications	90.0%	90.0%	90.0%	90.0%	100.0%	90.0%	67.0%
9050	ISPs, search portals, and data processing	90.0%	90.0%	90.0%	90.0%	100.0%	90.0%	67.0%
10010	Monetary authorities and credit intermediation, ex	90.0%	90.0%	90.0%	90.0%	100.0%	90.0%	67.0%
10020	Securities, commodity contracts and investments	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	67.0%
10100	Insurance carriers, funds, trusts, and other relat	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	67.0%
10200	Real estate	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	67.0%
11020	Professional and technical services	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	67.0%
11030	Management of companies and enterprises	90.0%	90.0%	90.0%	90.0%	100.0%	90.0%	67.0%
11090	Administrative and support services	90.0%	90.0%	90.0%	90.0%	100.0%	90.0%	67.0%
11100	Waste management and remediation services	90.0%	90.0%	90.0%	90.0%	75.0%	90.0%	67.0%
12010	Private Educational services	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
12020	Ambulatory health care services	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
12030	Hospitals	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
12040	Nursing and residential care facilities	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
12050	Social assistance	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
13010	Arts, entertainment, and recreation	90.0%	90.0%	90.0%	90.0%	50.0%	90.0%	67.0%
13020	Accommodation	90.0%	90.0%	90.0%	90.0%	25.0%	90.0%	67.0%
13030	Food services and drinking places	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
14010	Automotive and other repair and maintenance	90.0%	90.0%	90.0%	90.0%	100.0%	90.0%	67.0%
14020	Personal and laundry services	90.0%	90.0%	90.0%	90.0%	100.0%	90.0%	67.0%
14030	Membership associations and organizations	90.0%	90.0%	90.0%	90.0%	100.0%	90.0%	67.0%
14040	Private households	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
15010	Federal government, civilian	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
15014	Military	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
15020	State healthcare and educaton	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%
15030	Local education services	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	67.0%

## State and Regional Multipliers

Gcode	Description	Multipliers							
		State	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7
1010	Crops and livestock production	2.396	2.175	2.241	1.603	1.628	2.175	2.175	1.713
1020	Farm services	2.396	2.175	2.241	1.603	1.628	2.175	2.175	1.713
2010	Oil and gas extraction	5.582	2.879	3.983	5.115	4.190	2.879	2.879	2.355
2020	Mining (except oil and gas)	3.292	1.944	2.310	2.919	2.439	1.944	1.944	2.058
2030	Support Activities for mining	3.099	1.802	2.288	3.070	2.873	1.802	1.802	1.787
3030	Utilities	4.378	2.693	2.777	3.907	2.802	2.693	2.693	2.353
4010	Construction of buildings	2.292	1.685	1.932	2.208	1.995	1.685	1.685	1.717
4020	Heavy and civil engineering construction	2.292	1.685	1.932	2.208	1.995	1.685	1.685	1.717
4030	Special trade contractors	2.292	1.685	1.932	2.208	1.995	1.685	1.685	1.717
5010	Wood product and furniture manufacturing	2.108	1.524	1.633	2.050	1.679	1.524	1.524	1.492
5020	Nonmetallic mineral product manufacturing	2.981	2.143	2.692	2.705	2.185	2.143	2.143	2.214
5030	Primary and fabricated metal manufacturing	3.807	0.000	3.203	3.131	2.733	0.000	0.000	2.508
5040	Machinery manufacturing	2.798	1.964	2.253	2.521	2.200	1.964	1.964	2.009
5050	Computer and electrical equipment manufacturing	4.510	0.000	3.664	3.800	3.346	0.000	0.000	2.097
5060	Motor vehicle and transportation manufacturing	2.685	1.807	2.241	2.445	2.061	1.807	1.807	1.803
5070	Miscellaneous manufacturing	2.414	1.661	1.853	2.344	1.911	1.661	1.661	1.699
5080	Food and beverage product manufacturing	4.740	3.619	5.529	3.592	4.004	3.619	3.619	1.998
5090	Textile mills and product, apparel, and leather ma	1.918	1.499	1.649	1.878	1.568	1.499	1.499	1.428
5100	Paper and printing manufacturing	2.106	1.580	1.696	2.060	1.756	1.580	1.580	1.521
5110	Chemical manufacturing	3.839	2.439	2.683	4.101	2.829	2.439	2.439	2.542
5120	Plastics and rubber products manufacturing	2.371	1.739	1.981	2.281	1.852	1.739	1.739	1.789
6010	Wholesale	2.529	1.774	1.987	2.456	2.137	1.774	1.774	1.778
7010	Motor vehicle and parts dealers	1.679	1.337	1.424	1.658	1.495	1.337	1.337	1.343
7020	Furniture, electronics, appliances, and building m	1.679	1.337	1.424	1.658	1.495	1.337	1.337	1.343
7030	Food and beverage stores	1.679	1.337	1.424	1.658	1.495	1.337	1.337	1.343
7040	Health and personal care stores	1.679	1.337	1.424	1.658	1.495	1.337	1.337	1.343
7050	Gasoline stations	1.679	1.337	1.424	1.658	1.495	1.337	1.337	1.343
7060	Clothing and clothing accessories stores	1.679	1.337	1.424	1.658	1.495	1.337	1.337	1.343
7070	Sporting goods, hobby, book and music stores	1.679	1.337	1.424	1.658	1.495	1.337	1.337	1.343
7080	General merchandise stores	1.679	1.337	1.424	1.658	1.495	1.337	1.337	1.343
7090	Miscellaneous store retailers	1.679	1.337	1.424	1.658	1.495	1.337	1.337	1.343
7100	Nonstore retailers	1.679	1.337	1.424	1.658	1.495	1.337	1.337	1.343
8010	Air transportation	4.022	0.000	2.970	3.882	3.392	0.000	0.000	2.315
8020	Rail transportation	3.300	2.033	2.576	3.099	2.628	2.033	2.033	2.175
8030	Truck transportation	2.554	1.920	2.093	2.515	2.033	1.920	1.920	1.798
8040	Support for transportation	1.880	1.446	1.608	1.839	1.625	1.446	1.446	1.469
8050	Transit and ground passenger transportation	1.458	1.224	1.275	1.438	1.318	1.224	1.224	1.219
8060	Pipeline transportation	1.880	1.446	1.608	1.839	1.625	1.446	1.446	1.469
8070	Scenic, sightseeing, and water transportation	1.880	1.446	1.608	1.839	1.625	1.446	1.446	1.469
8080	Couriers and messengers and postal service assista	1.880	1.446	1.608	1.839	1.625	1.446	1.446	1.469
8090	Warehousing and storage	1.775	1.428	1.496	1.717	1.736	1.428	1.428	1.429
9010	Publishing industries	2.702	1.765	2.160	2.580	2.395	1.765	1.765	1.742
9030	Motion picture and broadcasting, except internet	2.084	1.384	1.547	2.097	1.836	1.384	1.384	1.450
9041	Internet publishing	3.608	2.172	2.432	3.488	2.959	2.172	2.172	2.153
9042	Other Telecommunications	3.608	2.172	2.432	3.488	2.959	2.172	2.172	2.153
9050	ISPs, search portals, and data processing	3.608	2.172	2.432	3.488	2.959	2.172	2.172	2.153
10010	Monetary authorities and credit intermediation, ex	2.676	1.786	1.944	2.644	2.225	1.786	1.786	1.812
10020	Securities, commodity contracts and investments	2.351	1.591	1.709	2.374	1.894	1.591	1.591	1.615
10100	Insurance carriers, funds, trusts, and other relat	2.927	1.771	2.091	3.006	2.374	1.771	1.771	1.829
10200	Real estate	3.055	2.580	2.509	2.920	2.797	2.580	2.580	2.257
11020	Professional and technical services	2.278	1.693	1.863	2.186	1.993	1.693	1.693	1.682
11030	Management of companies and enterprises	2.434	1.774	1.872	2.356	2.075	1.774	1.774	1.768
11090	Administrative and support services	1.543	1.272	1.366	1.512	1.425	1.272	1.272	1.299
11100	Waste management and remediation services	3.141	2.181	2.505	2.971	2.658	2.181	2.181	2.261
12010	Private Educational services	1.555	1.292	1.344	1.525	1.433	1.292	1.292	1.294
12020	Ambulatory health care services	2.072	1.596	1.670	2.018	1.795	1.596	1.596	1.601
12030	Hospitals	1.834	1.445	1.538	1.791	1.631	1.445	1.445	1.458
12040	Nursing and residential care facilities	1.834	1.445	1.538	1.791	1.631	1.445	1.445	1.458
12050	Social assistance	1.363	1.183	1.236	1.341	1.268	1.183	1.183	1.189
13010	Arts, entertainment, and recreation	1.552	1.289	1.360	1.523	1.409	1.289	1.289	1.299
13020	Accommodation	1.572	1.297	1.372	1.524	1.416	1.297	1.297	1.292
13030	Food services and drinking places	1.357	1.192	1.231	1.321	1.232	1.192	1.192	1.178
14010	Automotive and other repair and maintenance	1.759	1.362	1.462	1.717	1.586	1.362	1.362	1.422
14020	Personal and laundry services	1.759	1.362	1.462	1.717	1.586	1.362	1.362	1.422
14030	Membership associations and organizations	1.759	1.362	1.462	1.717	1.586	1.362	1.362	1.422
14040	Private households	1.300	1.129	1.203	1.272	1.213	1.129	1.129	1.142
15010	Federal government, civilian	1.957	1.412	1.647	1.867	1.679	1.412	1.412	1.454
15014	Military	1.578	1.249	1.391	1.524	1.410	1.249	1.249	1.274
15020	State Government	1.551	1.237	1.372	1.499	1.391	1.237	1.237	1.262
15030	Local Government	1.551	1.237	1.372	1.499	1.391	1.237	1.237	1.262
Household Direct Basic Industries									
	Commuters	1.500	1.215	1.338	1.453	1.355	1.215	1.215	1.237
	Federal payments to hhds <65	1.800	1.345	1.541	1.725	1.568	1.345	1.345	1.380
	Dividends, interest and rent to <65 hhds	2.100	1.474	1.744	1.997	1.781	1.474	1.474	1.522
	Households over 65, retirees	2.000	1.431	1.676	1.906	1.710	1.431	1.431	1.475

## State and Regional Multipliers (Cont.)

Gcode	Description	Multipliers						
		Region 8	Region 9	Region 10	Region 11	Region 12	Region 13	Region 14
1010	Crops and livestock production	1.751	1.685	1.793	1.662	1.685	1.685	1.751
1020	Farm services	1.751	1.685	1.793	1.844	1.685	1.685	1.751
2010	Oil and gas extraction	2.560	3.407	3.120	2.891	3.407	3.407	2.560
2020	Mining (except oil and gas)	2.264	2.862	2.665	2.434	2.862	2.862	2.264
2030	Support Activities for mining	1.847	2.501	2.306	2.141	2.501	2.501	1.847
3030	Utilities	2.616	2.764	2.902	2.945	2.764	2.764	2.616
4010	Construction of buildings	1.697	1.770	1.836	1.852	1.770	1.770	1.697
4020	Heavy and civil engineering construction	1.697	1.770	1.836	1.852	1.770	1.770	1.697
4030	Special trade contractors	1.697	1.770	1.836	1.852	1.770	1.770	1.697
5010	Wood product and furniture manufacturing	1.632	1.537	1.705	1.730	1.537	1.537	1.632
5020	Nonmetallic mineral product manufacturing	2.210	2.219	2.166	2.165	2.219	2.219	2.210
5030	Primary and fabricated metal manufacturing	0.000	1.984	1.999	1.346	1.984	1.984	0.000
5040	Machinery manufacturing	1.902	1.693	1.892	1.927	1.693	1.693	1.902
5050	Computer and electrical equipment manufacturing	0.000	2.144	2.390	2.399	2.144	2.144	0.000
5060	Motor vehicle and transportation manufacturing	2.036	1.660	1.872	1.919	1.660	1.660	2.036
5070	Miscellaneous manufacturing	1.742	1.783	1.912	1.952	1.783	1.783	1.742
5080	Food and beverage product manufacturing	3.406	2.274	2.590	2.779	2.274	2.274	3.406
5090	Textile mills and product, apparel, and leather ma	1.433	1.451	1.570	1.590	1.451	1.451	1.433
5100	Paper and printing manufacturing	1.556	1.535	1.622	1.638	1.535	1.535	1.556
5110	Chemical manufacturing	2.413	2.373	2.688	1.941	2.373	2.373	2.413
5120	Plastics and rubber products manufacturing	1.662	1.634	1.953	1.451	1.634	1.634	1.662
6010	Wholesale	1.766	1.818	1.901	1.919	1.818	1.818	1.766
7010	Motor vehicle and parts dealers	1.342	1.377	1.399	1.401	1.377	1.377	1.342
7020	Furniture, electronics, appliances, and building m	1.342	1.377	1.399	1.401	1.377	1.377	1.342
7030	Food and beverage stores	1.342	1.377	1.399	1.401	1.377	1.377	1.342
7040	Health and personal care stores	1.342	1.377	1.399	1.401	1.377	1.377	1.342
7050	Gasoline stations	1.342	1.377	1.399	1.401	1.377	1.377	1.342
7060	Clothing and clothing accessories stores	1.342	1.377	1.399	1.401	1.377	1.377	1.342
7070	Sporting goods, hobby, book and music stores	1.342	1.377	1.399	1.401	1.377	1.377	1.342
7080	General merchandise stores	1.342	1.377	1.399	1.401	1.377	1.377	1.342
7090	Miscellaneous store retailers	1.342	1.377	1.399	1.401	1.377	1.377	1.342
7100	Nonstore retailers	1.342	1.377	1.399	1.401	1.377	1.377	1.342
8010	Air transportation	2.257	3.081	2.918	2.757	3.081	3.081	2.257
8020	Rail transportation	2.164	2.385	2.499	2.438	2.385	2.385	2.164
8030	Truck transportation	1.863	1.811	1.976	1.986	1.811	1.811	1.863
8040	Support for transportation	1.479	1.571	1.613	1.583	1.571	1.571	1.479
8050	Transit and ground passenger transportation	0.000	1.246	1.272	1.271	1.246	1.246	0.000
8060	Pipeline transportation	1.479	1.571	1.613	1.583	1.571	1.571	1.479
8070	Scenic, sightseeing, and water transportation	1.479	1.571	1.613	1.583	1.571	1.571	1.479
8080	Couriers and messengers and postal service assista	1.479	1.571	1.613	1.583	1.571	1.571	1.479
8090	Warehousing and storage	1.434	1.456	1.497	1.503	1.456	1.456	1.434
9010	Publishing industries	1.756	1.829	1.956	1.974	1.829	1.829	1.756
9030	Motion picture and broadcasting, except internet	1.429	1.627	1.576	1.507	1.627	1.627	1.429
9041	Internet publishing	2.087	2.246	2.332	2.334	2.246	2.246	2.087
9042	Other Telecommunications	2.087	2.246	2.332	2.334	2.246	2.246	2.087
9050	ISPs, search portals, and data processing	2.087	2.246	2.332	2.334	2.246	2.246	2.087
10010	Monetary authorities and credit intermediation, ex	1.813	1.921	1.977	1.969	1.921	1.921	1.813
10020	Securities, commodity contracts and investments	1.607	1.698	1.740	1.731	1.698	1.698	1.607
10100	Insurance carriers, funds, trusts, and other relat	1.755	1.781	1.928	1.961	1.781	1.781	1.755
10200	Real estate	2.099	2.049	2.349	2.435	2.049	2.049	2.099
11020	Professional and technical services	1.661	1.760	1.801	1.802	1.760	1.760	1.661
11030	Management of companies and enterprises	1.782	1.799	1.887	1.903	1.799	1.799	1.782
11090	Administrative and support services	1.276	1.351	1.354	1.356	1.351	1.351	1.276
11100	Waste management and remediation services	2.141	2.194	2.403	2.494	2.194	2.194	2.141
12010	Private Educational services	1.286	1.346	1.357	1.350	1.346	1.346	1.286
12020	Ambulatory health care services	1.602	1.595	1.649	1.667	1.595	1.595	1.602
12030	Hospitals	1.452	1.488	1.520	1.523	1.488	1.488	1.452
12040	Nursing and residential care facilities	1.452	1.488	1.520	1.523	1.488	1.488	1.452
12050	Social assistance	1.188	1.208	1.221	1.220	1.208	1.208	1.188
13010	Arts, entertainment, and recreation	1.298	1.397	1.377	1.348	1.397	1.397	1.298
13020	Accommodation	1.302	1.328	1.351	1.352	1.328	1.328	1.302
13030	Food services and drinking places	1.183	1.184	1.208	1.212	1.184	1.184	1.183
14010	Automotive and other repair and maintenance	1.388	1.462	1.475	1.452	1.462	1.462	1.388
14020	Personal and laundry services	1.388	1.462	1.475	1.452	1.462	1.462	1.388
14030	Membership associations and organizations	1.388	1.462	1.475	1.452	1.462	1.462	1.388
14040	Private households	1.129	1.159	1.171	1.164	1.159	1.159	1.129
15010	Federal government, civilian	1.411	1.506	1.547	1.523	1.506	1.506	1.411
15014	Military	1.248	1.305	1.330	1.316	1.305	1.305	1.248
15020	State Government	1.236	1.291	1.315	1.301	1.291	1.291	1.236
15030	Local Government	1.236	1.291	1.315	1.301	1.291	1.291	1.236
Household Direct Basic Industries								
	Commuters	1.215	1.264	1.286	1.273	1.264	1.264	1.215
	Federal payments to hhds <65	1.343	1.423	1.457	1.437	1.423	1.423	1.343
	Dividends, interest and rent to <65 hhds	1.472	1.581	1.629	1.601	1.581	1.581	1.472
	Households over 65, retirees	1.429	1.529	1.572	1.547	1.529	1.529	1.429