



TECHNICAL MEMORANDUM TASK 4:

DEMOGRAPHIC, ECONOMIC, AND TRAVEL DEMAND PROJECTIONS

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Executive Summary

The U.S. population is growing faster than many other developed countries and is expected to increase nearly 50 percent to 435 million by 2055. This growth is not forecast to be evenly distributed, as population in the West and South is projected to grow much faster than in the Northeast and Midwest. Also, the age distribution of the nation's population will change dramatically. By 2030, the absolute number of older people will have grown from 34 million to over 70 million. As a result, in less than three decades, one in five Americans will be over 65 and almost one in eight of those seniors will be over 85.

U.S. economic growth is anticipated to remain healthy; with real gross domestic product (GDP) projected to expand by 2.8 percent annually in real dollars with a high and low that are 0.5 percent above and below this rate respectively. A strong growth in GDP can lead to higher vehicle miles of travel (VMT). With a healthy GDP growth and a globally competitive U.S. economy, total freight tonnage is projected to double by 2035, with trucks carrying the vast majority of all freight as measured in originating tons.

Overall VMT is projected to climb at a steady pace of about 2 percent annually with a high and low range of 2.4 and 1.6 percent per-year respectively. Compared to the average annual growth rate of 2.96 percent over the 1982 to 2002 20-year period, projected VMT growth is expected to be more moderate. VMT in rural areas is expected to grow by 2.24 percent annually and urban VMT by 1.93 percent annually. For the Interstate Highway System, VMT growth is expected to be only slightly higher at 2.41 percent on rural Interstates and 1.95 on urban Interstates.

The forecasted trends in the demographic and economic factors, along with the forecasts of continued growth in VMT and freight demands, will require a robust highway and intermodal transportation system. The Interstate Highway System is expected to remain the most important part of the nation's transportation system.

Population Projections

Total national interim population projections, based on the 2000 Census, are available from the Bureau of the Census out to 2050; these projections consider race, age, and sex and are not divided by region. These projections were released in March 2004 and incorporate the results of the 2000 Census. Regional, division, and state population projections by gender and age from 2000 to 2030 were released by the U.S. Census Bureau in April 2005. These projections are also based on Census 2000 results.

These national and state population projections constitute an interim update and will likely be replaced next year when the Population Division of the Census develops a revised set of state population projections that are consistent with a revised set of national population projections. National projections are based on assumptions developed for projections that were released in January 2000, with slight modifications to the assumptions about the rates of population change for fertility, mortality, and international migration. Compared to the January 2000 projections, the modified assumptions resulted in a forecast of a slight reduction in fertility, no change in mortality, and a small increase in international migration assumptions. With regard to state population projections, the general assumption is that state-specific trends in fertility, mortality, domestic and international migration will continue.

Because of the interim nature of the latest projections that are based on the year 2000 Census, the forecasts have been adjusted and disaggregated to regions based on the results of earlier Census estimates of breakouts by region, which were in turn based on the 1990 Census. The forecasts based on the 1990 Census also included high, middle, and low forecasts, and the new year 2000 estimates have also been factored based on these previous Census analyses in order to come up with high, medium, and low forecasts of future population.

High, Low, Middle Series and National Interim Projections

Census has historically provided a range of population forecasts that include a high, low, middle, and no immigration scenario. The middle series is the most commonly used population projection series. These scenarios have not yet been updated for the 2000 Census.) The 1990 middle series underestimated current population particularly due to increased immigration. The 1990 based middle series also projected a slightly lower percent growth to 2050 than the latest 2004 national interim projection; 46.6 percent compared to 48.8 percent.

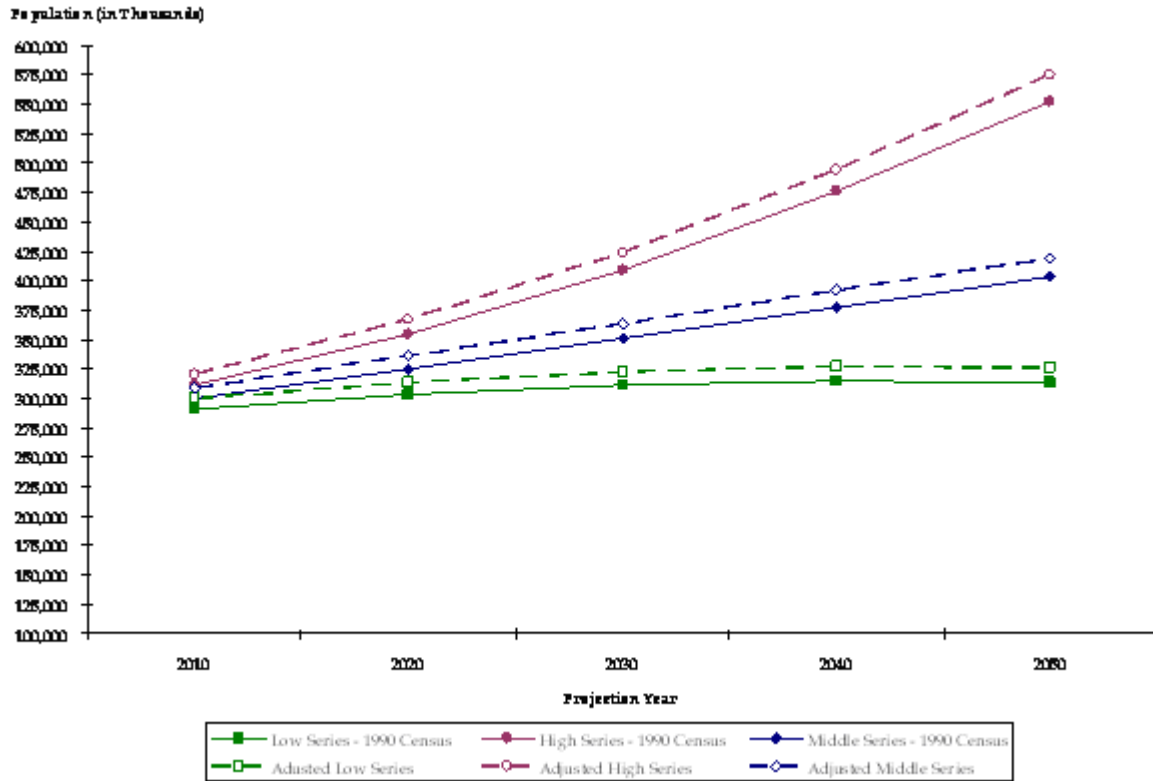
The same components of change that underpin the 1990 based middle series – fertility, mortality, and international migration – also underpin the Census Bureau’s high and low series projections. High and low projections represent “extreme” values where the three components of change were varied in order to produce a future population range. Because these series are based on extreme values, the high and low series do not represent probable population scenarios. Instead, they provide a range for which population projections will be highly likely to fall within. The middle series from the 1990 based forecasts was normalized to agree with 2000 based national projections, as were the high and low series to agree with the revised middle series; these projections are in Table 4.1. Figure 4.1 depicts the three 1990

based series as adjusted by the consulting team to be consistent with the latest 2000 based national interim projections.

Table 4.1 Normalized Middle, High, and Low Series Projections Consistent With the 2000 Census 2000-2055

	2000	2005	2010	2020	2030	2035	2040	2050	2055
Middle Series Normalized to Interim Projections	282,125	295,507	308,936	335,805	363,584	379,341	391,946	419,854	435,015
Low Series Normalized to Interim Projections	281,661	291,690	300,231	313,830	322,765	326,758	326,845	326,103	325,273
High Series Normalized to Interim Projections	282,648	300,255	320,318	366,515	424,204	459,827	494,359	574,894	620,917

Figure 4.1 Adjusted Middle, Low, and High Series Population Projections to be Consistent With National Interim Projections, 2010-2050

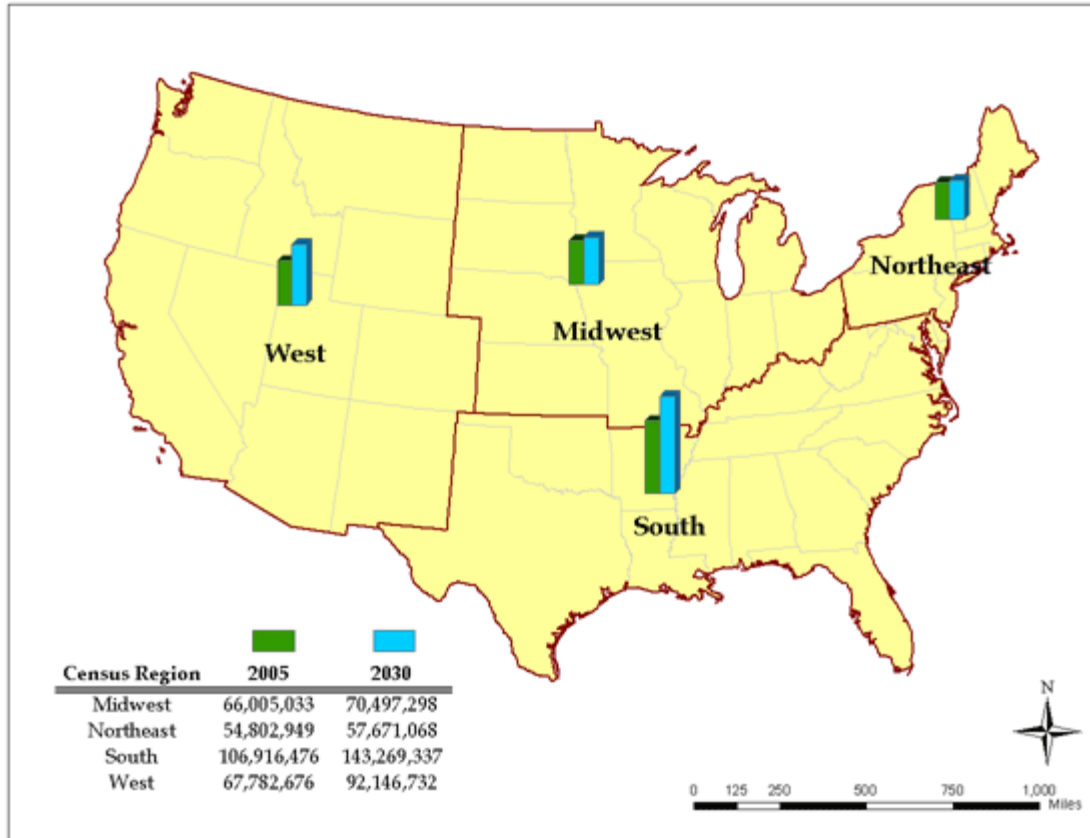


National interim projections produced by the Census Bureau are only available by decade increments. Therefore, in order to produce projections consistent with the national projections for the years 2035 and 2055, the average yearly percent change within each decade was applied to get estimates for those interim years.

Demographic Trends

The Census Bureau divides population estimates and projections into several geographic categories: nation, region, division, and state. States are organized into 9 divisions and four regions – Northeast, Midwest, South, and West. This section will discuss population trends at the regional level; see Figure 4.2.

Figure 4.2 Census Region Population Forecast, 2005-2030¹



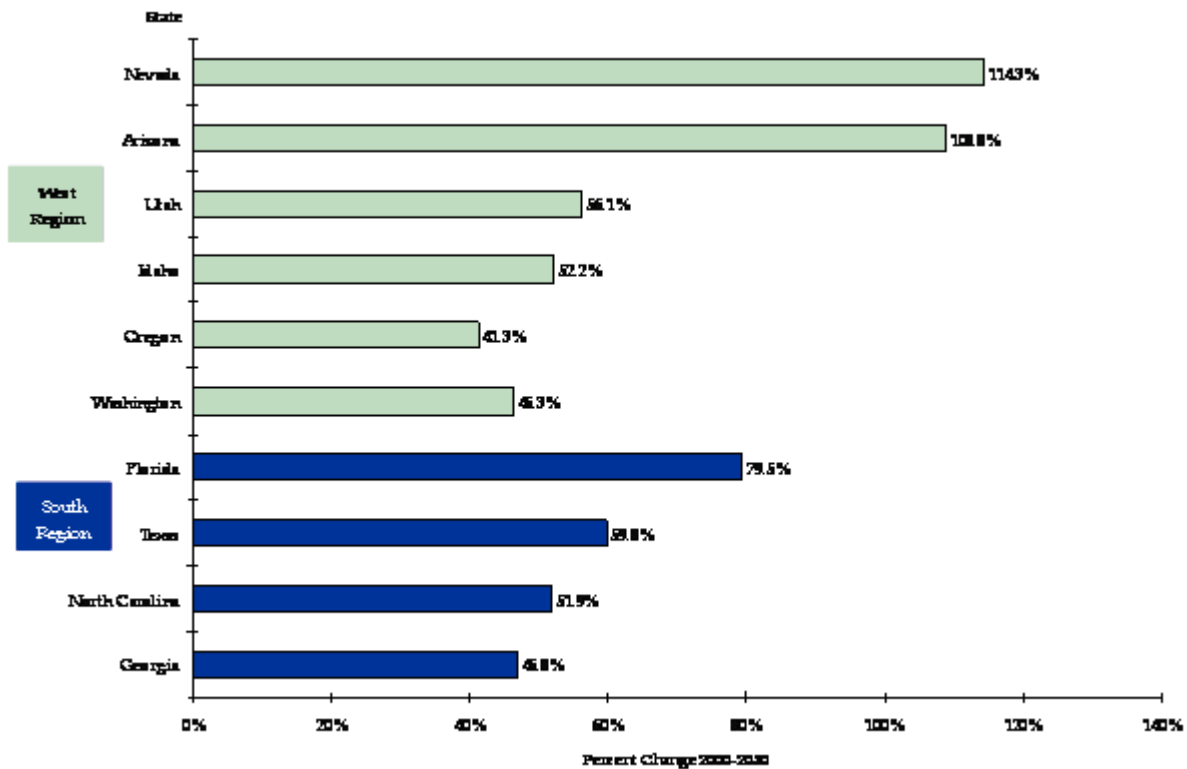
According to the interim projections, the population is expected to grow in the South by 42.9 percent over the period 2000 to 2030. This constitutes a population increase of nearly 44 million. During the same period, the West is projected to grow even more rapidly by 45.8 percent, and to add approximately 29 million. The Census Bureau projects that approximately 83 million people will be added to the national population by 2030 and that nearly 88 percent of this growth will occur in the South and West. Projected population growth in these regions dwarfs the projected growth in the Northeast and Midwest, which are expected to grow by 7.6 percent (adding 4 million population) and 9.5 percent (adding 6 million population) respectively.

¹ Note: Alaska and Hawaii not shown, but their populations are included in the West region total.

State Population Growth Forecasts

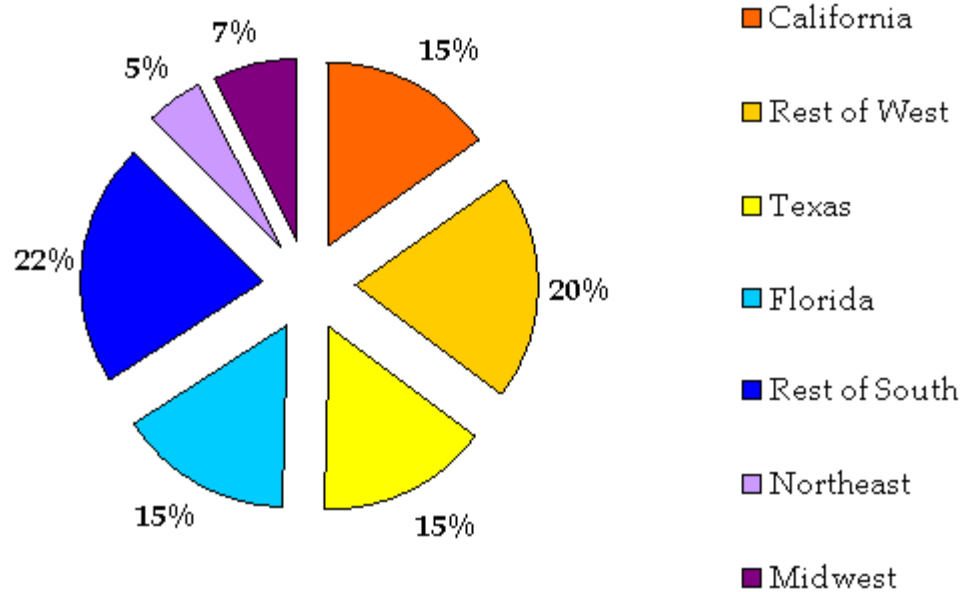
The states forecast to expand their populations the most are all located in either the South or West region as shown in Figure 4.3. In the South, Florida and Texas are forecast to add nearly 13 million people to each state between 2000 and 2030, which is a 79.5 percent increase and 59.8 percent increase respectively. California is also expected to add approximately 13 million, for a 37.1 percent increase during this time period. Nevada's population will grow in absolute terms from less than 2 million people in 2000 to over 4 million by 2030, an increase of 114.3 percent. Such rapid growth exceeds all other states in percentage terms, with Arizona being a close second with a 108.8 percent increase.

Figure 4.3 Ten Fastest Growing States, 2000-2030



Based on the 2000 Census, the five most populous states in rank order are: 1) California, 2) Texas, 3) New York, 4) Florida, and 5) Illinois. By 2030, the five most populous states in rank order are anticipated to be: 1) California, 2) Texas, 3) Florida, 4) New York, and 5) Illinois. In fact, of the 82.2 million people expected to be added to the U.S. by 2030, nearly half (over 45 percent) are forecast to be added in the three states of California, Texas, and Florida; see Figure 4.4.

Figure 4.4 Share of Population Changes, 2000-2030



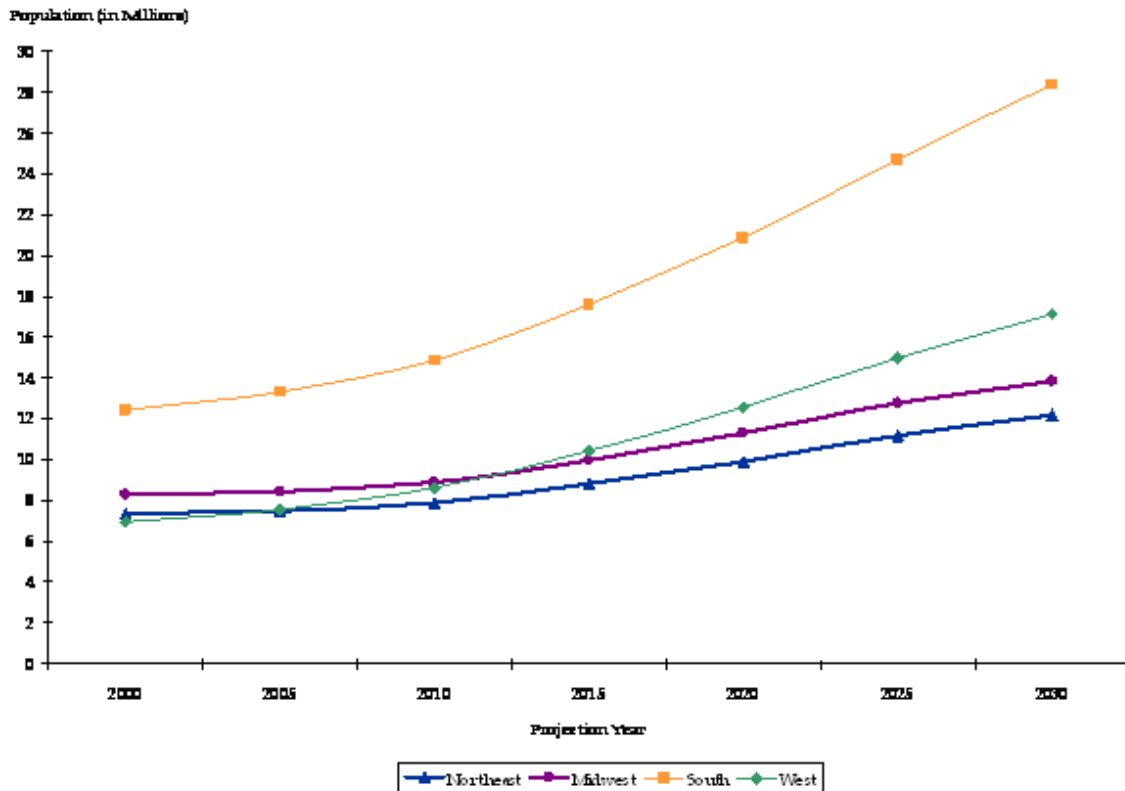
Population Growth by Age Categories

The population age 65 and older is forecast to increase significantly by 2030. As a percent of the total population, those who are 65 and older will increase from 12 percent in 2005 to 20 percent in 2030. By 2030, the absolute number of older people will have grown from 35 million to 71 million. As a result, in less than three decades, one in five Americans will be over 65. Almost one in eight of those over 65 will also be over 85.

Florida will have the highest percentage of population growth for those aged 65 and older from 2000 to 2030. In fact, 26 states will see their populations 65 and older double between 2000 and 2030. The states of Alaska, Arizona, and Nevada are projected to realize over a 250 percent increase in their state populations aged 65 and older. The majority of population growth in this age category will be concentrated in the South and West as shown in Figure 4.5. According to a recent NCHRP report, “over 75 percent of those over 65 in the future will live in low-density areas... Moreover far older people will live alone in the future. Due to these location and travel patterns there is expected to be almost universal licensing among those who will be elderly in the coming decades. These trends will contribute to increasing travel and will likely exacerbate major societal problems, including increased congestion, auto and pedestrian crashes, and energy and environmental challenges. Those living in low-density places, often alone, will face serious mobility and access problems when they can no longer drive or lose the only driver in the family.”²

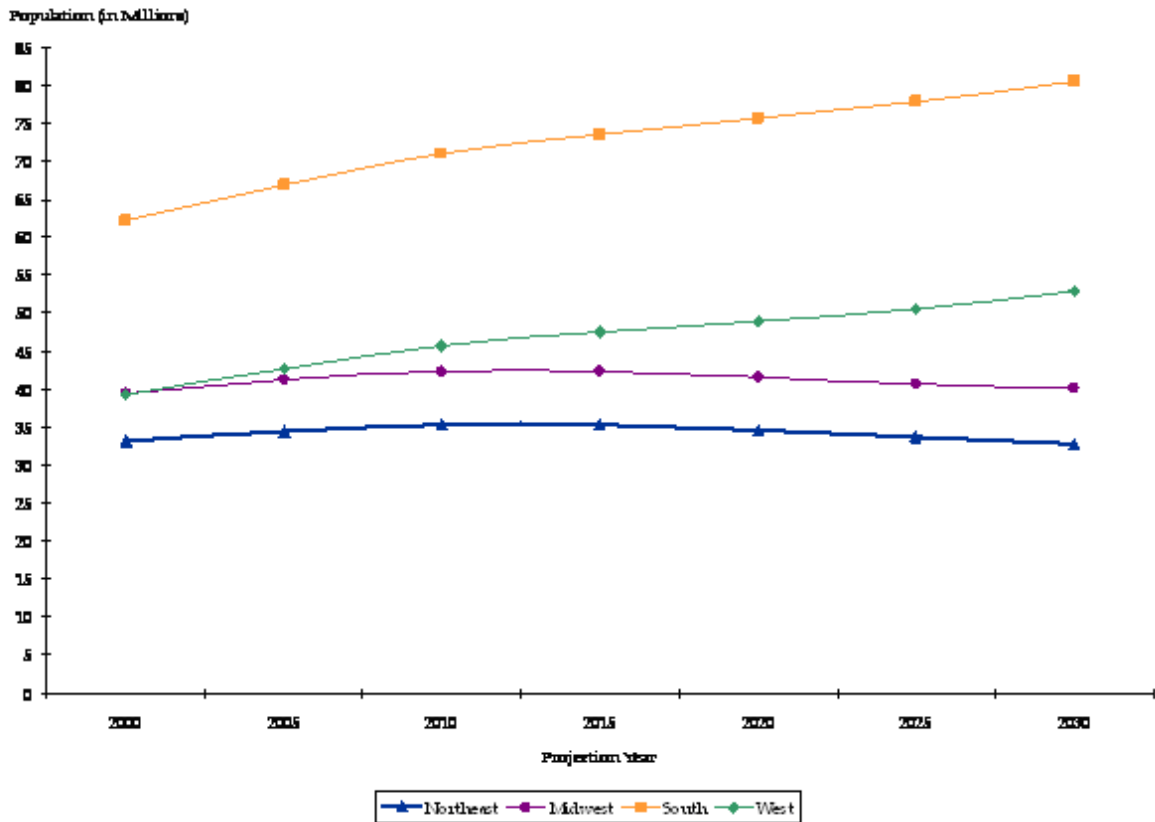
²NCHRP 8-36(50) Final Report “The Impact of an Aging Population on Systems Planning and Investment Policies”, May 2006

Figure 4.5 Population Projections by Region Age 65 and Older, 2000-2030



While a larger share of the growing population will be age 65 and older and will be located in the Southern and Western states, a considerable portion of the population age groups from 18 to 64 will also reside in states in the South and West. In fact, Southern states are forecast to be home to more than 80 million people in this age group and Western states will house more than 52 million people in these age groups by 2030. Figure 4.6 illustrates the geographic distribution of people age 18 to 64 between 2000 and 2030. It is important to note that as these population cohorts increase in the South and West, the projected populations of the age 18 to 64 cohorts are forecast to decline in the Northeast and Midwest thereby raising concerns about the work force of the future. The total projected population age 18 to 64 constitutes those of working age and thus embodies a significant constituency in the overall U.S. economic landscape. Comprising 63 percent of the total U.S. population in 2005 and forecast to decline to 57 percent in 2030, those aged 18 to 64 represent both the bulk of both the labor force and the driving age population.

Figure 4.6 Age 18 to 64 Population Projections by Region, 2000-2030

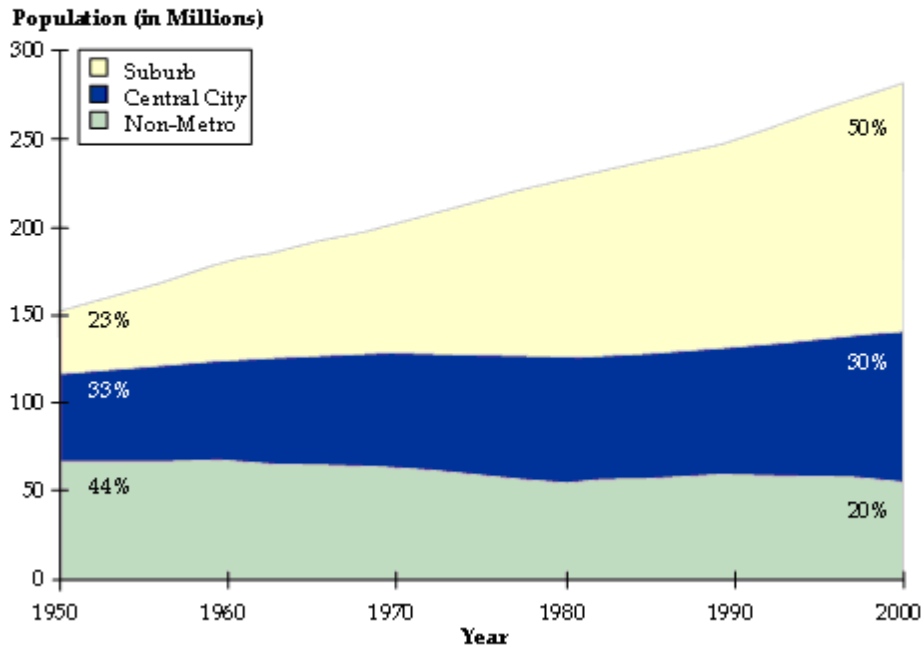


Population Growth in Metropolitan Areas

Figure 4.7 shows the historical long-term trend in American metropolitan development. It is clear that we are a predominantly metropolitan and predominantly a suburban nation today. In round numbers, the nation is half suburban – half not; the non-suburban half is divided 30 percent in central cities and only 20 percent in non-metropolitan areas, according to the current Census definitions.³

³ Alan Pisarski, "Commuting in America", forthcoming

Figure 4.7 Long-Term Population Trends by Major Geographic Areas: Suburbs, Central Cities, and Non_Metropolitan, 1950-2000



In reality rural populations have increased as have metropolitan areas but once rural areas are continually incorporated into metropolitan areas as they expand, creating increased suburban populations by Census definitions. According to a Hudson Institute report released in 2004 “2010 and Beyond: A Vision of America’s Transportation Future,” 4 most central cities continue to also show growth but the majority of population growth, about 75 percent, has been concentrated in suburban areas. The report further states that metropolitan areas, which encompass both central and suburban areas, are likely to absorb much of the international populations that migrate to the U.S. In 2002, 94 percent of the population that was born outside of the U.S. resided in metropolitan areas.

Between 1990 and 2000, the population of metropolitan areas grew by 14 percent, with many areas that were already heavily populated experiencing even higher growth. The growth has been concentrating in the metropolitan areas of Southern and Western states. Of the 15 largest metropolitan statistical areas defined by the U.S. Office of Management and Budget, 10 are located in the South and West. However, the Northeast has consistently had the highest percentage of population residing in metropolitan areas since the 1990s. The majority of the U.S. population, 83 percent as of 2003, lives in metropolitan areas and over 50 percent of this population lives in one of 50 metropolitan areas with 1 million or more people as currently defined by Census. As of the 2000 Census, there were nine metropolitan areas over

⁴ Hudson Institute, “2010 and Beyond: A Vision of America’s Transportation Future” 2004

5 million population, an increase from five in 1990, see Table 4.2. The most recent Census data now shows twelve metropolitan areas with populations over 5 million, now including Atlanta, Houston, and Miami in addition to those shown in Table 4.2.5 These twelve areas total approximately 100 million or roughly one-third of the national population; almost double the population in 1990 for the five areas over 5 million. Part of the shift was the result of the decision to merge the Washington DC and Baltimore areas together thus creating a new area over 5 million.⁶ From a transportation perspective, these are the cities with large transit systems, mostly heavy rail systems that generate much of the public transportation demand in the nation.

Table 4.2 Metropolitan Areas over 5 Million Population⁷

Pop Rank	Metropolitan Name	April 1, 1990 (millions)	April 1, 2000 (millions)	Numerical Change (millions)	Percent Change
1	New York City	19.55	21.20	1.65	8.44%
2	Los Angeles	14.53	16.37	1.84	12.68%
3	Chicago	8.24	9.16	0.92	11.14%
4	Washington-Baltimore	6.73	7.61	0.88	13.10%
5	San Francisco	6.25	7.04	0.79	12.57%
6	Philadelphia	5.89	6.19	0.30	5.01%
7	Detroit	5.46	5.82	0.36	6.67%
8	Boston	5.19	5.46	0.27	5.19%
9	Dallas	4.04	5.22	1.18	29.34%

According to the Census, metropolitan statistical areas grew fastest in the South and West between 1990 and 2000.⁸ Of metropolitan statistical areas with populations of 1 million or more, a number exhibit growth rates far above 20 percent. Table 4.3 illustrates the growth of the 10 fastest growing metropolitan statistical areas (1 million or more) between 1990 and 2000. All of the fastest growing metropolitan statistical areas are located in the South or West. A 2005 Census Report suggests that the growth trends exhibited between 1990 and 2000 have largely continued throughout the early 21st century.⁹

⁵ Alan Pisarski, "Commuting in America", forthcoming

⁶ Findings based on consolidated statistical areas.

⁷ Ibid

⁸ For definitions of metropolitan and micropolitan statistical areas, <http://www.census.gov/population/www/estimates/metrodef.html>

⁹ Available at: <http://www.census.gov/prod/2005pubs/p25-1134.pdf>

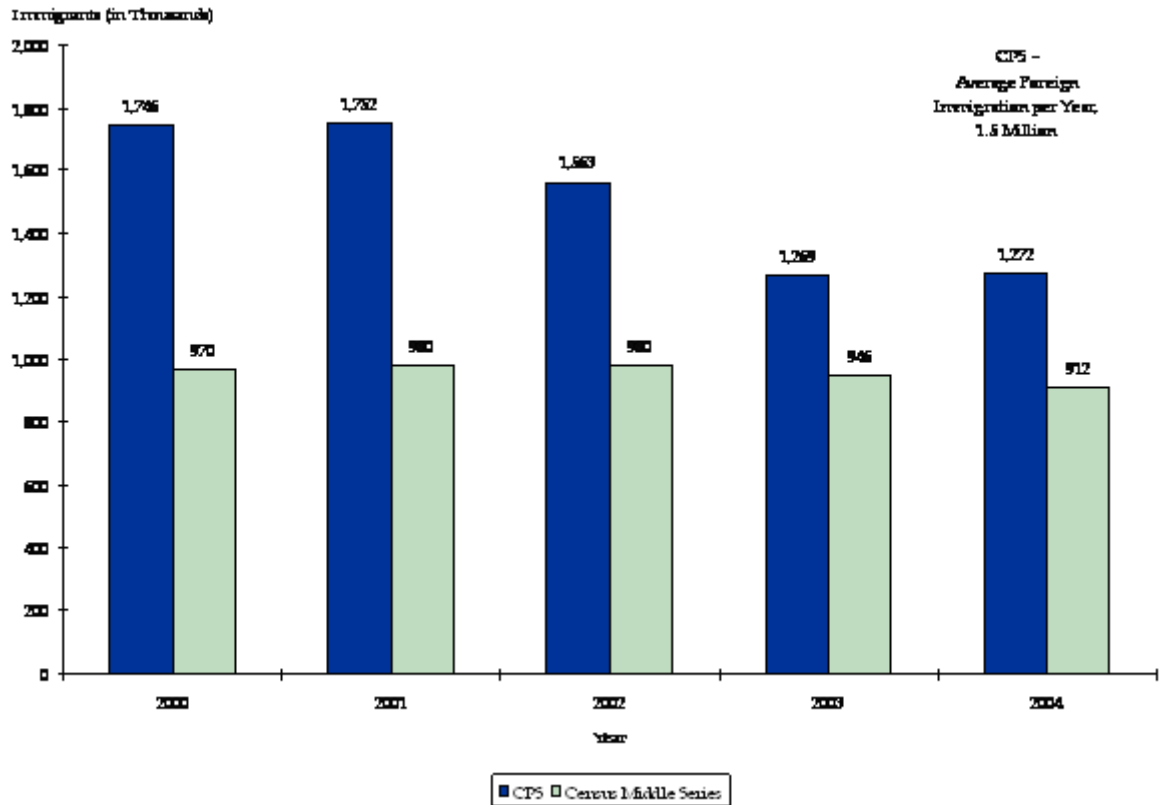
Table 4.3 Highest Growth Rate Metropolitan Areas Population Growth Rates with Populations of 1 Million or More

Rank (as of 2000)	Metropolitan Statistical Area	Population 2000 (in millions)	Absolute Population Growth (1990-2000) (in millions)	Percent Change (1990- 2000)
36	Las Vegas-Paradise, NV	1.4	.6	85.5%
40	Austin-Round Rock, TX	1.2	.4	47.7%
14	Phoenix-Mesa-Scottsdale, AZ	3.2	1.0	45.3%
11	Atlanta-Sandy Springs-Marietta, GA	4.2	1.2	38.4%
30	Orlando, FL	1.6	.4	34.3%
22	Denver-Aurora, CO	2.2	.5	30.7%
37	Charlotte-Gastonia-Concord, NC- SC	1.3	.3	29.8%
5	Dallas-Fort Worth-Arlington, TX	5.2	1.2	29.4%
25	Portland-Vancouver-Beaverton, OR-WA	1.9	.4	26.5%
13	Riverside-San Bernardino-Ontario, CA	3.2	.7	25.7%

Domestic and International Migration

Migration plays a significant role in the redistribution of the population. According to Current Population Survey (CPS) data, migration into the U.S. has been roughly 1.5 million people per-year from 2000 to 2004 (see Figure 4.8). However, the components of change for the older middle series projected that yearly net migration from 2000 to 2004 would decrease from 970 to 912 thousand. Although migration is difficult to predict, the U.S. has been experiencing much higher levels of migration from abroad than expected and it will likely continue to experience high levels unless there is a significant change in immigration policy.

Figure 4.8 Immigration from Abroad, 2000-2004



A 2006 report released by the Census Bureau on domestic net migration from 2000 to 2004¹⁰ found that domestic populations have been leaving the regions of the Northeast and Midwest for the South and West regions. Most domestic migrants entered the South, which had an immigration rate of 3.4 per 1,000 people. In the South, Florida was the largest recipient of domestic migration and Arizona and Nevada were the largest recipients of domestic migration in the West.

¹⁰ Available at: <http://www.census.gov/prod/2006pubs/p25-1135.pdf>

Demographic Conclusions

The nation's population is expected to grow nearly 50 percent by 2055, adding nearly 140 million people across the country. Significant population growth in the U.S. is in contrast to the declining populations projected to occur for much of Western Europe and Japan. The U.S. absolute population growth each decade is forecast to be approximately 25 million, slightly less than the addition of Canada's population, which was nearly 32 million in 2002,¹¹ each decade. Though forecasts have uncertainties, as reflected in the high and low ranges in this memorandum, they provide a reasonable assessment of demographic changes that are considered to be likely to occur over the next 50 years as the population, grows, ages, migrates, and accommodates immigration. The implications of these changes are likely to have profound consequences for the future demands on the nation's transportation system. Following is a synopsis of the demographic forecasts impacting transportation in the U.S.:

Population Characteristics

The dynamics of population characteristics will place increased demands on transportation systems in large part because: 1) much of the baby boom generation will retire and enter the age category 65 and older; 2) the population age 65 and older is both living longer and retaining driving independence longer; 3) the population is concentrating in the South and West, areas with strong auto ownership and automobile travel; 4) the population age 18 to 64, which constitutes the majority of the work force and driving population, will also be heavily concentrated in Southern and Western states; and 5) overall population growth in the South and West will grow at a faster pace than that in the Northeast and Midwest.

Immigration

Though foreign immigration is hard to predict, current immigration levels suggest that migrants are continuing to enter the U.S. in large numbers. These foreign born populations tend to concentrate in metropolitan areas and are helping to push the boundaries of metropolitan areas further away from central city centers. Much of the domestic out-migration often occurs from the nation's largest metropolitan areas, which is essentially balanced by large international immigration to these areas.

Slower Population Growth Rate

The pace of population growth is projected to slow down from an annual increase of 1.06 percent in the beginning of the 21st century to 0.79 percent by 2050. Decreasing fertility rates and the aging of the population contribute to this slowing of the population growth rate over time.

¹¹Global Population Profile: 2002, U.S. Census Bureau, March 2004. Available at: <http://www.census.gov/ipc/prod/wp02/wp-02.pdf>

Labor Force of the Future

A key issue will be where the labor force of the future comes from. The population age 18 to 64 will be a smaller share of the nation's population in the future. Also, there are likely to be some regional disparities in labor force availability as the age 18 to 64 population cohorts increase in the South and West and actually decline in the Northeast and Midwest.

Immigration policy will be an extremely important labor force factor for the future. More flexible work schedules for working parents and part-time employment by 'retirees' will certainly be part of the answer.

Economic Projections

Many economic factors affect growth in the demand for travel in the U.S., including growth in the labor force, growth in personal incomes, productivity growth, and growth in trade. Energy usage is also linked strongly to transportation demand. The U.S. has built an expanding domestic economy, yet it now also relies heavily on international trade. Highway investments and the developments in freight transportation have supported the growth of the U.S. economy as discussed in Task 2, but changes to the U.S. demographic and economic landscape have the potential to alter the demand for personal and freight transportation in the future.

Long-Term Projections

Global Insight produces a U.S. macro long-term forecast that provides a comprehensive 30-year economic outlook, which is summarized in the following section. Further details are provided in Appendix A.

Four projections are provided as described below: trend (baseline), cyclical, optimistic, and pessimistic.

Economic Projection Scenarios

The **trend projection** is the baseline scenario. It assumes that the economy suffers no major mishaps between now and 2036. It grows smoothly, in the sense that actual output follows potential output relatively closely. This projection is best described as depicting the mean of all possible paths that the economy could follow in the absence of major disruptions. Such disruptions might include large oil price shocks, untoward swings in macroeconomic policy, or excessively rapid increases in demand.

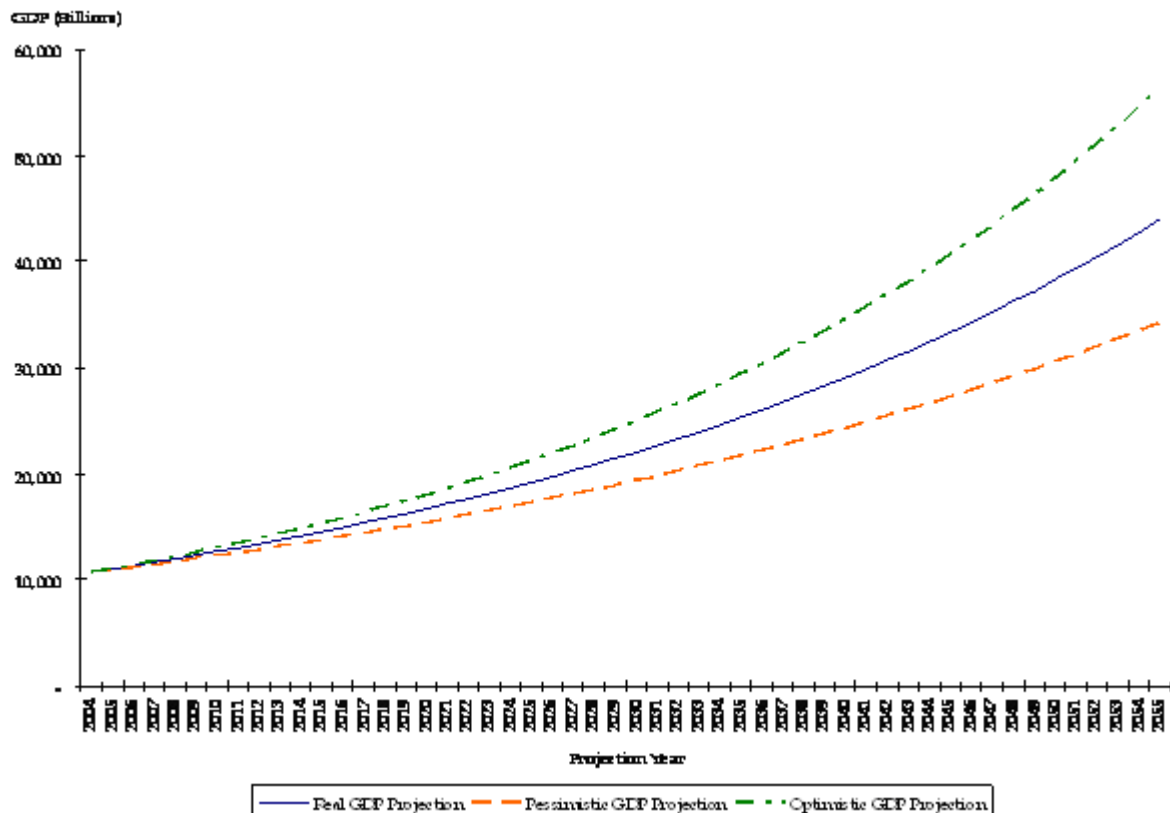
The **cyclical projection** is the primary alternative scenario. It superimposes business-cycle behavior on the trend scenario. Economic growth proceeds in a series of starts and stops, with periods of rapid expansion, followed by externally or policy-induced recessions. The timing of the recessions is merely suggestive. Because it is impossible to predict the exact timing of business cycles much in advance, it is unwise to focus on specific years. It is also inappropriate to calculate average growth rates between different points in the business cycle.

The **optimistic projection** is the upside scenario, in which economic growth proceeds smoothly but more rapidly than in the baseline, while prices rise more slowly. In this projection, population growth, labor force growth, and capital stock growth, as well as exogenous technological changes, occur more quickly than in the trend. Potential output thus climbs more rapidly, and because output is primarily supply-determined in the long run, real GDP grows 0.5 percentage point quicker per-year than in the trend projection.

The **pessimistic projection** is the downside scenario. Here, growth proceeds smoothly, but more slowly than in the baseline, and productivity growth is weaker. In this projection, population growth, labor force growth, and capital stock growth, together with exogenous technological changes, occur less rapidly than in the trend. Output thus climbs 0.5 percentage point more slowly per-year than in the trend projection.

GDP projections based on these scenarios are shown in Figure 4.9 below.

Figure 4.9 Real Gross Domestic Product, Trend, Optimistic, and Pessimistic Projections, 2004-2055



Probabilities

The underlying rate of growth in the trend projection is consistent with history, as well as with conjecture about the economy's structure. It can be regarded as the best-unbiased projection of the economy. Although any probabilities attached to long-run projections must be highly subjective, Global Insight believes there is only a 10 percent chance that the economy's underlying path will be outside the bandwidth encompassed by the optimistic and pessimistic projections.

Key Assumptions

Demographic

Demographic factors are a primary driving force in any long-term economic projection. The population's growth rate and changes in its composition have considerable impacts on the labor force, the full-employment unemployment rate, housing demand, and other spending categories-most notably, consumption of health services and purchases by state and local governments.

The population projections in Global Insight's trend and cyclical scenarios are built on the Census Bureau's latest interim projections. The trend or middle projection is based on specific assumptions about immigration, fertility, and mortality rates. The age distribution of the population is also an important factor in the long-term outlook. As baby boomers begin to retire, the share of the U.S. population aged 65 years and over will increase. In addition, the growth rate of the working-age population will slow more than the growth rate of the overall population.

The optimistic and pessimistic alternatives embody population projections different from those in the trend. The optimistic outlook assumes the U.S. population will increase more quickly because of higher net immigration. Conversely, the pessimistic alternative constricts growth in the labor force because of lower-assumed net immigration from the start of the forecast period. As a result, annual population growth averages 1.4 percent in the optimistic scenario and just 0.4 percent in the pessimistic scenario.

Fiscal and Monetary Policy and Inflation

It is expected that Federal spending on defense, transfer payments, and Federal aid to state and local governments will consume a good share of GDP. As a result, the Federal government is expected to post deficits in the unified budget over the forecast period. In the forecast, the deficit averages 0.8 percent of GDP in 2005 to 2035. In the longer run, the baby boomers' retirement will cause deficits to grow, despite some increases in the Social Security tax rate.

Monetary policy remains important in the long-term projections, not so much in determining the level of output, but rather in determining the rate of inflation. Ultimately, the Federal Reserve decides on the steady-state rate of inflation. Monetary policy can cause inflation to accelerate by being overly accommodative and pushing the unemployment rate temporarily

below the rate at which inflation is stable. Alternatively, it can cause inflation to decelerate by being restrictive and pushing the unemployment rate temporarily above the rate at which inflation is stable.

The forecast assumes that the ultimate goal of the Federal Reserve and the Federal government is a stable inflation rate. The CPI inflation rate rises in the early years of the forecast, and eventually settles to about 2.4 percent.

In the optimistic scenario, the Fed is assumed to keep a tight rein on the money supply, permitting little acceleration of inflation. Conversely, in the pessimistic scenario, the central bank is assumed to be reluctant to put the economy through the pain necessary to bring inflation back to baseline levels, choosing instead to tolerate an inflation rate that is higher than in the baseline.

Energy

Global Insight's Energy Service expects the average acquisition price of foreign oil to remain above \$40 per barrel over the forecast period. With worldwide demand steadily increasing, the Organization of Petroleum Exporting Countries (OPEC) cartel will maintain some pricing power. Although it is impossible to predict the precise timing of price changes, the trend projection assumes that oil prices will drop from current high levels and hover around \$40 to \$50 per barrel through the end of 2022. Thereafter, the forecast shows oil prices climbing steadily to \$63 per barrel by 2030. The West Texas Intermediate price for oil is projected to reach \$79 per barrel by 2036, compared with the average price of \$26 in 2001. In the long run, scarcity tends to bid energy prices up, while new technologies tend to hold them down. In the end, Global Insight projects that scarcity will win out, with the real price of imported oil rising from about \$21.50 per barrel in 2001 to \$36.00 in 2036.

The oil price path in the cyclical scenario has several oil spikes, where oil producers are assumed to mimic their behavior of the 1970s, raising oil prices substantially when the world economy is close to a cyclical peak. In the Global Insight pessimistic scenario, nominal and real oil prices are higher than in the trend. In the optimistic scenario, nominal and real oil prices are below what they are in the trend.

Price projections are a trend. It is likely that there will be periods, possibly of several years at a time, when prices are either above or below the trend. A price outcome higher than the projected trend could result from stronger demand growth (perhaps notably in China) and/or weaker supply (more disappointments in non-OPEC and loss of productive capacity in OPEC due to political upsets). A price outcome lower than the projected trend could arise from recession, enforcement of higher efficiency standards, or better than expected supply prospects.

International Considerations

In the trend projection, the major U.S. trading partners are assumed to follow a growth pattern similar to that in the U.S., with the pace of growth (in real consumption) averaging 2.0 percent over the forecast period, down from an average 2.6 percent over the past 30 years. This

slowdown reflects demographic forces similar to those operating in the U.S., as well as the maturation of many of the other developing economies. Owing to steady pressure from the current account deficit, the dollar will fluctuate, but on average, is expected to depreciate throughout the long-term forecast.

Variations in the international environment help explain some of the differences among the alternative scenarios. A faster (slower) rate of growth abroad partially explains the higher (lower) level of exports in the optimistic (pessimistic) scenario.

See Appendix A for a summary of the long-term projections and assumptions.

Economic Conclusions

Global

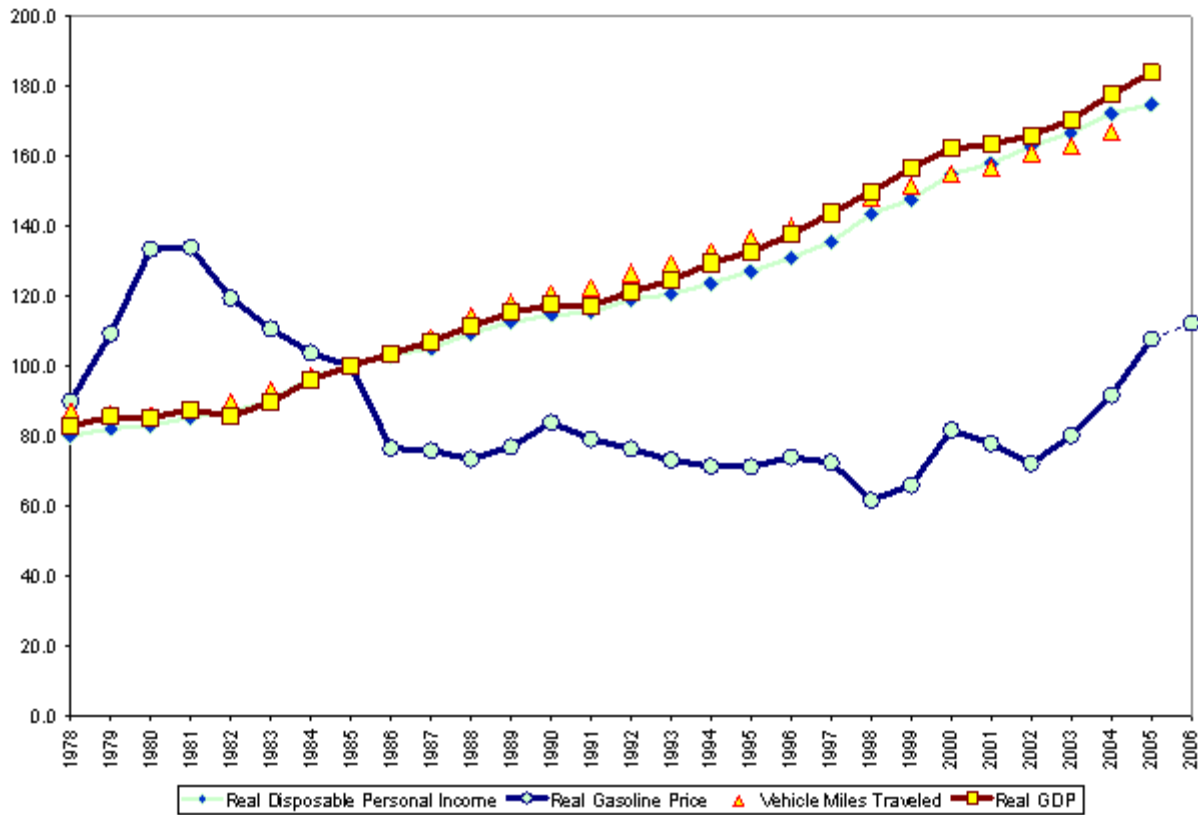
Our economy will increasingly become part of an integrated global economy that will require finely tuned and highly reliable supply chains, logistics, and transportation systems. Projections for this project assume a growing healthy economy with a trend projection of 2.8 percent real GDP growth over the forecast period. There will obviously be economic cycles of higher and lower growth, impacts due to oil price spikes, and world economic conditions but the long-range trend is positive. Global production, demand, and consumption patterns will impact U.S. economic conditions as reflected in the high and low scenarios, e.g., level of exports among other factors. Furthermore, immigration will continue to be a factor in providing the needed labor force for the future.

Energy and Fuel

Oil is traded in the world market, which makes petroleum prices vulnerable to global uncertainties. Given these uncertainties, however, there is little evidence that energy markets and resources will constrain demand. A 2006 EIA report¹² shows that the retail price of gasoline declined by 1.3 percent annually between 1983 and 2001, while personal income and GDP exhibited healthy growth as shown in Figure 4.10. Although current fuel prices have jumped to around \$3 dollars per gallon, in real terms they are still below 1981 highs and now represent a significantly smaller share of the economy than in 1981.

¹² Energy Information Administration, "Household Vehicles Energy Use: Latest Data & Trends", November 2005. Available online at: http://www.eia.doe.gov/emeu/rtecs/nhts_survey/2001/

Figure 4.10 Annual Indices of Real Disposable Income, Vehicle Miles Traveled, Gross Domestic Product, and Real Average Retail Gasoline Prices, 1978-2005, 1985 =100



Sources: Energy Information Administration, Household Vehicles Energy Use: Latest Data and Trends, November 2005.

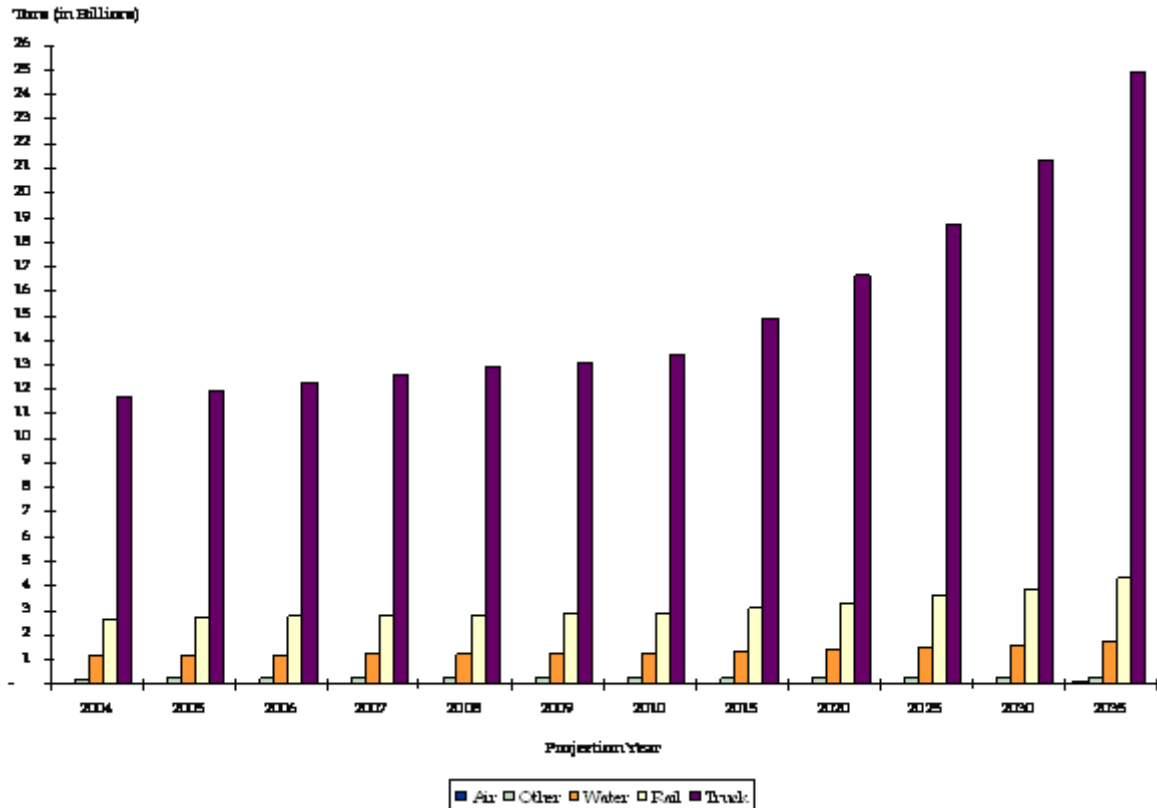
Note: Modified by Cambridge Systematics, Inc. to include Real GDP (Bureau of Economic Analysis) and to include real fuel prices for 2005 and 2006.

Freight Tonnage Projections

Global Insight also produces freight tonnage forecasts for a 30-year period based on the economic forecasts discussed above. The projections by mode are shown by tonnage in Figure 4.11. Total tonnage is expected to double (101 percent) between 2004 and 2035. Broken down by mode, trucking tonnage is projected to more than double over this period to 24 billion tons, which constitutes a 114 percent increase. Rail is projected to grow 63 percent over this period to over 4 billion tons. Water tonnage will grow by 56 percent between 2004 and 2035. Air, while starting with a low share, is projected to grow by 150 percent between 2004 and 2035, effectively increasing its share of total tonnage by 0.06 percent in 2035. By 2035, it is anticipated that trucks will carry the bulk of total tonnage, or 79.4 percent, while rail will carry 13.7 percent, water will carry 5.6 percent, and other modes will carry 0.9 percent.

Not surprisingly, the share of tons carried by truck will slightly increase (5 percent) by 2035, while the modal share of tons carried by water and rail will decline slightly.

Figure 4.11 Projected Freight Ton Growth by Mode, 2004-2035



Freight Tonnage Conclusions

Operation and Durability of the Interstate – Growth in freight tonnage has significant implications for truck transportation and its reliance on the Interstate system. A doubling in truck tonnages to 2035 will place tremendous demands on the Interstate system both in operational capacity as well as infrastructure durability.

Globalization

As the U.S. has become more immersed in global trade, including the North American Free Trade Agreement (NAFTA), the heavy movement of goods across the country by both highways and rail has caused the emergence of freight oriented bottlenecks on the Interstate system and on major rail corridors as well as in major intermodal terminals. Globalization is expected to continue current growth trends for the foreseeable future. In particular, NAFTA is a major driver of truck traffic; as a result of NAFTA there are an estimated 30,000 additional truck crossings per-day in the four southwest border states of Arizona, California, New Mexico, and Texas. In 2004 there were 11.4 million trucks that crossed the Canadian and Mexican borders into the U.S.

Trucks account for one-fifth of the VMT on the Interstate system, but account for more than 30 percent of all vehicles on a substantial portion of the system. The Interstate will continue to be the backbone of an intermodal transportation system that must be rehabilitated and expanded to move the U.S. forward as a world economic power through the first half of the 21st century.

Vehicle Miles of Travel Projections

In an EIA report¹³ referenced in the Economic Projections section, household mobility as measured by vehicle miles traveled is purported to generally parallel the rise in disposable income.¹⁴ Historically, total VMT has also tracked very well with the GDP, as shown in Figure 4.10. Freight transportation is expected to continue tracking with GDP over the forecast period with personal transport growing more slowly due to slowing of population growth and gradual saturation in auto ownership. In regard to the impact of fuel prices, the EIA report further states that fuel prices play a relatively minor role in determining vehicle use and that the prices of other consumer products have assumed a larger portion of consumer expenditures. These findings are supported by a recent release by the Congressional Research Service (CRS)¹⁵ that suggests, while the nominal price of gasoline continues to rise, the proportion of consumer spending on oil and gasoline has declined since the high levels of the 1970s and 1980s. Furthermore, the CRS report supports the assertion that fuel consumption and the demand for gasoline in the U.S. will continue to rise.

Highway Performance Monitoring System VMT Projections

The vehicle miles of travel projections reported in the recent U.S. Department of Transportation 2004 Conditions and Performance (C&P) Report show growth of 2.07 percent per-year (2.29 percent rural and 1.93 percent urban) from 2003 to 2022. This projection is based on Highway Performance Monitoring System (HPMS) data submitted by states. Historic average annual VMT growth on all systems between 1993 and 2002 was higher at 2.5 percent per-year. During the same period, the Interstate average annual VMT growth rate was 3.1 percent.

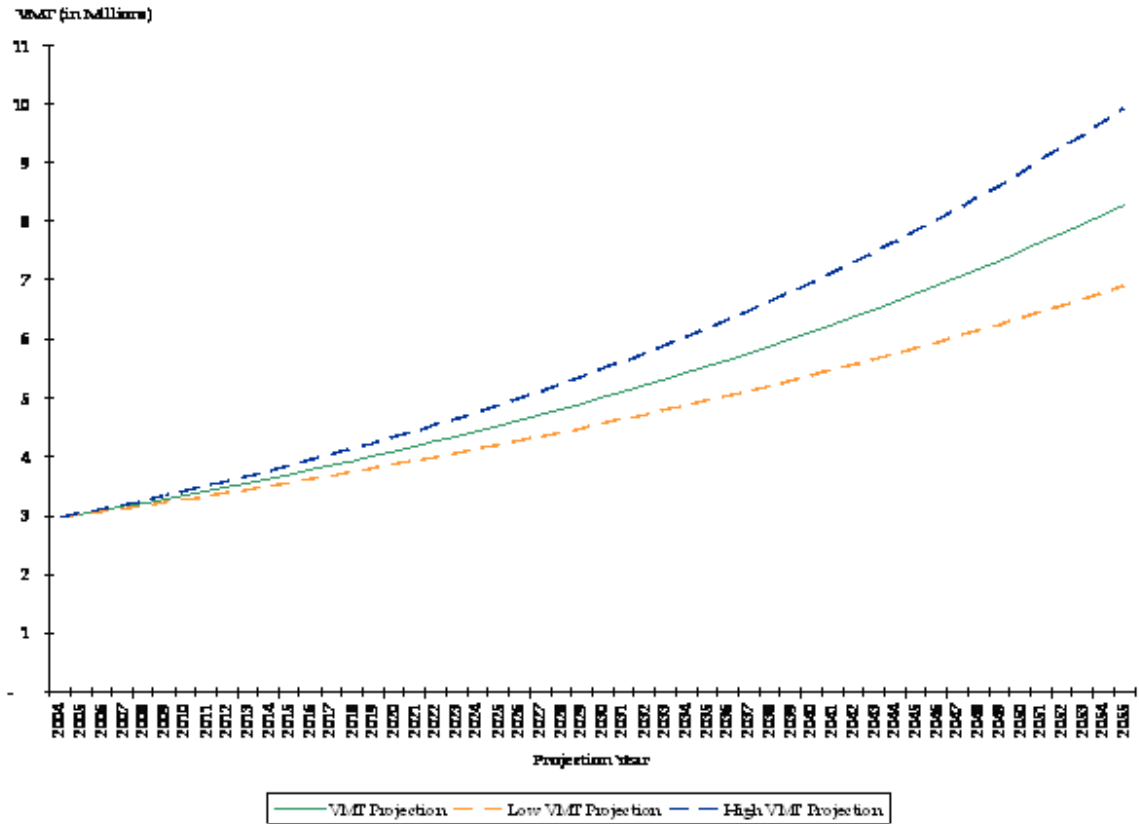
Long run VMT forecasts are trend extended from the 2004 state provided 20-year HPMS VMT growth rates. (Note: The 2004 HPMS VMT projections show a 2.04 percent annual increase as compared to the 2.07 percent annual rate from the 2002 HPMS data set reflected in the 2004 C&P Report.) The VMT growth rates are broken out by rural and urban as well as by Interstate and all systems. For long run forecasts to 2055, a VMT range could include higher or lower forecasts based on Global Insight's GDP forecasts that could vary up or down by 0.5 percent from the trend of 2.8 percent long run, 2.3 percent for low, and 3.3 percent for high. Proportional increases and reductions are applied to the long run HPMS travel forecasts. The VMT projections with the high and low range are shown in Figure 4.12.

¹³ Energy Information Administration, "Household Vehicles Energy Use: Latest Data & Trends", November 2005. Available online at: http://www.eia.doe.gov/emeu/rtecs/nhts_survey/2001/

¹⁴ Energy Information Administration, "Household Vehicles Energy Use: Latest Data & Trends", November 2005. Available online at: http://www.eia.doe.gov/emeu/rtecs/nhts_survey/2001/

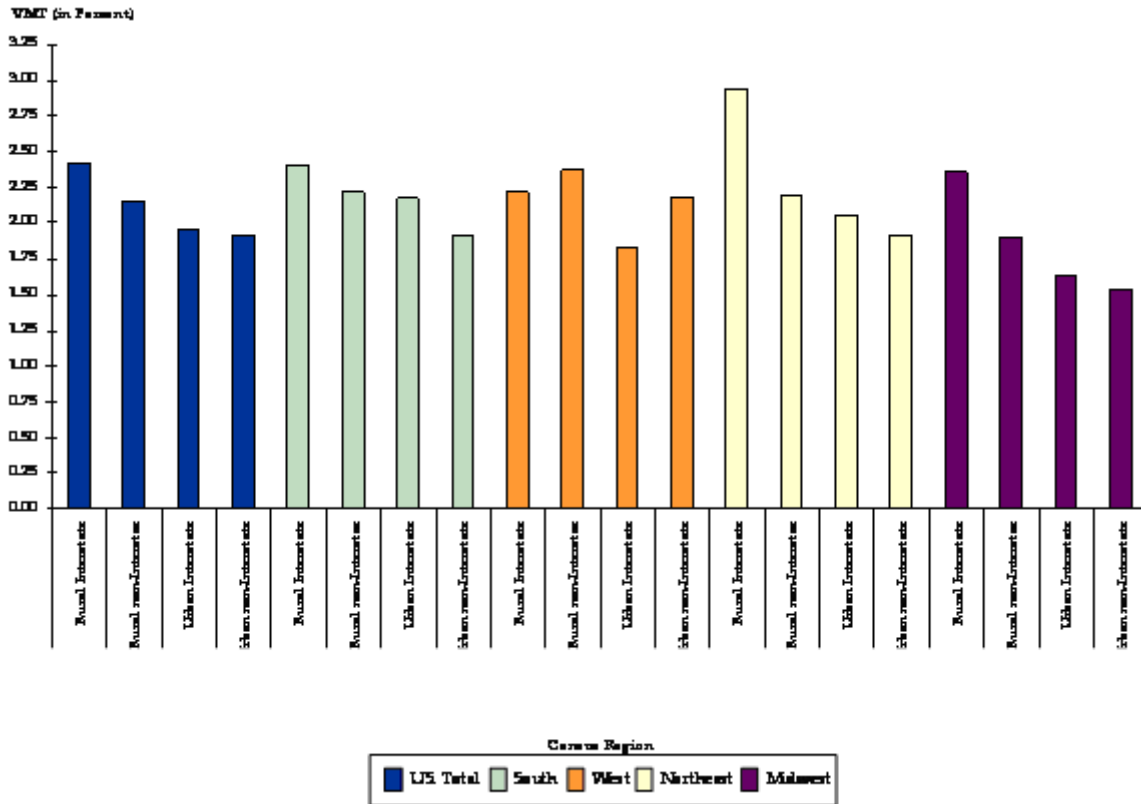
¹⁵ Congressional Research Service, "Gasoline Prices: New Legislation and Proposals", Issue Brief for Congress, April 21, 2006.

Figure 4.12 Vehicle Miles of Travel Projection, 2004-2055



National growth rates from HPMS forecast that VMT on rural systems will grow faster than urban systems. The forecast is an annual increase of 2.41 on rural Interstates and 1.95 on urban Interstates. Regional growth rates from HPMS are shown in Figure 4.13 and illustrate a common theme – traffic will grow in every region so all regions will face similar issues associated with traffic growth. These projections show that growth on the existing Interstate system will be broad and nationwide.

Figure 4.13 National and Census Region Vehicle Miles of Travel Growth Rates



Vehicle Miles of Travel Conclusions

Regional VMT Growth

VMT projections provided by HPMS show long-term growth of about 2 percent, with higher rates generally occurring on the Interstate. Although there will be large differences in the demographic changes among regions, VMT growth among the regions is much more uniform, perhaps due to the demands of the national economy on the entire Interstate system. Although the Northeast is growing slower than its Southern and Western regional counterparts, it has a huge existing population base that results in continuing large freight demands and has large metro areas with relatively affluent populations that have growing personal travel demands.

Overall Conclusions

All regions of the country will see growing demands placed on its aging Interstate infrastructure. Although population will grow much faster in the Southern and Western

regions of the country, a large, relatively affluent, existing population base in the Northeast and Midwest will continue to demand growing transportation services. Moreover, increasing international and interregional trade flows of a growing economy will impact Interstate demand in all portions of the country.

Increasing metropolitan area populations and the geographic expansion of those urban regions will put further strains on an already congested urban Interstate and other principal arterial systems. The 2004 C&P reports that urbanized area percent of travel under congested conditions increased to just over 30 percent in 2002. The average congested travel period has increased from 5.4 hours in 1987 to 6.6 hours in 2002. The 2004 C&P reports that substantially increased investment over current levels would be needed to prevent this delay from increasing over the next 20 years.

The needs of a rapidly growing over 65 population will put increased demands on the transportation system. Assuring a safe transportation system with an aging population will be a particular challenge. Special mobility needs of a dispersed elderly population will challenge conventional transportation system patterns in both urban and rural areas.

The trend, optimistic, and pessimistic economic projections in this paper (as provided by Global Insight) are based on assumptions regarding growth of population, immigration, fiscal policy, international trade, fuel prices, and related factors. The trend projection assumes a long-range real GDP growth of 2.8 percent per-year. The optimistic projection is the upside scenario, in which economic growth proceeds smoothly, but more rapidly than in the baseline, while prices rise more slowly. In this projection, population, labor force, and capital stock growth, as well as exogenous technological changes, occur more quickly than in the trend. Potential output thus climbs more rapidly, and because output is primarily supply-determined in the long run, real GDP grows 0.5 percentage point quicker per-year. The pessimistic projection is the downside scenario. Here, growth proceeds smoothly, but more slowly than in the baseline, and productivity growth is weaker. In this projection, population growth, labor force growth, and capital stock growth, together with exogenous technological changes, occur less rapidly than in the trend. GDP thus climbs 0.5 percentage point more slowly per-year.

The optimistic outlook assumes the U.S. population will increase more quickly because of higher net immigration. Conversely, the pessimistic alternative constricts growth in the labor force because of lower-assumed net immigration from the start of the forecast period. As a result, annual population growth averages 1.4 percent in the optimistic scenario and just 0.4 percent in the pessimistic scenario. The economic forecasts assume that the ultimate goal of the Federal Reserve and the Federal government is a stable inflation rate; although there is some variance in fiscal policy and level of inflation under the optimistic and pessimistic scenarios. Not surprisingly, the oil price path to the future is likely to have several oil spikes, where oil producers are assumed to mimic their behavior of the 1970s, raising oil prices substantially when the world economy is close to a cyclical peak. These intermediate spikes are part of a cyclical scenario produced by Global Insight, but for the trend, pessimistic, and optimistic scenarios used in the Interstate project, only uniform growing prices are accounted for since the timing of economic and/or oil price cycles cannot be accurately forecast. In the pessimistic scenario, nominal and real oil prices are higher than in the trend. In the optimistic scenario, nominal and real oil prices are below what they are in the trend.

In the trend projection, the major U.S. trading partners are assumed to follow a growth pattern similar to that in the U.S., with the pace of growth (in real consumption) averaging 2.0 percent over the forecast period, down from an average 2.6 percent over the past 30 years. This slowdown reflects demographic forces similar to those operating in the U.S., as well as the maturation of many developing economies. Variations in the international environment help explain some of the differences among the alternative scenarios. A faster (slower) rate of growth abroad partially explains the higher (lower) level of exports in the optimistic (pessimistic) scenario.

A growing national economy and international trade means that freight demand will likely grow faster than passenger demand, with more than a doubling in truck tonnage expected between now and 2035 according to Global Insight projections. Rail and water tonnage will also grow substantially, but not at as rapid a pace as trucking. Trucking tends to carry a higher portion of growing merchandise trade, including time sensitive commodities, than the other freight surface modes; i.e., water, and rail.

Overall, national VMT is projected to grow at about 2 percent per year according to HPMS data submitted by the states; this is assumed to mirror Global Insight's trend economic projection. Based on an optimistic and pessimistic range of economic projections as reflected in GDP growth by Global Insight, these VMT growth rates could range from a high of about 2.4 percent per-year to a low of just over 1.6 percent per-year growth over the next 30 to 50 years. [Note: VMT has historically tracked close to GDP growth (as shown in Figure 4.10) which suggests that we should definitely test a scenario with the higher VMT growth rate of 2.4% which is closer to long run GDP growth and to historic VMT growth than the 2 percent HPMS projection for national VMT annual growth]. The regional VMT growth rates, including breakouts by urban and rural areas and by Interstate and non-Interstate systems, are estimated for each of the four Census regions. The growth rates range from a high of 2.94 percent for northeast rural Interstate to a low of 1.53 percent for Midwest urban non-Interstate.

In conclusion, we envision a growing and competitive national economy over the next 50 years that is made possible by a world class Interstate system complemented by other highway and intermodal systems.

Appendix A

Capsule Summary of the Global Insight Long-Term Economic Projections Trend and Cyclical

	Trend	Cyclical
General Outlook		
	The economy exhibits mild variations in growth and approaches its balanced-growth path. CPI inflation rises slowly, averaging 2.2%.	Typical business-cycle fluctuations.
Principal Exogenous Assumptions		
Demographic	Projections consistent with the Census Bureau's latest middle-growth forecast, which assumes a leveling off of the fertility rate at 2.2 births, an ultimate mortality rate of 79.0 years for men and 84.8 years for women, and net immigration of 912,000–1,040,000 per-year.	
Energy imports	Real oil prices rise gradually. No embargoes are assumed.	Sharp price hikes occur in periods of peak demand.
Food prices	Wholesale farm prices average 1.0% annual increases.	Wholesale farm prices average 1.5% annual increases.
Other Parameters		
Average annual productivity growth	2.3%	2.3%
Average annual potential output growth (real GDP)	2.8%	2.7%
Consumer price inflation	Eventually stabilized at about 2.4%	Periodic demand surges, oil price shocks, and more aggressive wage responses boost the average inflation rate.
Consumer price index	2.2%	2.7%
Average annual increase	2.5% (2006)	4.3% (2014)

Optimistic and Pessimistic

	Optimistic (High growth)	Pessimistic (Low growth)
General Outlook		
	Deviations from trend due to differences in demographic assumptions, productivity growth, and investment.	
Principal Exogenous Assumptions		
Demographic	Projections above the trend are a result of higher net immigration.	Projections below the trend due to lower net immigration.
Energy imports	Real oil prices rise slower than in the trend.	Real oil prices increase more than in the trend forecast.
Food prices	Wholesale farm prices rise 0.6% annually.	Wholesale farm prices average 3.1% annual increases.
Other Parameters		
Average annual productivity growth	2.4%	1.8%
Average annual potential output growth (real GDP)	3.3%	2.3%
Consumer price inflation	Converges to about 2.2%.	Inflation rises above 5.0%
Consumer price index	1.8%	4.2%
Average annual increase	2.2% (2036)	5.2% (2036)