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Methodology for the Freight Analysis Framework-2: Forecasts of Inter-regional Commodity Flows

Contract # DTFH61-01-C-00182

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May 29, 2007

Table of Contents

1. Introduction

This project has been conducted in response to the Federal Highway Administration's request for a forecast of inter-regional commodity flows for the Freight Analysis Framework-2 (FAF2). This report outlines the approaches that have been employed to create the freight volume forecasts, measuring both tonnages and dollar values, for both the domestic and international segments of the FAF2 data sets. Also discussed in this report are the underlying data sets and methodologies of Global Insight products and models that were employed in the process.

2. Forecast Methodology

The foundation of the approach to the freight forecasting is the consistency in outlook provided by using Global Insight's macroeconomic, regional, inter-industry, and intrastate forecast modeling capabilities. These economic forecasting models are built and maintained with a common framework and perspective that provides comprehensiveness, consistency, and detail unique for freight transportation forecasting. Most importantly, this means that the resulting detailed freight flow forecasts are derived in a manner consistent with the path of the economy at a national, regional, and sub-state level.

This section provides a general overview of the forecasting methodology, while the following two sections provide a more detailed examination of the steps taken in producing the domestic and international forecasts.

The initial calibration in the forecasting process involves two distinct steps. The first is constructing the desired level of geography in the Business Demographics Model and the Business Transactions Matrix relative to the 2002 FAF2 base year data. The creation of the FAF2 region geography in these two models is an aggregation process, grouping the county-level data into the FAF2 regional market definitions, and summing the values.

The second step during this initial stage entails the development of the crosswalk between the North American Industry Classification System (NAICS) industry sector classifications and the two-digit level of the Standard Classification of Transported Goods (SCTG) commodity classification. This was done through a review of existing commodity classification concordance files, which detail the relationships between various combinations of NAICS, SCTG, the Standard Transportation Commodity Classification (STCC) and Standard Industry Classification (SIC) codes at various levels of detail. The crosswalk between industry and commodity classifications is important because it provides the bridge between the value and weight of the physical commodities and products shipped through the transportation system and the industry activity measured by economists on an industry establishment level, typically using the value of output or purchases and the associated employment.

The development of the baseline commodity tonnage forecasts uses a multi-step approach:

1) Establish national control totals by commodity;
2) Apply specific shipment growth by market and commodity;
3) Apply specific purchasing and consumption growth by market and commodity;
4) Summarize & compare the results from steps 2 & 3 with the national controls;
5) Adjust the resulting freight flows so that the volumes correspond with the national control levels as follows:

For each market and commodity, adjust so shipments match purchases.
For each commodity, adjust so that national control totals are satisfied.

2A. Domestic Forecast Methodology

The first step in creating the forecast of the FAF II data set is to extract the county-level employment and the U.S. dollar value of output information, by 6-digit NAICS code, from Global Insight's Business Demographics Model (BDM). This data covers each of the forecast years from 2002 to 2030. A separate routine is used to extend the forecast data from 2030 to the 2035 forecast horizon. Section 3 of this report contains a detailed description of the BDM.

The employment data from the BDM is then converted from NAICS into SCTG categories, and aggregated to the 2-digit SCTG level to conform to the FAF II 2002 baseline data. The concordance table identifying the relationships between NAICS and SCTG coding systems is used in this processing. The programming code with the NAICS to SCTG logic is presented in Section 4, in a tabular representation.

The NAICS to SCTG relationships were refined using input from a variety of sources including the Harmonized System commodity classification (HS) to SCTG mapping created by MacroSys, Inc. for the FAF2 project. Additional commodity coding relationship tables were consulted and reviewed including mappings from the U.S. Census Bureau between NAICS, SCTG, HS, SIC and STCC. Extensive cross-referencing was required to insure that all detailed NAICS industry categories in the BDM were assigned to a SCTG commodity code, and also that all SCTG commodity category codes in the FAF2 data were assigned to a NAICS industry sector classification.

Concurrent with the extension of the BDM output and employment forecasts to 2035, the county-level data is summarized to match the geographic market region definitions used in the 2002 FAF2 base year data set. The counties were mapped to the FAF2 geographic regions using the definitional assignments provided by FHWA. The output and employment data is then converted to growth rates and the results are cross-checked and verified against the growth rates for the individual constituent counties.

The independent forecast variables include data from Global Insight's Business Transaction Matrix (BTM), described in Section 5 of this report. The BTM Input/Output (I/O) tables require a similar methodology for translation of the NAICS industry classification codes to SCTG commodity category codes, and the county-level geography to the FAF2 geographic market regions. Minor adjustments to the NAICS to SCTG relationships were made to insure that all SCTG categories had assignments from NAICS industry categories, as follows:

NAICS 212322 → 25% to SCTG11 & 75% to SCTG12
NAICS 211111 → 45% to SCTG16 & 55% to SCTG19
NAICS 324110 → 26% to SCTG17, 25%t to SCTG18 & 50% to SCTG19

The procedure next takes the original 2002 baseline FAF2 domestic freight flow data set, and creates two versions for subsequent processing. The first version maintains all of the original modal detail (truck, rail, air, water, truck & rail, pipeline, and other) and their associated tonnage and dollar volume values. This version of the file is then used later in the process to apply the appropriate modal share distribution across the forecast lane volumes. The second version of the file aggregates each of the modal volumes, again maintaining both the tonnage and dollar values, into region-to-region traffic lane totals.

The total domestic shipment volumes are projected out to the forecast horizon using the forecast information from the BDM, converted to annual growth rates. The result is a table that for each region-to-region SCTG commodity flow, a forecast tonnage and dollar value for each of the forecast years is produced.

The BTM Input/Output data are integrated with the 2002 base year FAF2 data, so that for each region - SCTG commodity combination there is a complete set of associated SCTG commodity volumes that are purchased or consumed. The base year purchases or consumption volumes are then forecast to each year of the forecast period using the BDM output and employment data growth rates.

At this point the national level freight forecast, based on the most recent Global Insight U.S. quarterly-frequency economic data, is used to establish aggregate level benchmark freight volumes for each SCTG commodity category. The total 2002 base year FAF2 freight flows, by SCTG commodity, are forecast using the national level forecasts of output and consumption.

Once these benchmark values have been established the next step is a rebalancing of the original BDM-based region-to-region forecast. This is an iterative process whereby the detailed regional geographic market-to-regional geographic market commodity flow volumes are adjusted to and constrained by the national benchmarks. Upon completion of this iterative scaling, a series of tables are created that analyze the forecast changes in annual growth rates. These results were extensively reviewed before the final reallocation of the total forecast lane volumes by mode. This is where the modal distributions from the 2002 base year FAF2 data by commodity, by origin and destination are used to distribute the total forecast lane volume.

2B. International Forecast Methodology

The procedure for forecasting the international components of the FAF2 data are similar in nature to those used for the domestic traffic, but some adjustments are needed due to the different underlying growth drivers for international business transactions and the additional gateway or port market definitional dimension that are incorporated. The process of producing the international forecasts treated the import and export portions of the international data separately, as the treatment of suppliers and consumers is asymmetrical with respect to the level of detail available on each end of the transaction, with much more detail available on the U.S. end of the shipment.

The base year FAF2 data is maintained throughout the processing in separate files of imports and exports, and one set of files maintains the original mode distinctions (truck, rail, air, water, truck & rail, pipeline, and other), while a second set of files is created that provides the lane total volumes for the sum of all of the modes. Tonnage and dollar values are maintained in each.

Unlike the domestic data, the international records also contain the gateway or port market which identifies where flows enter or exit the U.S. The originating foreign geographic market for imports and the foreign destination geographic market for exports is identified by the foreign region in the base year 2002 FAF2 data and in the forecasts.

The growth rates of U.S. imports and U.S. exports, by commodity, from Global Insight's World Trade Service World Trade Model (WTM) are applied to the FAF2 base year international data to obtain forecasts flows by the gateway/foreign geographic regional market/SCTG commodity combination. Additional information about the WTM is found in Section 3C.

In order to apply the WTM to the FAF2 2002 base year data, the commodity classifications of the WTM commodity trade models had to be translated to SCTG commodity categories. The relationship between the WTM commodity groups and SCTG commodity codes is shown in Section 4B. Additionally, the geographic regional market areas used in the WTM were translated to match those used in FAF2, as shown is Section 4C.

With the needed commodity and geographic regional market mappings complete, export volume growth was established by regional market and commodity from the BDM output data, and the WTM foreign import purchases data. For U.S. international import volume growth, also by geographic regional market and SCTG commodity category, the shipment level import freight flow forecast was a function of the WTM import forecast, and the purchases from the BTM.

As in the domestic forecasts, national-level constraints by SCTG commodity category where applied in an iterative process. Import shipment level forecasts were controlled by purchases, and export purchases are controlled by shipments. Once the national level constraint was applied, a similar process was completed for each port and SCTG commodity combination. The resulting file at this stage contains total tonnage and dollar values for each forecast year for each regional market-gateway region-SCTG commodity combination.

A quality control step similar to that used for the domestic forecasts produced output formatted with annual growth changes for each SCTG commodity, gateway and SCTG, and foreign geographic region market and SCTG commodity category. After review of this summary data, the modal share splits were then applied to create the final detailed import and export international traffic forecast files.

3. Underlying Economic Forecast Drivers

Global Insight's economic forecasting model of the U.S. economy and Global Insight's Regional state economic models provide significant inputs that shape the freight flow forecasts. This section describes the approach used in these models as well as those Global Insight models that directly provide growth rates used in the FAF2 freight flow forecasts.

Global Insight Model of the U.S. Economy

Global Insight's flagship model of the U.S. Economy integrates modern economic theory and behavior in an analytical tool that is widely used in forecasting, assessing derivative risks, and evaluating policy alternatives. The theoretical structure of the Global Insight Model of the U.S. Economy strives to incorporate the best insights of many theoretical approaches to the business cycle: Keynesian, Neoclassical, monetarist, supply-side, and rational expectations. It embodies major properties of the Neoclassical growth models developed by Robert Solow; thus ensuring that short-run cyclical developments will converge to robust long-run equilibrium.

In growth models, the expansion rate of technical progress, the labor force, and the capital stock determine the productive potential of an economy. Both technical progress and the capital stock are governed by investment, which in turn must be in balance with post-tax capital costs, available savings, and the capacity requirements of current spending. As a result, monetary and fiscal policies will influence both the short- and the long-term characteristics of such an economy through their impacts on national saving and investment.

A modern model of output, prices, and financial conditions is melded with the growth model to present the detailed, short-run dynamics of the economy. In specific goods markets, the interactions of a set of supply and demand relations jointly determine spending, production, and price levels. Typically, the level of inflation-adjusted demand is driven by prices, income, wealth, expectations, and financial conditions. The capacity to supply goods and services is keyed to a production function combining the basic inputs of labor hours, energy usage, and the capital stocks of business equipment and structures, and government infrastructure. The “total factor productivity" of this composite of tangible inputs is driven by expenditures on research and development that produce technological progress.

Prices adjust in response to gaps between current production and supply potential and to changes in the cost of inputs. Wages adjust to labor supply-demand gaps (indicated by a demographically-adjusted unemployment rate), current and expected inflation (with a unit long-run elasticity), productivity, tax rates, and minimum wage legislation. The supply of labor positively responds to the perceived availability of jobs, to the after-tax wage level, and to the growth and age/gender mix of the population. Demand for labor is keyed to the level of output in the economy and the productivity of labor, capital, and

energy. Tempering the whole process of wage and price determination is the exchange rate; a rise signals prospective losses of jobs and markets unless costs and prices are reduced.

For financial markets, the model predicts interest rates, exchange rates, stock prices, loans, and investments interactively with the preceding GDP and inflation variables. The Federal Reserve sets the supply of reserves in the banking system and the fractional reserve requirements for deposits. In the Global Insight Model, "monetary policy" is defined by a set of targets, instruments, and regular behavioral linkages between targets and instruments. The model user can choose to define unchanged monetary policy as unchanged reserves, or as an unchanged reaction function in which interest rates or reserves are changed in response to changes in such policy concerns as the price level and the unemployment rate.

The Global Insight Model captures the full simultaneity of the U.S. economy, forecasting over 1,200 concepts spanning final demands, aggregate supply, prices, incomes, international trade, industrial detail, interest rates, and financial flows. **Chart 1** summarizes the structure of the interactive sectors. The following discussion presents the logic of each sector and the significant interactions with other sectors.

Consumer Spending: The domestic spending, income, and tax policy sectors model the central circular flow of behavior as measured by the national income and product accounts. Consumer spending is divided into eleven durable goods categories, nine nondurable goods categories, and sixteen service categories. Real consumption expenditures are motivated by real income and the user price of a particular category relative to the prices of other consumer goods. Durable and semidurable goods are also especially sensitive to current financing costs, and consumer speculation on whether it is a "good time to buy." The University of Michigan Survey of Consumer Sentiment monitors this last influence, with the index itself modeled as a function of current and lagged values of inflation, unemployment, and the prime rate.

Business Investment: Business spending includes nineteen fixed investment categories. Each equipment and structures spending category is determined by its specific effective post-tax capital costs, capacity utilization, and replacement needs. The cost terms are sophisticated blends of post-tax debt and equity financing costs (offset by expected capital gains) and the purchase price of the investment good (offset by possible tax credits and depreciation-related tax benefits). This Neoclassical structure builds upon the work of Dale Jorgenson, Robert Hall, and Charles Bischoff.

Residential Investment: The residential investment sector of the model includes two housing starts (single and multi-family starts) and three housing sales categories (new and existing single family sales, and new single family units for sale), and five GDP account categories. The housing sector of the Global Insight Model explains new construction as a decision primarily based on the after-tax cost of home ownership relative to disposable income. The equations also include a careful specification of demographic forces.

Government: The government sector is largely exogenous (user-determined) at the federal level and endogenous (equation-determined) at the state and local level. The presence of a large and growing deficit imposes no constraint on federal spending. This contrasts sharply with the state and local sector where legal requirements for balanced budgets mean that declining surpluses or emerging deficits produce both tax increases and reductions in spending growth.

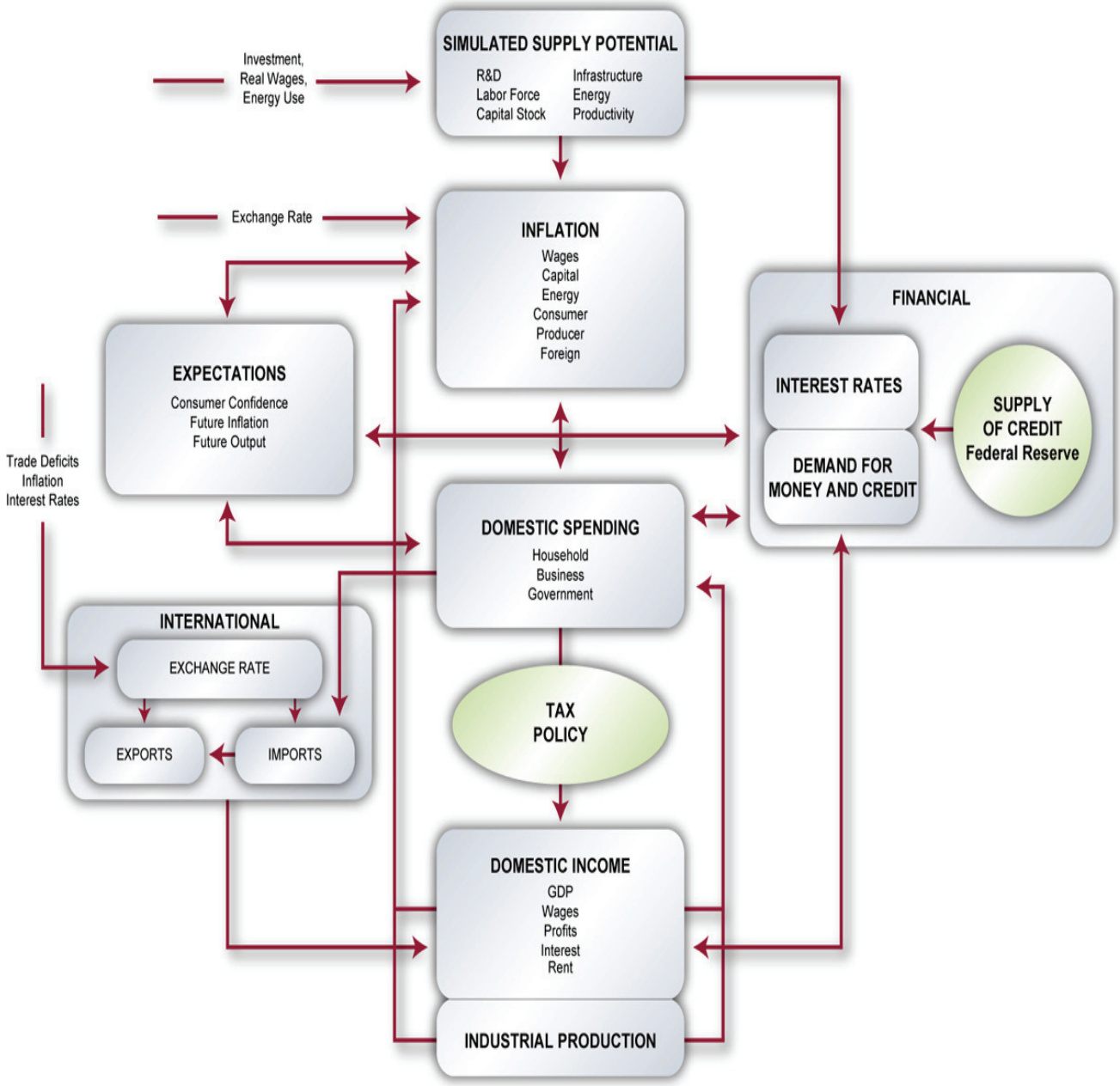
Incomes: Domestic spending, adjusted for trade flows, defines the economy's value-added or gross national product (GNP) and gross domestic product (GDP). Because all value-added must accrue to some sector of the economy, the expenditure measure of GNP also determines the nation's gross income. The distribution of income among households, business, and government is determined in the Tax Policy and Domestic Income sectors of the model. Each pre-tax income category except corporate profits is determined by some combination of wages, prices, interest rates, debt levels, and capacity utilization or unemployment rates. Profits are logically the most volatile component of GNP on the income side. When national spending changes rapidly, the contractual arrangements for labor, borrowed funds, and energy imply that the return to equity holders is a residual that will soar in a boom and collapse in a recession. The model reflects this by subtracting each non-profit income item from national income to solve for profits.

Taxes: Since post-tax rather than pre-tax incomes drive expenditures, each income category must be taxed at an appropriate rate; the model therefore tracks personal, corporate, payroll, and excise taxes separately. Users may set federal tax rates; tax revenues are then simultaneously forecast as the product of the rate and the associated pre-tax income components. However, the model automatically adjusts the effective average personal tax rate for variations in inflation and income per household, and the effective average corporate rate for credits earned on equipment, utility structures, and R&D.

International: The international sector is a critical, fully simultaneous block that can either add or divert strength from the central circular flow of domestic income and spending. Depending on the prices of foreign output, the U.S. exchange rate, and competing domestic prices, imports capture varying shares of domestic demand. Depending on similar variables and the level of world gross domestic product, exports can add to U.S. production. The exchange rate itself responds to international differences in inflation, interest rates, trade deficits, and capital flows between the U.S. and its competitors. Eight aggregate-level categories of goods and two service categories are separately modeled for exports and imports, with one additional category for oil imports.

Investment income flows are also explicitly modeled. The stream of huge current account deficits incurred by the U.S. has important implications for the U.S. investment income balance. As current account deficits accumulate, the U.S. net international investment position and the U.S. investment income balance deteriorate. U.S. foreign assets and liabilities are therefore included in the model, with the current account deficit determining the path of the net investment position.

Chart 1 – Overview of the Global Insight Model of the U.S. Economy



Financial: The use of a detailed financial sector and of interest rate and wealth effects in the spending equations recognizes the importance of credit conditions on the business cycle and on the long-run growth prospects for the economy. Interest rates, the key output of this sector, are modeled as a term structure, pivoting off the federal funds rate. The federal funds rate is determined in response to changes in such policy concerns as inflation and unemployment. Longer-term interest rates are driven by shorter-term rates as well as factors affecting the slope of the yield curve. In the Global Insight Model, such factors include inflation expectations, government borrowing requirements, and corporate financing needs.

Inflation: Inflation is modeled as a carefully controlled, interactive process involving wages, prices, and market conditions. The principal domestic cost influences are labor compensation, nonfarm productivity (output per hour), and foreign input costs; the latter are driven by the exchange rate, the price of oil, and foreign wholesale price inflation. Excise taxes paid by the producer are an additional cost fully fed into the pricing decision. This set of cost influences drives *each* of the industry-specific producer price indexes, in combination with a demand pressure indicator and appropriately weighted composites of the other producer price indexes. In other words, the inflation rate of each industry price index is the reliably weighted sum of the inflation rates of labor, energy, imported goods, and domestic intermediate goods, plus a variable markup reflecting the intensity of capacity utilization or the presence of bottlenecks.

Supply: The first principle of the market economy is that prices and output are determined simultaneously by the factors underlying both demand and supply. In the Global Insight Model, aggregate supply, or potential GDP, is estimated by a Cobb-Douglas production function that combines factor input growth and improvements in total factor productivity. Factor input equals a weighted average of labor, business fixed capital, public infrastructure, and energy provided by the energy sector. Total factor productivity depends upon the stock of research and development capital and trend technological change. Taxation and other government policies influence labor supply and all investment decisions, and thus potential supply. The growth of aggregate supply is the fundamental constraint on the long-term growth of demand. Inflation, created by demand that exceeds potential GDP, raises credit costs and weakens consumer sentiment, thus putting the brakes on aggregate demand.

Expectations: Expectations influence several expenditure categories in the Global Insight Model, but the principal nuance relates to the entire spectrum of interest rates. Shifts in price expectations or the expected capital needs of the government are captured through price expectations and budget deficit terms, with the former affecting the level of rates throughout the maturity spectrum, and the latter affecting intermediate and long-term rates, and hence affecting the shape of the yield curve. On the expenditure side, inflationary expectations affect consumption via consumer sentiment, while growth expectations affect business investment.

Global Insight U.S. Regional Economic Forecasting Models

The Global Insight approach to regional modeling at the state level represents a departure from many earlier multi-regional modeling and forecasting efforts. Most other regional models are constructed as proportions of the U.S. national economy. In the Global Insight regional forecasting system each area is modeled individually and then linked into the national system. Thus, our models do not forecast regional growth as simple proportions of U.S. totals, but focus on internal growth dynamics and state specific business cycle response. This approach is referred to as "top-down bottom-up." It contrasts with pure share (top-down) models, and models which are not linked to a national macroeconomic model (bottom-up), and contains the best of both approaches. A primary objective is to project how regional activity varies, given an economic environment as laid out by our macroeconomic and industry forecasts. Important regional issues are addressed using information about detailed industrial mix, inter-industry and interregional relationships, productivity and relative costs, and migration trends. Global Insight maintains separate models for 50 states and for Washington DC, as well as for 318 metropolitan areas. The state models have two fundamental characteristics: (1) Each state is modeled individually, with different model structures specified according to the characteristics of the state; and (2) national policy is explicitly captured.

These models were converted from an SIC industry classification basis to a NAICS basis to reflect changes in the industrial classification system used by the U.S. government in reporting state and local industry activity. The individual state models are econometrically estimated and contain about 250 or more equations each. Employment by sector and wage rates and income by type of activity, and Gross State Product (GSP) by sector are modeled in detail. Other coverage includes housing starts, retail sales, consumer price indexes, population by 10-year age groups, the labor force and household employment. The models have the ability to forecast income, wages and GSP in nominal as well as real dollars. The state models have a quarterly periodicity, so they are able to capture the business cycle behavior of the economy, including the timing and amplitude of turning points. Another model characteristic is that they are policy sensitive — they respond to changes in tax rates, military spending, utility costs, etc. The policy simulation capability can be classified into: (1) how a state economy responds to changes in the national economy resulting from national or international events; and (2) how a state responds to a change in government policy.

3A. Global Insight's Business Demographics Model

Global Insight’s business demographics forecast contains a consistent set of historical statistical estimates and forecasts by industry sector, by geographic region. The statistics include the number of business establishments, employees, and sales by industry. Industry aggregation levels include the sub-sectors and the 4-, 5-, and 6-digit classifications in the NAICs codes. The model specifically forecasts variables at the county level. Other geographic levels are created by combining, aggregating, or splitting data from this level. All business demographics modeled databases are designed to meet two key criteria. First, they must reflect economic activity that is consistent with actual

information available at this level of geography. Second, they must also agree with published values for national and state employment, establishment and sales data.

The table below lists the business demographic concepts included in the BDM.

Business Demographics Model Coverage

Number of Employees	**Business Size Segments***
Total	1 to 4 Employees
By Industry	5 to 9 Employees
By Occupation Group*	10 to 19 Employees
By Geographic Area	20 to 49 Employees
By Business Size*	50 to 99 Employees
Self-Employed*	100 to 249 Employees
Number of Business Locations	250 to 499 Employees
By Industry	500 to 999 Employees
By Business Size*	1000 Employees or More
By Geographic Area	Self-Employed
Industry Segments	**Geographic Segments**
4-Digit NAICS Code	Nation
5-Digit NAICS Code	Census Regions
6-Digit NAICS Code	States
	Metropolitan Areas
	Counties
	ZIP Codes*

* Non-standard, and not used in the FAF2 forecasts

The following discussion describes the data and estimation techniques utilized in the Business Demographics Model.

Data

Every BDM forecast starts with at least one observation of activity at the level of geography of interest. This observation, generally collected by a government agency, is treated as an "actual" measurement of the economic activity within a given geographic area. In fact, this observation is actually an estimate of activity. The government surveys a percentage of employers within the region and then imputes the value for the region as a whole from this sample. As with any estimate, these "actual" observations may deviate from the "truth." However, as the size of the geographic area increases, so too does the accuracy of the estimate. This occurs due to the law of averages. It is for this reason that the sum of our county level forecasts will always add up to a measurement or an estimate of state and national level activity.

The following data sources were used as a basis for the first round model of county employment and establishments. U.S. County Business Patterns (CBP) data provides a series of county level employment and establishments from 1980 to 2002 at the four-digit SIC code and six-digit NAICs level of detail. This data serves as our starting observation of "actual" activity for most sectors of the economy. The CBP does not contain data for the government or agriculture sectors. Government data is obtained from the Bureau of Labor Statistics, and the agriculture data is obtained from the Census of Agriculture. Data from the U.S. Bureau of Labor Statistics (BLS) is the basis of Global Insight's national and state level macroeconomic forecasting services. These forecasts are available at the two-digit NAICS and SIC code level of detail for counties, and at the one-digit level of detail for MSAs. Forecasts provided by these services serve as the national and state level constraints on the county level forecasts. The counties add up to the state, and the states sum to the nation. In this way the BDM is always consistent with widely accepted levels of economic activity while also ensuring that county estimates are a valid measure of local activity.

Estimation Techniques

a. Employment and the Number of Establishments

The description of modeling methodology is broken into two sections. First, the modeling of employment and the number of establishments are discussed, followed by a description of the estimation of output.

Like many of the Global Insight models, the underlying technique of county level estimation is the "Top-Down Bottom-Up" model. "Top-Down Bottom-Up" methodology relies on using all of the information available to us at any given time. First, county level data is employed to determine the trend of data in a particular county. Both trending and sharing techniques are used here to create an independent forecast of employment and the number of establishments.

To begin, a first round forecast is calculated using CBP county level data. Employment and the number of establishments for each industry as defined by government four-digit SIC and six-digit NAICs codes are estimated by use of a five-year moving average of historical growth rates (from this point any description of procedures to estimate employment also applies to establishments). This forecast is independent of any information at the state, MSA, or national levels, and returns a unique growth path for each of the nation's 3,141 counties.

Next, a second level forecast is calculated using estimates provided in the first round. Over the period 2002 to 2030, employment in each county for every NAICS code is recalculated as a percentage of the first round estimated total for that industry sector. The resulting series represents the relative movement of employment within the county relative to that at the state level, and to employment in other counties within the state. In other words, is employment in industry X in county Y growing faster, slower, or in step with its counterpart at the state level or in the next county. Next, an estimate of

employment levels is made by apportioning the forecast state level employment for that industry to each county based on its share of first round estimated employment.

At this point data for 318 Metropolitan Statistical Areas (MSAs) in the United States are introduced. In an iterative procedure, the county level forecasts are adjusted until the estimates solve for both the state and MSA. A brief description of this procedure follows. Estimates calculated by allocating state level data to the counties are summed to either the MSA to which the county belongs or to a "rest of state" variable. Those counties that comprise each MSA are aggregated into a summed MSA variable. From this, each county's share of MSA employment is calculated, and this share is used to allocate MSA employment to the counties. All of the MSAs in a state are then summed, and subtracted from the sum of the counties for each state. This value, the remainder of employment within each state but not in an MSA, is then allocated to the "rest of state" counties based on their share of the "rest of state" variable calculated above. This process continues iteratively until the selected criteria are met.

b. Output

Output by industry on national level is obtained from Global Insight's Industry Analysis Service. Industry output (as value of sales) is measured in current dollars and is available for all the four-digit NAICS code categories. The Global Insight Industry Analysis Service includes forecasts of constant dollar output and the corresponding price indexes for each of the industry sectors. Nominal dollar output is obtained as identities.

Constant dollar output is estimated as a function of total demand from the input/output block, cyclical variables, and a time trend. The functional form used imposes a unitary elasticity on the demand term, which embodies most of the explanatory power in the relationship. Additional non-demand terms are included in the equations to explain the pattern not well accounted for by the input/output model and its demand indicators – cyclicality and technological change.

National output by industry is transformed to regional measures by using region specific productivity measures from Global Insight's regional models. In addition, the share of employment by industry is used to allocate output to sub-regional geographies.

Data sources include the following: Economic Census, Department of Agriculture, Census of Mining, Annual Survey of Manufactures, Census of Transportation, FCC Statistics of Common Carrier, and Census of Services.

3B. Global Insight's Business Transaction Matrix

Information on inter-industry purchases is provided from Global Insight's Business Transactions Matrix. The primary data source for the Business Transaction Matrix is the latest U.S. Bureau of Economic Analysis (BEA) input/output tables. This data is released every five years as the benchmark input-output accounts of the U.S. The industrial breakdown generally follows a standard six-digit NAICs detail for the manufacturing sectors, and four-digit or three-digit NAICs detail for the non-manufacturing sectors.

Global Insight employs a modified RAS algorithm to forecast changes in the input-output coefficients over time. The chief merits of this method are twofold: its minimal data requirements, and the support of studies that have found the accuracy of the RAS method to be superior to other non-survey coefficient adjustment techniques.

The modified RAS method requires two sets of data: the direct coefficient matrix of an input-output table for an initial year *t* and a column vector of sectoral gross outputs in year *t+1*. Given these sets of data, an iterative adjustment procedure is applied to the direct coefficient matrix, which yields an adjusted coefficient matrix for year *t+1* that is consistent with the ratio of intermediate input to output and the gross output measures of that year.

Once the input-output matrix forecast estimation is complete, purchases by industry and county can be determined. National use factors (defined as purchases by industry *j* from industry *i* per employee in industry *j*) are calculated, and then multiplied by the number of employees in industry *j* by county from the BDM, resulting in an estimation of purchases by industry *j* from industry *i* in each county.

3C. Global Insight's World Trade Service World Trade Model

The Global Insight world trade forecasting system provides detailed forecasts of international commodity trade to assist decision makers involved with international commodity transportation. The world trade forecasts include all commodities that have physical volume, but not trade in services or commodities without physical volume, such as electricity. The trade forecasts are produced with a system of linked world trade commodity models collectively called the World Trade Model (WTM). The commodities forecast are grouped into Global Insight's own categories derived from the International Standard Industrial Classification (ISIC) and cover 77 ISIC categories. For all trade partners in the world, the WTM has 54 major countries individually and groups the rest of the world into 16 regions according to their geographic location. Therefore, Global Insight forecasts 77 commodities traded among 70 country/regions. This is a framework of 77×70×(70-1), or 371,910 potential trade flows. Because not every country trades every commodity with every other country, there are presently about 270,000 non-zero trade flows in the forecasts. The forecasts of world trade are in nominal and real commodity value and are converted to physical volume by transportation mode. Primary modes of transportation include air, overland and maritime transport, all measured in

metric tons as well as in value. The table below shows the aggregate level concepts of world trade in the forecast.

Global Insight World Trade Service Forecast Concepts

Concept
Nominal Value
Real Value
Airborne Nominal Value
Seaborne Nominal Value
Airborne Real Value
Seaborne Real Value
Airborne Metric Tons
Seaborne Metric Tons
Over Land / Other Transportation Nominal Value
Over Land / Other Transportation Metric Tons
All Transportation Mode Metric Tons

Trade Data Sources

The primary international trade history data come from the United Nations as processed and published by Statistics Canada. These commodity trade statistics are collected from member countries' customs agencies. Customs departments have records of both the export side and import side of trade flows. Statistics Canada produces export data in f.o.b. (free on board) terms, which are better to use in estimating the real value of commodity trade. These data cover all UN member countries and non-member economies, such as Taiwan. Global Insight also uses OECD international trade by commodity statistics for more current data from developed countries. Because international trade statistics collected by different countries usually have discrepancies and because no one source has complete data, Global Insight also uses U.S. Customs data and IMF Direction-of-Trade data to calibrate and supplement historical commodity trade data. Data from different sources are recorded in different classification systems and units of measurement. Global Insight converts data into thousands of current U.S. dollars and into 1997 real commodity value.

The Global Insight world trade forecasting models also rely on Global Insight's world macroeconomic history and forecast databases. Among the data used are population, GDP, GDP deflators, industrial output, foreign exchange rates, and export prices by country. These data are exogenous variables in the trade forecast models. For international commodity prices, data from the U.S. Bureau of Labor Statistics on international import and export prices are used. Global Insight also uses other data, such as foreign direct investment and import tariffs as determinants of a country's export capacity and import costs.

Modeling International Trade

The basic structure of the model for the trade flow of a commodity is that a country's imports from another country are driven by the importing country's demand forces, enabled by the exporting country's capacity of exporting (supplying) the commodity, and affected by the exporting country's export prices and importing country's import costs for the commodity. A country will import more of a commodity if its demand for this commodity increases. At the same time, the country will import more of this commodity from a particular exporting country if that exporter's capacity to export this commodity is larger and its export price for this commodity is lower than in other exporting countries. Importers will ultimately purchase based on the delivered cost, importing more when the import cost decreases. The distance between two countries is also an important factor in determining the scale of trade between two countries. Our models are constructed to capture the dynamics of international trade so that geographic distance as a constant is embedded in determining the scale of the base. Demand forces are commodity specific. Presently, Global Insight groups 77 commodities into two types: (1) those where major demand forces are the importing country's population and income growth; and (2) those where major demand forces are the importing country's production and technology development.

Export capacity for a commodity is estimated based on the country's capacity to produce this commodity and its ability to export it. Infrastructure, the establishments and resources needed for production determine production capacity. For export capabilities, the models estimate the production capacity that exceeds that needed to meet a country's domestic demand. Export capability is also determined by quality and cost of products facing competition in world markets. Import costs are determined by export prices, import tariffs, and each importing country's foreign exchange rates. The 77 commodity groups are categorized on the basis of the demand response to import costs as price inelastic, low price elastic, and price elastic.

The models are constructed in real value terms. That is, value type variables are in terms of value minus the effect of price inflation. For example, the trade flow of a commodity is measured in the 1997 value of this commodity, and GDP of a country is measured in its 1990 value of GDP. Global Insight uses data in real value terms, because only in real terms do the levels of imports and exports show clear respective responses to changes in demand, supply, and prices. Global Insight does not simply forecast a country's aggregate imports and exports, but forecasts each country's imports and exports with each of its trade partners. Trade between each pair of trading partners can be quite volatile, with importing behavior exhibiting switching of suppliers on an ongoing basis. To capture trade pattern switching, Global Insight use multi-stage switch modeling in the trade forecasting.

The multi-stage switching model approach represents an important improvement on earlier trade model methodologies and better captures the longer term characteristics of individual commodity trade. At the same time this approach is consistent with Global Insight's World Macro and World Industry forecasts.

4. High and Low Growth Alternate Forecast Scenarios

The high and low growth alternate forecasts of the FAF2 data are based on alternative scenarios from Global Insight's U.S. macroeconomic forecasting model. The U.S. Macroeconomic forecast provides alternate scenario projections in addition to the preferred or baseline estimation. In this particular application to freight transportation volumes, sector-specific employment variables were utilized. These variables represent anticipated future employment levels based on U.S. Bureau of Labor Statistics data under high and low economic growth scenarios.. The high and low growth values for the specific variables used can be found in Section 5D of this report, with percentages of the baseline for each variable under the low and high growth scenarios for 2010 and 2035.

The alternate levels of forecasted employment captured in the high and low scenarios are projected based on more optimistic and pessimistic views of overall growth in the U.S. economy.

As an illustration of the variation between the base, high, and low growth scenarios in the employment factors, the total non-farm payroll employment levels in the final year of the forecast horizon, 2035, are 18% higher in the high growth scenario than in the base case. The low growth scenario is 15% lower than the base. Viewing these same numbers from the perspective of growth from the base year, in the base case forecast the total growth over the forecast horizon is 38%. In the high growth situation the overall increase is 62%, and in the low growth projection the rate is 17%.

For manufacturing employment, again projected to 2035, there is a 30% increase in the high growth forecast, versus the base, and a 20% decrease in the low growth projection compared to the base. Within the component industries of the manufacturing sector, employment in miscellaneous non-durable goods shows a 99% increase over the base case in the high growth situation, and a 47% decline in the low growth. Textile mill employment, conversely, only shows a 9% increase in the high growth scenario, and shows virtually no change in the low growth scenario.

The actual methodological application that creates the high and low growth forecast of the FAF2 flow data follows the steps outlined in Section 2 of this paper, as used for creating the base case forecast. This process was re-run with the appropriate input files changed to reflect the different levels of employment captured in the high and low scenario forecasts.

5. Data Classification Mapping

This section documents the relationships developed and used between industry, commodity and geographic regional data dimensions as referenced in prior sections as well as the industry sector variables for the alternative scenarios.

5A. NAICS to SCTG Relationships

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if naics='112000' then sctg=1;
if naics='311212' then sctg=2;
if naics='111000' or naics='311223' or naics='311911' or naics='311920'
or naics='313111' then sctg=3;
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or naics='311312' or naics='311411'
  or naics='311611' or naics='311613' then sctg=4;
if naics='114111' or naics='114112' or naics='311615' then sctg=5;
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or naics='311823' or naics='325412'
  or naics='325520' then sctg=6;
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or naics='311421' or naics='311422'
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naics='311520' or naics='311711' or naics='311919'
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if naics='312130' then sctg=8;
if naics='312210' or naics='312221' or naics='312229' then sctg=9;
if naics='212311' then sctg=10;
if naics='212322' then sctg=11;
if naics='212319' then sctg=12;
if naics='212324' or naics='212325' or naics='212392' or naics='212393'
or naics='327410' then sctg=13;
if naics='212210' or naics='212221' or naics='212222' or naics='212231'
or naics='212234' or naics='212291'
  or naics='212299' then sctg=14;
if naics='212111' or naics='212113' then sctg=15;
if naics='324121' or naics='324199' then sctg=19;
if naics='211112' or naics='325110' or naics='325120' or naics='325131'
or naics='325181' or naics='325182'
  or naics='325312' or naics='325320' or naics='325411' or
naics='325611' or naics='327910' then sctg=20;
if naics='325414' or naics='339114' then sctg=21;
if naics='212391' or naics='325311' then sctg=22;
if naics='311942' or naics='325191' or naics='325510' or naics='325612'
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naics='326121' or naics='326160' or naics='326191'
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naics='339920' or naics='339991' then sctg=24;
if naics='113310' or naics='321114' then sctg=25;
if naics='321113' or naics='321211' or naics='321212' or naics='321213'
or naics='321219' or naics='321911'
  or naics='321920' then sctg=26;
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or naics='511130' then sctg=29;
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naics='316212' or naics='316213' or naics='316214'
  or naics='316219' or naics='316991' or naics='316993' or
naics='316999' or naics='325221' then sctg=30;
if naics='324122' or naics='327111' or naics='327121' or naics='327122'
or naics='327123' or naics='327124'
  or naics='327125' or naics='327211' or naics='327213' or
naics='327215' or naics='327310' or naics='327331'
  or naics='327332' or naics='327991' or naics='327993' or
naics='327999' or naics='339914' then sctg=31;
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or naics='331314' or naics='331315'
  or naics='331319' or naics='331491' then sctg=32;
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or naics='331524' or naics='332114'
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naics='332211' or naics='332213' or naics='332312'
  or naics='332321' or naics='332323' or naics='332431' or
naics='332611' or naics='332722' or naics='332913'
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naics='333992' or naics='335129' or naics='337214'
  or naics='337920' or naics='339992' then sctg=33;
if naics='314999' or naics='316110' or naics='322291' or naics='323122'
or naics='332212' or naics='332410'
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naics='336415' or naics='337129' or naics='339993'
  then sctg=34;
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  or naics='334613' or naics='335110' or naics='335212' or
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or naics='336214' or naics='336370'
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or naics='336411' or naics='336414'
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or naics='334513' or naics='334514'
  or naics='334517' or naics='339113' then sctg=38;
if naics='323113' or naics='327212' or naics='337110' or naics='337121'
or naics='337127' then sctg=39;
if naics='321992' or naics='332214' or naics='332311' or naics='332992'
or naics='332995' or naics='334518'
  or naics='339911' or naics='339931' or naics='339941' or
naics='339943' or naics='339994' then sctg=40;
if naics='331411' or naics='333319' then sctg=41;

Other relationships that were also estimated:
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NAICS 211111 → 45% to SCTG16 & 55% to SCTG19
NAICS 324110 → 26% to SCTG17, 25%t to SCTG18 & 50% to SCTG19

NAICS to SCTG

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naics='313320'                    sctg=24;
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naics='324199'                    sctg=19;
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naics='325191'                    sctg=23;
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naics='325311'                    sctg=22;
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naics='332997'                    sctg=34;
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naics='334511'                    sctg=35;
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naics='339994'                    sctg=40;
naics='511110'   naics='511130'   sctg=29;
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NAICS 211111 → 45% to SCTG16 & 55% to SCTG19
NAICS 324110 → 26% to SCTG17, 25%t to SCTG18 & 50% to SCTG19

5B. World Trade Model to SCTG Commodity Mapping

WTM Code	Commodity Name	SCTG CODE
C1I	Other Agriculture	**1**
C1A	Grain	**2**
C1C	Vegetables, Fruits and Eggs - requiring Refrigeration	**3**
C1D	Vegetables and Fruits - non-Refrigerated	**3**
C1G	Cotton	**3**
C311D	Animal Feed	**4**
C311A	Meat/Dairy/Fish Requiring Refrigeration	**5**
C311B	Other Meat/Dairy/Fish/Fruit/Vegetables	**5**
C311F	Other Food	**6**
C1B	Oil Seeds	**7**
C311C	Sugar	**7**
C311E	Animal and Vegetable Oils	**7**
C313	Beverages	**8**
C314	Tobacco	**9**
C2A	Stone, Clay and Other Crude Minerals	**11**
C369	Non-Metallic Products, nec.	**13**
C2C	Ores	**14**
C371	Iron and Steel	**14**
C2D	Coal and Coke	**15**
C2E	Crude Petroleum	**16**
C353	Petroleum Refineries	**17**
C2F	Natural Gas	**19**
C354A	Briquettes, Lignite, Peat and Coke	**19**
C354B	Residual Petroleum Products	**19**
C3511A	Organic Chemicals	**20**
C3511B	Inorganic Chemicals	**20**
C3522	Drugs and Medicines	**21**
C3523	Soap and Cleaning Preparations	**21**
C2B	Crude Fertilizers	**22**
C3512	Fertilizers and Pesticides	**22**
C3513	Synthetic Resins	**23**
C3521	Paint, Varnishes and Lacquers	**23**
C3529	Chemical Products, nec.	**23**
C1F	Natural Rubber	**24**
C355	Rubber Products	**24**
C356	Plastic Products, nec.	**24**
C1E	Cork and Wood	**25**
C331	Wood Products	**26**
C341B	Pulp	**27**

C341A	Waste Paper	**28**
C341C	Paper and Paperboard and Products	**28**
C342	Printing and Publishing	**29**
C1H	Other Raw Textile Materials	**30**
C321	Textiles	**30**
C322	Wearing Apparel	**30**
C323	Leather and Products	**30**
C324	Footwear	**30**
C361	Pottery, China etc.	**31**
C362	Glass and Products	**31**
C372	Non-Ferrous Metals	**32**
C381	Metal Products	**33**
C3822	Agricultural Machinery	**34**
C3823	Metal and Wood Working Machinery	**34**
C3824	Special Industrial Machinery	**34**
C3829	Machinery and Equipment, nec.	**34**
C3831	Electrical Industrial Machinery	**34**
C3821	Engines and Turbines	**35**
C3825	Office and Computing Machinery	**35**
C3843A	Motor Vehicles	**36**
C3843B	Parts of Motor Vehicles	**36**
C3844	Motorcycles and Bicycles	**36**
C3841	Shipbuilding and Repairing	**37**
C3842	Railroad Equipment	**37**
C3845	Aircraft	**37**
C3849	Transport Equipment, nec.	**37**
C3832A	Radio and TV	**38**
C3832B	Semi-Conductors	**38**
C3832C	Other Communications Equipment	**38**
C3833	Electrical Appliances and Housewares	**38**
C3839	Electrical Apparatus, nec.	**38**
C3851	Professional Equipment	**38**
C3852	Photographic and Optical Goods	**38**
C3853	Watches and Clocks	**38**
C332	Furniture and Fixtures	**39**
C390	Other Manufacturing, nec.	**40**
C2G	Scrap	**41**
C399	Miscellaneous, nec. Note: nec is not elsewhere classified	**43**

5C. World Trade Model to FAF2 Geographic Region Mapping

WTM Region	FAF #	Regions
Gulf	1	Birmingham-Hoover-Cullman, AL CSA
Gulf	2	Remainder of Alabama
North Pacific	3	Alaska
South Pacific	4	Phoenix-Mesa-Scottsdale, AZ MeSA
South Pacific	5	Tucson, AZ MeSA
South Pacific	6	Remainder of Arizona
Gulf	7	Arkansas
South Pacific	8	Los Angeles-Long Beach-Riverside, CA CSA
South Pacific	9	San Diego-Carlsbad-San Marcos, CA MeSA
South Pacific	10	Sacramento--Arden-Arcade--Truckee, CA-NV CSA (CA Part)
South Pacific	11	San Jose-San Francisco-Oakland, CA CSA
South Pacific	12	Remainder of California
Great Lakes	13	Denver-Aurora-Boulder, CO CSA
Great Lakes	14	Remainder of Colorado
North Atlantic	15	New York-Newark-Bridgeport, NY-NJ-CT-PA CSA (CT Part)
North Atlantic	16	Remainder of Connecticut
North Atlantic	17	Delaware
North Atlantic	18	Washington-Arlington-Alexandria, DC-VA-MD-WV MeSA (DC Part)
South Atlantic	19	Jacksonville, FL MeSA
South Atlantic	20	Miami-Fort Lauderdale-Miami Beach, FL MeSA
South Atlantic	21	Orlando-The Villages, FL CSA
South Atlantic	22	Tampa-St Petersburg-Clearwater, FL MeSA
South Atlantic	23	Remainder of Florida
South Atlantic	24	Atlanta-Sandy Springs-Gainesville, GA-AL CSA (GA Part)
South Atlantic	25	Remainder of Georgia
South Pacific	26	Honolulu, HI MeSA

South Pacific	27	Remainder of Hawaii
Great Lakes	28	Idaho
Great Lakes	29	Chicago-Naperville-Michigan City, IL-IN-WI CSA (IL Part)
Great Lakes	30	St Louis, MO-IL MeSA (IL Part)
Great Lakes	31	Remainder of Illinois
Great Lakes	32	Chicago-Naperville-Michigan City, IL-IN-WI CSA (IN Part)
Great Lakes	33	Indianapolis-Anderson-Columbus, IN CSA
Great Lakes	34	Remainder of Indiana
Great Lakes	35	Iowa
Great Lakes	36	Kansas City, MO-KS MeSA (KS Part)
Great Lakes	37	Remainder of Kansas
Great Lakes	38	Louisville-Elizabethtown-Scottsburg, KY-IN CSA (KY Part)
Great Lakes	39	Remainder of Kentucky
Gulf	40	New Orleans-Metairie-Bogalusa, LA CSA
Gulf	41	Remainder of Louisiana
North Atlantic	42	Maine
North Atlantic	43	Baltimore-Towson, MD MeSA
North Atlantic	44	Washington-Arlington-Alexandria, DC-VA-MD-WV MeSA (MD Part)
North Atlantic	45	Remainder of Maryland
North Atlantic	46	Boston-Worcester-Manchester, MA-NH CSA (MA Part)
North Atlantic	47	Remainder of Massachusetts
Great Lakes	48	Detroit-Warren-Flint, MI CSA
Great Lakes	49	Grand Rapids-Wyoming-Holland, MI CSA
Great Lakes	50	Remainder of Michigan
Great Lakes	51	Minneapolis-St Paul-St Cloud, MN-WI CSA (MN Part)
Great Lakes	52	Remainder of Minnesota
Gulf	53	Mississippi
Great Lakes	54	Kansas City, MO-KS MeSA (MO Part)
Great Lakes	55	St Louis-St Charles-Farmington, MO-IL CSA (MO Part)
Great Lakes	56	Remainder of Missouri
Great Lakes	57	Montana
Great Lakes	58	Nebraska
South Pacific	59	Las Vegas-Paradise-Pahrump, NV CSA
South Pacific	60	Remainder of Nevada
North Atlantic	61	New Hampshire

North Atlantic	62	New York-Newark-Bridgeport, NY-NJ-CT-PA CSA (NJ Part)
North Atlantic	63	Philadelphia-Camden-Vineland, PA-NJ-DE-MD CSA (NJ Part)
North Atlantic	64	Remainder of New Jersey
Gulf	65	New Mexico
North Atlantic	66	Albany-Schenectady-Amsterdam, NY CSA
Great Lakes	67	Buffalo-Cheektowaga-Tonawanda, NY MeSA
North Atlantic	68	New York-Newark-Bridgeport, NY-NJ-CT-PA CSA (NY Part)
Great Lakes	69	Rochester-Batavia-Seneca Falls, NY CSA
North Atlantic	70	Remainder of New York
South Atlantic	71	Charlotte-Gastonia-Salisbury, NC-SC CSA (NC Part)
South Atlantic	72	Greensboro--Winston-Salem--High Point, NC CSA
South Atlantic	73	Raleigh-Durham-Cary, NC CSA
South Atlantic	74	Remainder of North Carolina
Great Lakes	75	North Dakota
Great Lakes	76	Cincinnati-Middletown-Wilmington, OH-KY-IN CSA (OH Part)
Great Lakes	77	Cleveland-Akron-Elyria, OH CSA
Great Lakes	78	Columbus-Marion-Chillicothe, OH CSA
Great Lakes	79	Dayton-Springfield-Greenville, OH CSA
Great Lakes	80	Remainder of Ohio
Great Lakes	81	Oklahoma City-Shawnee, OK CSA
Great Lakes	82	Tulsa-Bartlesville, OK CSA
Great Lakes	83	Remainder of Oklahoma
North Pacific	84	Portland-Vancouver-Beaverton, OR-WA MeSA (OR Part)
North Pacific	85	Remainder of Oregon
North Atlantic	86	Philadelphia-Camden-Vineland, PA-NJ-DE-MD CSA (PA Part)
North Atlantic	87	Pittsburgh-New Castle, PA CSA
North Atlantic	88	Remainder of Pennsylvania
North Atlantic	89	Rhode Island
South Atlantic	90	Greenville-Anderson-Seneca, SC CSA
South Atlantic	91	Spartanburg-Gaffney-Union, SC CSA
South Atlantic	92	Remainder of South Carolina

Great Lakes	93	South Dakota
Gulf	94	Memphis, TN-MS-AR MeSA (TN Part)
Gulf	95	Nashville-Davidson--Murfreesboro--Columbia, TN CSA
Gulf	96	Remainder of Tennessee
Gulf	97	Austin-Round Rock, TX MeSA
Gulf	98	Dallas-Fort Worth, TX CSA
Gulf	99	Houston-Baytown-Huntsville, TX CSA
Gulf	100	San Antonio, TX MeSA
Gulf	101	Remainder of Texas
Great Lakes	102	Salt Lake City-Ogden-Clearfield, UT CSA
Great Lakes	103	Remainder of Utah
North Atlantic	104	Vermont
North Atlantic	105	Richmond, VA MeSA
North Atlantic	106	Virginia Beach-Norfolk-Newport News, VA-NC MeSA (VA Part)
North Atlantic	107	Washington-Baltimore-Northern Virginia, DC-MD-VA-WV CSA (VA Part)
North Atlantic	108	Remainder of Virginia
North Pacific	109	Seattle-Tacoma-Olympia, WA CSA
North Pacific	110	Remainder of Washington
Great Lakes	111	West Virginia
Great Lakes	112	Milwaukee-Racine-Waukesha, WI CSA
Great Lakes	113	Remainder of Wisconsin
Great Lakes	114	Wyoming
North Pacific	115	Anchorage, AK
North Pacific	116	Blaine, WA
Great Lakes	117	International Falls, MN
Great Lakes	118	Alexandria Bay, NY
Great Lakes	119	Champlain/Rouses Point, NY
North Atlantic	120	Portland, ME
South Atlantic	121	Charleston, SC
South Atlantic	122	Savannah, GA
Gulf	123	Mobile, AL
Gulf	124	Baton Rouge, LA
Gulf	125	Morgan City, LA
Gulf	126	Lake Charles, LA

Gulf	127	Beaumont, TX
Gulf	128	Corpus Christi, TX
Gulf	129	Brownsville/Hidalgo, TX
Gulf	130	Laredo, TX
Gulf	131	El Paso, TX

5D. Economic Variables for High & Low Growth Scenarios

The differences from the baseline values for the high and low growth scenarios are listed in the table below for the industry sectors used in the forecasts for the example years of 2010 and 2035.

Category Description	2010 Low	2010 High	2035 Low	2035 High
Crop Farming	88.11%	109.79%	76.40%	122.70%
Animal Production	88.11%	109.79%	76.40%	122.70%
Forestry	88.11%	109.79%	76.40%	122.70%
Fishing, Hunting and Trapping	88.11%	109.79%	76.40%	122.70%
Support Activities for Farming, Forestry, Fishing	88.11%	109.79%	76.40%	122.70%
Crude Petroleum and Natural Gas Extraction	94.00%	100.81%	82.54%	97.84%
Mining	94.00%	100.81%	82.54%	97.84%
Support Activities for Mining	94.00%	100.81%	82.54%	97.84%
Utilities	94.91%	103.48%	86.82%	110.76%
Mining	93.65%	108.19%	85.01%	119.26%
Building Construction	93.65%	108.19%	85.01%	119.26%
Heavy and Civil Engineering Construction	93.65%	108.19%	85.01%	119.26%
Specialty Trade Contractors	90.76%	116.62%	58.53%	141.32%
Wood Product Manufacturing	97.12%	109.94%	86.44%	120.84%
Nonmetallic Mineral Product Manufacturing	94.21%	101.99%	75.73%	156.15%
Primary Metal Product Manufacturing	96.62%	106.37%	76.12%	121.17%
Fabricated Metal Product Manufacturing	95.86%	102.30%	74.83%	143.85%
Machinery Manufacturing	85.31%	97.63%	80.23%	106.71%
Computer & Electronic Product Manufacturing	98.47%	103.52%	80.33%	139.70%
Electrical Equipment & Appliance Manufacturing	95.85%	101.29%	75.98%	128.23%
Transportation Equipment Manufacturing	95.28%	108.94%	94.29%	134.16%
Furniture & Related Product Manufacturing	96.87%	98.05%	52.86%	199.34%
Miscellaneous Manufacturing	97.40%	99.82%	88.83%	106.21%
Food Manufacturing	95.49%	100.45%	93.12%	129.50%
Beverages & Tobacco Products	97.55%	100.39%	100.71%	108.90%
Textile Mills	98.35%	104.55%	82.87%	145.05%
Textile Product Manufacturing	98.29%	103.70%	95.52%	107.68%
Apparel	98.72%	103.83%	96.80%	110.40%
Leather & Allied Product Manufacturing	96.57%	100.90%	89.44%	184.36%
Paper & Paper Product Manufacturing	99.12%	100.75%	85.42%	114.17%
Printing & Related Support Activities	92.64%	94.79%	108.24%	102.09%
Petroleum & Coal Products	96.64%	102.00%	89.51%	116.06%
Chemical Product and Preparation Manufacturing	96.98%	103.00%	88.53%	139.22%
Plastics & Rubber Product Manufacturing	94.76%	107.82%	80.52%	115.29%
Durable Goods Merchant Wholesalers	94.76%	107.82%	80.52%	115.29%
Nondurable Goods Merchant Wholesalers	94.76%	107.82%	80.52%	115.29%
Wholesale Trade Agents, Brokers, Electronic Markets	95.17%	103.98%	85.76%	108.66%
Motor Vehicles & Parts Stores	95.17%	103.98%	85.76%	108.66%
Home Furnishings Stores	95.17%	103.98%	85.76%	108.66%
Consumer Electronics & Appliance Stores	95.17%	103.98%	85.76%	108.66%

Category Description	2010 Low	2010 High	2035 Low	2035 High
Building Materials, Nurseries, and Farm Supply Stores	88.11%	109.79%	76.40%	122.70%
Food & Beverage Stores	95.17%	103.98%	85.76%	108.66%
Drug, Health and Personal Care Stores	95.17%	103.98%	85.76%	108.66%
Gasoline Stations	95.17%	103.98%	85.76%	108.66%
Clothing, Shoe, Jewelry Stores	95.17%	103.98%	85.76%	108.66%
Sporting, Toy, Hobby, Book, Sewing Stores	95.17%	103.98%	85.76%	108.66%
Department, General Merchandise Stores	95.17%	103.98%	85.76%	108.66%
Miscellaneous Store Retailers	95.17%	103.98%	85.76%	108.66%
Other Direct Selling Establishments	95.17%	103.98%	85.76%	108.66%
Air Transportation	95.37%	108.99%	86.28%	172.56%
Railroad Transportation	95.37%	108.99%	86.28%	172.56%
Water Transportation	95.37%	108.99%	86.28%	172.56%
Truck Transportation	95.37%	108.99%	86.28%	172.56%
Transit and Ground Passenger Transportation	95.37%	108.99%	86.28%	172.56%
Pipeline Transportation	95.37%	108.99%	86.28%	172.56%
Scenic and Sightseeing Transportation	95.37%	108.99%	86.28%	172.56%
Air Traffic Control and Airport Operations	95.37%	108.99%	86.28%	172.56%
Postal Service	95.37%	108.99%	86.28%	172.56%
Couriers, Messengers and Local Delivery	95.37%	108.99%	86.28%	172.56%
Warehousing and Storage	95.37%	108.99%	86.28%	172.56%
Publishers	98.35%	107.18%	89.52%	177.39%