Appendix B: Description of the Intertemporal General Equilibrium Model (IGEM): Industries and Commodities, Model Organization and Model Flows

In IGEM, production is disaggregated to 35 separate commodities produced by one or more of 35 industries. The industries are listed in Table B-1 and generally match two-digit sectors in the North American Industry Classification System (NAICS). Each industry produces one primary product and may produce one or more additional goods or services.

Table B-1

Definitions of Industries-Commodities

Number	Description
1	Agriculture, forestry and fisheries
2	Metal mining
3	Coal mining
4	Crude oil and natural gas extraction
5	Non-metallic mineral mining
6	Construction
7	Food and kindred products
8	Tobacco manufactures
9	Textile mill products
10	Apparel and other textile products
11	Lumber and wood products
12	Furniture and fixtures
13	Paper and allied products
14	Printing and publishing
15	Chemicals and allied products
16	Petroleum refining
17	Rubber and plastic products
18	Leather and leather products
19	Stone, clay and glass products
20	Primary metals
21	Fabricated metal products
22	Non-electrical machinery
23	Electrical machinery
24	Motor vehicles
25	Other transportation equipment
26	Instruments
27	Miscellaneous manufacturing
28	Transportation and warehousing
29	Communications
30	Electric utilities (services)
31	Gas utilities (services)
32	Wholesale and retail trade
33	Finance, insurance and real estate
34	Other personal and business services
35	Government enterprises

Economic activity is organized in an inter-industry framework in which the demands for and supplies of each commodity, as well as those of capital and labor, balance in both value and quantity terms. This inter-industry framework consists of the thirty-five producing sectors, the household or consumer sector, a business investment sector, the federal, state and local governments sector and a foreign sector. The organization of annual use and make tables is shown in Figure B-1; these are "spreadsheets" at the industry and commodity level of detail. The use tables show commodity purchases by industries and final demand while the make tables show the commodities made by industries. Figure B-1 also shows the inputs of capital and labor into each producing and consuming sector.
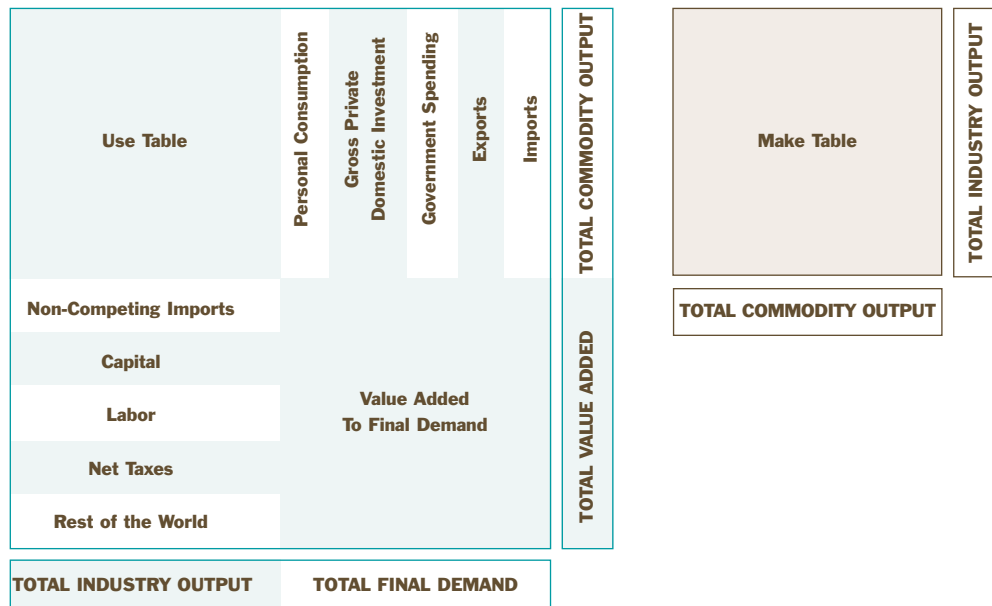
Organization of the **Use and Make Tables**

Figure B-2 depicts production and supply. Inputs of the thirty-five commodities plus capital, labor and non-competing imports are combined to produce domestic industrial outputs. In turn, these outputs are mapped into domestic commodity outputs through use of the make table. Combining the domestic commodities with competitive foreign imports gives rise to the available supplies that are purchased as intermediate inputs or finished goods (final demand).

Finally, household consumption by commodity is shown as the result of a three-stage, multi-period optimization process in Figure B-3. Households choose the amount of full consumption (goods, services and leisure) they are going to consume in each period. They then allocate this between the consumption of goods and services and the consumption of leisure. Given the time endowment for each period, the choice of leisure simultaneously determines the labor supply that, with prevailing compensation rates, interest, profits and other capital income, determines total income. The difference between income and consumption is private domestic saving which, with foreign saving, funds private domestic investment and the government deficit. Consumption then is allocated among the thirty-five commodities, including the service flows from consumer durable goods. Investment is allocated similarly across the various categories of capital goods as households and businesses use saving to purchase additions to the capital stock. Government additions to capital are part of government purchases.

Figure B-2

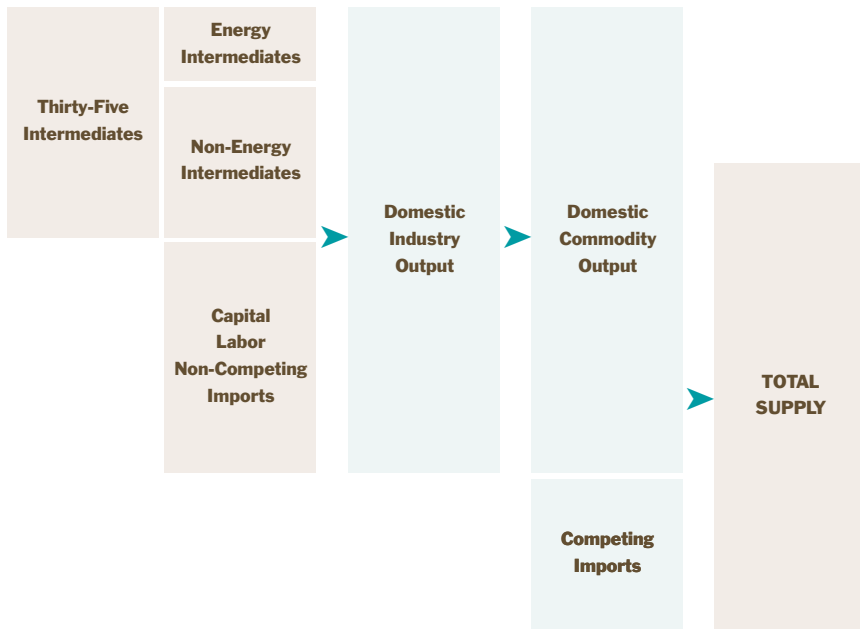The Model Flows of **Production and Commodity Supply**

Thirty-Five Intermediates	**Energy Intermediates**			
	Non-Energy Intermediates	**Domestic Industry Output** ➤	**Domestic Commodity Output** ➤	
	Capital Labor Non-Competing Imports			**TOTAL SUPPLY**
			Competing Imports	

Figure B-3

The Model Flows of **Household Behavior**

	Income		
Saving ◄ {	{	**Energy** } ➤	
Full Consumption ➤ }	**Consumption**	**Non-Energy** ➤ } ➤	**Thirty-Five Commodities**
	Leisure	**Capital**	
	Labor Supply ▼		**Capital Labor Non-Competing Imports**