producer input shares, are derived from microsurvey data and data from national accounts. "Elasticity" parameters, such as those for labor supply, household consumption, and production, characterize the behavior of households and producers in response to changes in prices (wages) or income. Values for the elasticity parameters come from economic and social science research.

A complete CGE model also includes a number of closure rules. Closure rules place aggregate constraints on the economic activity simulated in the CGE model. They pertain to how the three major macroeconomic accounts (government, trade, and capital accounts) adjust to regain equilibrium in response to changes in economic activity. The accounting identity for the government account is

(1) Revenue – Expenditure = Surplus (or Deficit if negative).

For the trade account, which pertains to the relationship between the United States and the rest of the world, the identity is

(2) Imports – Exports = Net Value of Capital Income from ROW.

The identity for the capital account is

(3) Savings = Investment.

The macroaccounting identities must hold true under all circumstances for any macroeconomic or economywide model (Robinson, 1989; Arora and Dua, 1993). Closure rules establish the mechanisms for keeping the three major macroaccounts in balance after a change in economic activity. These rules have an important effect on the way a policy change works through the economy. For example, if closure rules fix both real government expenditures and the government deficit, then a policy change that increases government revenue will necessarily result in lower taxes.

Once the CGE model is fully specified, it provides a mechanism for measuring the potential economywide effects of a hypothetical change in economic policy or other shocks to the economy. Simulating a policy change in a CGE model is a "what if" comparison of two equilibrium states of the economy. The CGE model calculates the changes to the initial equilibrium arising after an economic shock or policy change has been incorporated into the economy and a new equilibrium has been established (in equilibrium, prices equate demand and supply for all markets, including labor markets).

In the next section, we present the characteristics of the ERS Food Assistance CGE model and describe the strengths of this model for examining the interactions between food assistance programs and the general economy.

Building a CGE Model Focusing on Food Assistance: Characteristics and Innovations of the Food Assistance CGE Model

A CGE model can provide a framework for examining the impact of food assistance programs on the economy and the impact of economic change on the need for food assistance. Despite the contribution that a CGE model can make to this analysis, few CGE models have focused on food assistance or, for that matter, on any aspect of the welfare assistance system. One example of a CGE model that does examine welfare transfers was developed by Ballard and Goddeeris (1999) to examine Medicare and health care issues. Another example is the ERS CGE model used to examine the economywide impact of reduced Food Stamp Program funding (Smallwood et al., 1995a, 1995b, and Kuhn et al., 1996). This early ERS model was derived from a model developed by Robinson et al. (1990).

The Food Assistance CGE model was constructed using a modeling style similar to the one developed by Robinson et al.[1] The base model presents a snapshot view of the U.S. economy in 1996. We chose 1996 for the base for two reasons. First, we wanted to establish a pre-welfare-reform base model in order to be able to conduct simulation experiments examining the impact of welfare reform, and 1996 is the last year of official pre-welfare-reform data. Second, it is a lengthy procedure to establish the database for a CGE model. At the time this project began (1998), 1996 was the last year of complete data available.

The Food Assistance CGE model includes a number of specifications that make it particularly suitable for examining the interaction between food assistance programs and general economic activity. The specifications incorporated into the model are as follows:

- Households are categorized by demographic variables and income to better capture the impact of changes in food assistance programs and taxes.

[1]For a technical appendix detailing the construction of the Food Assistance CGE model, contact Ken Hanson at khanson@ers.usda.gov.

- Consumption patterns are varied according to household income to better capture the impact of redistribution on economic activity.

- Industry categories highlight key agricultural and food processing sectors.

- Labor occupations are categorized by skill level to highlight differences in labor supply and demand by skill level across households and industries.

- Labor supply elasticities are detailed by household type to better capture the impact of the redistribution of economic activity.

- Government transfers to individuals are specified by program in order to focus on the role each transfer plays in assisting low-income households.

- Model closure rules direct the impact of policy change to household sectors.

As a result of these specifications, the Food Assistance CGE model provides a powerful tool for analyzing the distributional consequences of food policy and economic change. Discussion follows of each of the above innovations and of the way they facilitate the analysis.

Household Categories Reflect Key Demographic Variables and Income

One of the first tasks in constructing a CGE model is to identify important household characteristics with respect to the policy issues under consideration and then to create relevant household categories for the model. Food assistance programs affect the economy through their impact on household consumption and labor supply. Accordingly, the households in the Food Assistance CGE model are differentiated with respect to those characteristics that influence consumption and labor supply behavior. Specifically, the Food Assistance CGE model distinguishes households on the basis of "household type" and income. These two variables also help determine eligibility for food assistance and other welfare assistance programs.

The Food Assistance CGE model includes five mutually exclusive household types: (1) dual-parent households, (2) single-parent households, (3) multi-adult households, (4) single-adult households, and (5) elderly households.[2] Within each demographic group, the model distinguishes three income groups: low-, mid-, and high-income. Low-income households have incomes at or below 130 percent of the poverty line (the cutoff for food stamp eligibility).[3] Mid-income households have incomes above 130 percent of the poverty line but below the income earned by either 50 or 75 percent of households in the demographic group.[4] High-income households are those with an income above that received by either 50 or 75 percent of households in the demographic group.

Table 1 shows the population and income distribution by household group. Appendix A presents more details on household groupings and sources of income. Data on household demographics and on income by source and household group are from the 1997 March Supplement to the Current Population Survey (CPS) of the Bureau of the Census.

The household grouping in the Food Assistance CGE model allows the model to simultaneously evaluate the distributional impact of food assistance programs and of the taxes funding those programs. The aggregation scheme facilitated a detailed specification of household expenditure patterns and labor supply characteristics (which was necessary to make a redistribution of income among types of household groups trigger shifts in expenditure patterns and labor supply in the model).

Household Expenditure Patterns Vary by Income

The Food Assistance CGE model differentiates general expenditure patterns by household groups so that income shifts among different types of households generate shifts in expenditures. The variation in expenditure patterns across household groups enhances the model's ability to trace the impact of changes in food assistance policy to their impact on the distribution of income, consumption, and, ultimately, production.

In the Food Assistance CGE model, the variation in expenditure patterns across households stems from two

[2]A household was categorized as elderly if the household head was 65 years old or older. The elderly household group was the category of preference if the household fit in multiple categories.

[3]The poverty line for household groups was defined with respect to the definition of income used by the Bureau of the Census for poverty calculations.

[4]Whether the cutoff point between mid- and high-income households is at 50 or 75 percent of households depends on how wealthy the demographic group is. For example, for single-parent households, almost 50 percent of households have incomes below 130 percent of the poverty line. For this group, mid-income households are those with incomes up to that earned by 75 percent of households. For more affluent demographic groups, the mid-income group is cut off at the income earned by 50 percent of households.

empirical observations, both of which are incorporated into the model. First, consumption patterns vary by income. For the different household groups in the Food Assistance GCE model, expenditure (budget) shares are based on 1995 data from the Consumer Expenditure Survey, Bureau of Labor Statistics. These data reflect the variation in expenditure shares by income group. For example, the average food budget share was 14.0 percent for households with incomes below 130 percent of the poverty line and 9.1 percent for high-income households. Poor households also spend an additional (marginal) dollar of income differently than upper income households do. Marginal expenditure estimates for the different income groups were derived from previous empirical work (Blanchiforti et al., 1986; Blundell et al., 1993; and Park et al., 1996).

The second reason that expenditure patterns vary across households is that households spend food stamp benefits differently than cash. A dollar of food stamp benefits translates into a higher food expenditure than a dollar in cash. Empirical studies find that a dollar of food stamps increases food demand by 15 to 45 cents,[5] while a dollar of cash income increases food expenditures by 5 to 10 cents (Fraker, 1990; Devaney and Moffitt, 1991; Levedahl, 1995; Smallwood et al., 1995a and 1995b; and Rossi, 1998).[6] Thus, the conversion of a dollar of food

[5]This amount is often referred to as the "supplementation effect" (Smallwood et al., 1995a and 1995b).

[6]A dollar of food stamp benefits does not translate into a dollar of food expenditures because even though recipients spend all food stamps on food, the receipt of food stamps allows them to shift some of their previous cash expenditures on food to alternative uses.

Table 1—Household population and income distribution, 1996

Item	Number of households	Labor supply (jobs)	Labor income	Food stamps	Taxes	Net income[1]
	---------Millions---------		*----------Billion dollars----------*			
All households[2]	111	131	4,042.7	21.9	886.9	5,447.4
Low-income	23	4	97.8	18.7	1.8	297.0
Mid-income	60	59	1,661.2	2.6	213.4	2,049.9
High-income	28	69	2,283.7	.6	671.7	3,100.5
Two-parent households	25	52	1,621.1	4.8	283.3	1,636.0
Low-income	3	1	37.3	3.8	.5	74.0
Mid-income	16	25	719.6	1.0	82.6	716.4
High-income	6	25	864.1	.0	200.1	845.6
Two-adult households	22	8	221.2	12.3	26.6	331.5
Low-income	2	1	27.7	11.3	.3	93.2
Mid-income	15	2	56.4	.7	3.4	77.3
High-income	6	5	137.0	.3	22.8	161.0
Single parent households	11	42	1,295.3	1.1	288.9	1,490.4
Low-income	5	0	6.9	.8	.1	18.9
Mid-income	3	21	588.7	.3	87.9	639.3
High-income	3	21	699.7	.0	200.9	832.2
Single adult households	30	23	737.2	2.2	170.0	909.6
Low-income	8	1	24.4	1.8	.8	56.5
Mid-income	14	10	273.4	.3	34.5	277.8
High-income	7	12	439.4	.1	134.7	575.2
Elderly households	22	6	167.9	1.5	118.1	1,079.9
Low-income	5	0	1.4	1.1	.0	54.4
Mid-income	11	1	23.0	.3	5.0	339.0
High-income	5	5	143.4	.1	113.1	686.5

[1]Net income includes labor income, capital income, retirement income, and most cash and noncash government transfers net of personal income taxes. Appendix A provides a list of the income sources included in this definition.

[2]The household categories are described in appendix A. Low-income households are those with incomes at 130 percent of the poverty line or below. Mid-income households are those with incomes above 130 percent of the poverty line but below the income earned by 50 or 75 percent of households in the demographic group. High-income households are those with incomes above that earned by 50 or 75 percent of households in the demographic group.

stamps to a cash transfer may decrease food demand by 10 to 35 cents, an amount known as the slippage effect. In the Food Assistance CGE model, we followed Smallwood et al. (1995a and 1995b) and used a low mid-range estimate, setting the slippage effect at 17 percent.

In the Food Assistance CGE model, taxes and savings also vary across household groups. We derived tax payments by household group from the 1997 March Supplement to the Current Population Survey and savings by group from the Survey of Consumer Finances, as presented in Bosworth et al. (1991). We adjusted all data for consistency with aggregate household data from the National Economic Accounts.

Industry Categories Highlight Key Sectors

For the industrial aggregation, firms that make similar, though by no means identical, products are grouped together into an industry. In the Food Assistance CGE model, we aggregated the 500-plus industries in the U.S. Input-Output Accounts into about 50, with considerable detail about farming and food processing (U.S. Department of Commerce, Bureau of Economic Analysis, 1998). For our model, we updated the latest detailed Input-Output Accounts (1992) to 1996. Appendix A presents the list of industries we used in the model.

Through the Input-Output Accounts, the Food Assistance CGE model explicitly accounts for interindustry linkages, including those between food industries and the farm sector. Interindustry linkages transmit changes in household income and demand for goods and services from one set of industries to another. With these linkages, the model is able to trace the impact of a change in the Food Stamp Program to the farm and food processing sector, to industries providing inputs to the farm and food processing sectors, such as transportation and energy, and then to industries supplying inputs to these industries, and so on. To the extent that the occupational mix of employment varies by industry, a shift in industry production also alters the demand for labor, which then has an impact on wages and household income and thus on consumption.

Labor-Occupation Categories Include Variations in Skill Level

In the Food Assistance CGE model, both the supply of and demand for labor are disaggregated by occupation. Each household group in the model supplies labor according to the distribution of occupations characteristic of that household group, while each industry in the model demands labor according to the distribution of occupations characteristic of the industry. The occupations included in the model are further grouped into skill-level categories. Low-skill occupations include service occupations, handlers, and laborers. Mid-skill level-1 occupations include sales, administrative support, and farming. Mid-skill level-2 occupations include manufacturing production and transportation workers. High-skill level-2 occupations include professional categories. High-skill level-1 occupations include executive positions.

Table 2 presents information on the number of jobs and earnings for each of the skill-level categories included in the model, table 3 presents information on the type of labor supplied by each household group, and table 4 presents information on the type of labor demanded by type of industry. The statistics in tables 3 and 4 are aggregate: they describe the group as a whole and not necessarily each member of the group. For example, not every firm included in the health services classification has a labor force composed of over 45 percent high-skill occupations, and not every high-income household supplies low-skill labor (though 15 percent of the labor supplied by high-income households is low-skill).

The disaggregation of labor into occupations by skill levels allows the model to link both the supply of labor and the flow of labor income to specific household groups by skill level. It also allows the model to link the demand for labor by occupation to industry demand. Through detailing occupation by skill level, the Food Assistance CGE model improves our ability

Table 2—Number of jobs and earnings by skill level, 1996

Skill level	Number of jobs	Total income
	Thousands	*Billion dollars*
All labor	131,405	4,044
High-skill 1	9,003	540
High-skill 2	23,733	1,071
Mid-skill 1	41,800	1,009
Mid-skill 2	29,195	950
Low-skill	27,675	474

Note: Low-skill occupations include service occupations, handlers and laborers. Mid-skill level-1 includes sales, administrative support, and farming. Mid-skill level-2 includes manufacturing production and transportation workers. High-skill level-2 occupations include professional occupations. High-skill level-1 occupations include executive positions.

Source: Occupation Employment Statistics, Bureau of Labor Statistics, U.S. Department of Labor, Bureau of Labor Statistics, 1998.

to model issues arising from welfare reform as low-income households move from welfare to work.[7]

Labor Supply Elasticities Vary Across Household Types

In the Food Assistance CGE model, the responsiveness of labor supply to changes in wage rates and income varies across household groups. This responsiveness is an important feature because it gives the model the ability to trace a change in food assistance policy from its impact on consumption, production, and labor demand to its impact on labor supply. With this specification, changes in the demand for different types of labor (as reflected in changes in wage rates) will elicit different labor supply responses, depending on the type of labor and the type of household supplying the labor. In addition, income changes triggered by changes in taxes and welfare assistance will also elicit different labor supply responses, depending on the type of household supplying the labor.

The amount of labor that a household supplies to the market changes in reaction to changes in wage rate, for two reasons. First, a change in the wage rate makes each hour of labor more or less remunerative. Households tend to respond to higher hourly remuneration by supplying more labor and to lower remuneration by supplying less. Labor economists call the magnitude of this response the compensated wage elasticity. Second, a change in the wage rate results in higher or lower total earnings for the same amount of time worked. Households tend to respond to higher total earnings by reducing the number of labor hours and to lower total earnings by increasing labor hours. Labor economists call the magnitude of this response the income elasticity. The total response to a wage change (compensated wage elasticity plus income elasticity) is called the uncompensated wage elasticity.

[7] Legislation in 1996 to reform the welfare system to assist low-income families in need emphasized moving recipients from welfare to jobs.

Table 3—Labor supplied by households, by type of labor and household

Type of household	High-skill 1	High-skill 2	Mid-skill 1	Mid-skill 2	Low-skill	Total
			Percent			
Total households	6.75	18.05	31.62	22.07	21.51	100
Low-income	1.26	3.43	19.92	23.63	51.76	100
Mid-income	3.81	10.58	31.53	27.40	26.68	100
High-income	9.49	25.09	32.49	17.64	15.28	100
Two-parent	7.11	19.11	31.10	23.40	19.28	100
Low-income	1.66	2.63	22.50	34.46	38.76	100
Mid-income	4.04	10.86	30.71	30.66	23.73	100
High-income	10.46	28.22	31.99	15.58	13.75	100
Single-parent	3.56	10.24	30.92	20.17	35.11	100
Low-income	1.03	2.87	18.24	18.90	58.95	100
Mid-income	2.61	7.12	36.45	20.23	33.58	100
High-income	4.63	13.51	31.65	20.46	29.75	100
Two-adult	7.11	16.83	33.70	21.62	20.74	100
Low-income	1.07	2.24	19.89	25.37	51.44	100
Mid-income	3.94	10.53	32.82	26.73	25.98	100
High-income	10.32	23.25	34.75	16.52	15.16	100
Single-adult	7.35	21.86	29.16	22.38	19.25	100
Low-income	1.26	5.00	19.44	19.95	54.35	100
Mid-income	3.78	11.66	30.27	25.42	28.88	100
High-income	10.70	31.35	29.10	20.18	8.67	100
Elderly	5.35	13.69	36.06	18.39	26.50	100
Low-income	.68	2.81	24.95	20.34	51.22	100
Mid-income	1.74	3.79	28.87	21.54	44.05	100
High-income	6.12	15.77	37.61	17.75	22.75	100

Source: 1997 March Supplement of the Current Population Survey.

The uncompensated wage elasticity can be positive or negative, depending on whether the compensated wage elasticity or the income elasticity is larger in magnitude. The income effect also comes into play when a person's nonwage income changes. A change in income resulting from a change in transfer payments, dividends, interest, and rents can all lead to readjustments in hours worked.

How much labor households supply and how they respond to changes in net wages and income, including government transfer programs, will depend on various factors such as access to other income and family composition. To determine how much to vary wage and income elasticities across household types in the Food Assistance CGE model, we relied on the results of empirical studies documented in the economic literature (Blundell and MaCurdy, 1999; Bosworth and Burtless, 1992; Burtless, 1990; Danzinger et al., 1981; Eissa and Liebman, 1996; Hamermesh and Rees, 1993; Hausman, 1985; Heckman, 1993; Hoynes, 1997; Killingsworth and Heckman, 1986; Kimmel and Kniesner, 1998; Moffitt, 1985; Moffitt, 1992; Mroz, 1987; Triest, 1990; Zabel, 1993). However, because of a lack of consensus and because some groups have received more attention in the literature than others, we often found it necessary to choose a "reasonable" number from the range of empirically estimated numbers.

Table 5 reports the wage and income elasticities incorporated in the Food Assistance CGE model. For single adults, we chose income elasticities of -0.1. For married men, we assumed income elasticities very close to zero (-0.025). For married women, we assumed larger reactions to income changes, with elasticities of -0.2. We set uncompensated wage elasticities for married men and single adults without children very close to zero (0.05). We assumed that married women and single adults with children would be the most sensitive to wage changes, with wage elasticities of 0.4 and 0.125, respectively. In the current specification of the Food Assistance CGE model, the labor supply decision represents a change in the number of hours worked and not a decision to take or leave a job.

Government Transfers Highlight Key Welfare Programs

In the Food Assistance CGE model, "government" is split into two aggregates: Federal and State/local. In

Table 4—Labor type by industry

Industry	High-skill 1	High-skill 2	Mid-skill 1	Mid-skill 2	Low-skill	Total
			Percent			
Total	6.9	18.1	31.8	22.2	21.1	100
Nonfarm, nonfood processing:						
Construction	9.1	4.2	11.5	61.6	13.6	100
Energy	7.9	20.7	22.9	44.7	3.8	100
Trade and transportation	6.6	5.6	56.4	21.2	10.3	100
Tobacco and alcohol	7.5	8.1	18.9	52.1	13.5	100
Apparel	4.1	2.5	10.6	73.8	9.1	100
Nondurable manufacturing	6.9	12.5	27.8	44.8	8.1	100
Durable manufacturing	6.9	14.7	12.9	59.4	6.1	100
Finance and real estate	12.3	15.7	57.5	9.2	5.4	100
Food services (restaurants, etc.)	5.8	0.5	10.2	2.0	81.6	100
Health services	4.3	43.2	22.6	2.4	27.6	100
Education	5.5	55.9	19.7	6.3	12.6	100
Other services	6.8	26.5	27.6	12.3	26.9	100
Farm	.7	1.0	92.7	4.2	1.5	100
Food processing:						
Fish	5.4	3.8	13.4	55.1	22.3	100
Meat	3.0	1.9	7.6	70.7	16.8	100
Poultry	3.0	1.9	7.6	70.7	16.8	100
Dairy	6.3	5.0	16.3	55.6	16.9	100
Grains	6.5	6.2	16.1	58.6	12.7	100
Fruits and vegetables	4.6	4.1	13.4	61.3	16.6	100
Miscellaneous foods	5.7	3.9	17.4	50.7	22.3	100

Source: Occupation Employment Statistics, Bureau of Labor Statistics, U.S. Department of Labor, Bureau of Labor Statistics, 1998.

light of the "new Federalism" introduced by the 1996 Personal Responsibility and Work Opportunity Reconciliation Act, the ability to distinguish State and local government from the Federal Government is important for a model focusing on government assistance programs.

The two levels of government specified in the model have separate budgets, taxes, expenditures, and transfers. Five types of taxes are distinguished and associated with the appropriate levels of government: (1) social security tax on labor income; (2) corporate profit tax on the returns to capital; (3) personal income tax on household income; (4) business and sales tax on the production and sale of commodities; and (5) tariffs on imports. Government expenditures for goods and services are disaggregated into the components of demand associated with different government activities for each level of government.

Government transfers are aggregated into 11 programs and are distinguished by whether they are Federal or State/local programs and by whether they provide cash or in-kind benefits. The base-year Food Assistance CGE model is pre-welfare reform, so welfare assistance programs included in the model are pre-reform. The programs are (1) retirement, social insurance, and veterans' benefits, (2) unemployment compensation, (3) supplemental security income, (4) Aid to Families with Dependent Children (AFDC) plus general assistance, (5) education assistance, (6) Medicare, (7) Medicaid, (8) Food Stamp Program (FSP), (9) housing subsidies, (10) energy assistance, and (11) Earned Income Tax Credit (EITC). Federal block grants for welfare assistance programs to State and local governments are an intergovernmental transfer. Data on transfer payments by program and household group receiving the transfer are from the 1997 March Supplement to the Current Population Survey (U.S. Department of Commerce, 1997). Total program expenditures are adjusted for consistency with the values reported in the National Economic Accounts.

Table 5—Base wage and income elasticities in the Food Assistance CGE model

Type of household	Income elasticity	Compensated wage elasticity	Uncompensated wage elasticity
Single adult no children	-0.100	0.150	0.050
Single adult with children	-.100	.225	.125
Married couple no children:			
Husband	-.025	.075	.050
Wife	-.200	.600	.400
Married couple with children:			
Husband	-.025	.075	.050
Wife	-.200	.600	.400
Elderly	-.100	.100	0

The current version of the Food Assistance CGE model includes two simplifying assumptions that reduce the ability of the model to handle simulations involving welfare reform. First, in the current model, we treat welfare programs as fixed payments by type of program. This means that changes in economic activity, or changes in one set of government assistance benefits, do not trigger appropriate changes in payments made by other government assistance programs. For example, in the model, a cut in AFDC benefits would not trigger a compensating increase in food stamp benefits. Because these changes are not endogenous to the model, we must calculate them exogenously. In other words, we would need to specify new food stamp benefits in the model to capture any changes in these amounts triggered by changes in AFDC benefits. Or, similarly, we would need to specify the increase in EITC benefits triggered by households leaving welfare for low-paying jobs—the model would not automatically calculate new EITC payments.

The second simplifying assumption is that we specified only one State and local government aggregate in the Food Assistance CGE model. Such a specification makes it difficult, if not impossible, to characterize welfare assistance programs defined at the State and local level when each State designs its own programs. For simulations involving programs that vary radically across States, this characterization will cause distortions.

Model Closure Directs Policy-Change Impacts to Households

Model closure rules have an important influence on the way the model tracks a policy change through the economy. For the Food Assistance CGE model, we chose the following closure rules:

Fix real government expenditures and the government deficit, and let personal income tax rates adjust. With this rule, personal income tax rates adjust after a policy change to bring the government account back into equilibrium. For example, personal income tax

rates decline in response to a policy change that reduces government food stamp expenditures, leaving the government deficit unchanged.

Fix real investment, and let household savings rates adjust. To maintain the nominal investment-saving balance with fixed real investment, household savings adjust, leading to a change in income available for household consumption.

Fix the trade balance in world prices, and let the exchange rate adjust. This closure rule introduces a new source of price change in domestic markets. For example, with this rule, a depreciation of the dollar causes the domestic price of both exports and imports to rise. Producers increase exports in response to the higher prices, while consumers of imports will shift toward domestically produced substitutes. Both actions put upward pressure on the domestic price level, reducing real household consumption.

The closure rules in the Food Assistance CGE model direct the impact of a shock away from the trade balance, real investment, and the government deficit and toward real household consumption. Even though a policy change may have an impact on the fixed accounts, by keeping them balanced at their initial levels, one can channel the impact into real consumption (through changes in personal income tax rates, household saving rates, and the exchange rate). This balance allows the model to summarize the impact of a policy change in terms of changes to real income and consumption.

The Food Assistance CGE Model: A Powerful Tool for Redistribution Analysis

As a result of the innovations discussed above, the Food Assistance CGE Model provides a powerful tool for analyzing the distributional consequences of food policy and economic change. The real strength of the Food Assistance CGE model is that it provides not just gross measures of economic change but distributional measures as well. This is an important ability for a model designed to examine food assistance programs. Like all welfare assistance programs, food assistance programs are redistributive; they take government funds collected through taxes and give them to poorer segments of the economy in the form of cash or in-kind assistance payments. A measure of the consequences of these programs should thus include their distributional impact. The Food Assistance CGE model is designed to trace the impact of economic or policy changes on the distribution of household consumption, labor supply, and income, as well as on the distribution of industry production, labor demand, and sector income.

Unlike partial equilibrium or microlevel approaches,[8] the Food Assistance CGE model traces the economic consequences of household behavior across the economy. Though partial equilibrium and microsimulation approaches can model households in great detail, neither approach is able to capture wider economic ramifications of food assistance programs, including distributional ramifications. The results of these models can, however, be folded into a CGE model to examine the economywide feedback. For example, each household's response to a policy change in a microsimulation model can be aggregated to approximate the policy response by household groups for use in a CGE model.

Policy Simulations

In the policy simulation experiments, we asked two questions: "What would happen if funding for the Food Stamp Program were cut by $5 billion?" and "What would happen if food stamp benefits to low-income households were converted from food vouchers to cash?" Our choice of a $5 billion cut in the FSP approximates an annual average of earlier proposals to cut the FSP over the period 1996 to 2000, as discussed in Smallwood et al. (1995b). For each simulation we changed the initial conditions described in the base CGE model to reflect the hypothetical policy change and then, given the change, used the CGE model to calculate the new equilibrium. We then compared the new equilibrium with the initial equilibrium to reveal the economywide impacts of the policy change. It is possible to proportionately scale the results from this experiment for different FSP cuts or to flip the sign for an increase in program expenditures rather than a cut.

In the new equilibrium solution, prices equate supply and demand in the markets for goods, services, labor, and capital. In the Food Assistance CGE, the aggregate amount of capital is fixed, meaning that the new equilibrium does not reflect changes that are due to the creation of new capital. The types of changes captured in the new equilibrium therefore correspond to changes that would take about 2 years in an actual economy.

[8]Citro and Hanushek (1991) provide a description of the use of microsimulation modeling.