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Tracing the Impacts of Food Assistance Programs on Agriculture and Consumers

A Computable General Equilibrium Model

Kenneth Hanson, Elise Golan, Stephen Vogel, and Jennifer Olmsted

Abstract

Changes in food assistance policy can have impacts on economic activity and household income across the economy. Using a Computable General Equilibrium model focusing on food assistance, we found that both a hypothetical cut in food stamp benefits and a hypothetical cash-out of the Food Stamp Program led to reductions in food demand and farm production. In addition, this hypothetical cut in food stamp benefits resulted in a decline in transfer income for low-income households that was not compensated for by increased labor income. The cash-out triggered general equilibrium effects that led to higher taxes and reductions in labor income, chiefly for high-income households. The Food Assistance Computable General Equilibrium model includes modeling innovations that make it particularly useful for investigating the potential economic impact of changes in food assistance policy. These innovations include allowing household consumption patterns to vary by income and food stamp benefits, letting labor supply and demand vary by skill level and occupation, and using considerable industry detail for key agricultural and food processing sectors.

Keywords: General equilibrium analysis, computable general equilibrium model, food stamps, food stamp cash-out, food assistance policy, agricultural linkages.

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Summary

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The interaction between food assistance and the general economy depends on the economic interaction among households, industry, the government, and the rest of the world. This interaction involves a complex system of relationships and economic transactions. A Computable General Equilibrium (CGE) model describes this complex system. The Food Assistance CGE model developed at USDA's Economic Research Service (ERS) describes the U.S. economy, focusing on the relationships between food assistance programs, households, the farm economy, and general economic activity. It provides a mechanism for examining the impact of food assistance programs on economic activity, and vice versa.

The Food Assistance Computable General Equilibrium model includes a number of innovations that make it particularly useful for analysts investigating the potential economic impact of changes in food assistance policy:

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

The policy simulation experiments address 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 were converted from food vouchers to cash?" Each simulation experiment changed the initial conditions described in the base CGE model to reflect the hypothetical policy change and then, given the change, the model recalculated the new equilibrium conditions. A comparison of the new equilibrium conditions with the initial equilibrium revealed the economywide impacts of the hypothetical policy change.

Both simulation experiments had an impact on the farm economy. The $5 billion food stamp cut led to decreases in farm and food processing production of

approximately $1.3 billion and 7,500 jobs lost. The hardest hit farm sectors were livestock, feed crops, and fresh fruits and vegetables. The $18.5 billion food stamp cash-out led to decreases in farm and food processing production of approximately $3.5 billion and 18,500 jobs lost. Again, the hardest hit farm sectors were livestock, feed crops, and fresh fruits and vegetables.

The production and job losses resulting from the experiments were distributed across the Nation, with the greatest losses occurring in nonmetropolitan areas specializing in livestock and feed crops. For the food stamp cut, the hardest hit area was the Plains States, with nonmetro job losses of 441. However, many nonmetro areas gained jobs after the food stamp cut. In the aggregate, nonmetro employment expanded by over 1,000 jobs, illustrating the fact that many nonmetro areas of the country have an economic base extending beyond agriculture. All metro areas of the country experienced job growth, gaining 21,000 jobs in aggregate after the food stamp cut. In the cash-out experiment, all nonmetro areas of the country experienced job reductions, losing almost 8,000 jobs overall. The hardest hit nonmetro areas were located in the Plains and North Central States. The negative impact of the cash-out spilled over into many metro areas as well, particularly in the North Central States, illustrating how widespread the economic linkages are between agricultural and other industries.

The number of "working poor" increased as a result of the food stamp cut. Spurred by the reduction in food stamp benefits, low-income households sought more work hours, but, in aggregate, did not earn enough labor income to compensate for the drop in food stamp benefits.

The results of the cash-out experiment revealed a surprising negative effect on mid- and high-income households. The cash-out caused a shift in low-income household consumption from food to nonfood goods and services, which led to decreased production in industries demanding a relatively high amount of occupations with mid-level skills. These occupations are primarily filled by workers from mid- and high-income households. As a result, these households experienced a decline in labor income (a result that would have been dampened or reversed if the model had calculated longer term impacts on the housing market). Simultaneously, economywide changes triggered an increase in taxes for the mid- and high-income wage earners. The general equilibrium analysis reveals that a welfare policy change that is seemingly limited to effects on low-income recipient households, such as the food stamp cash-out, may have ramifications that extend to other income groups.

The results of the simulation experiments hinge critically on assumptions about consumption patterns embedded in the Food Assistance CGE model. Because the model incorporates a different marginal propensity to consume food with food stamps than with cash, an additional dollar of cash income produces a different mix of consumption than an additional dollar of food stamp benefits. Without this slippage effect, households would spend food stamp benefits the same way that they spend cash. In this case, the economywide effects triggered by the simulation experiments would be severely dampened or disappear completely. The value for the marginal propensity to consume food with food stamps that was used in the Food Assistance CGE model is taken from the lower range of estimates reported in the literature.

One of the primary strengths of the Food Assistance CGE model is that it provides policymakers and analysts with a mechanism for examining the economy-wide, distributional impact of potential policy changes. This is an important quality for a model designed to examine food assistance programs. Like all welfare assistance programs, food assistance programs are redistributive; these programs take government funds collected through taxes and redistribute them to lower income groups in the form of cash or in-kind assistance payments. The redistributive intent of food assistance programs means that an assessment of the consequences of these programs would benefit from a measure of distributional impact.

To the extent that assumptions about consumption patterns for households remain valid, the results of the simulations would have been similar, though of opposite sign, if we had flipped the questions to ask, "What would happen if funding for the Food Stamp Program were increased by $5 billion?" and "What would happen if cash welfare benefits were converted to in-kind food benefits?" No matter which way the question is posed, changes in food assistance policy have effects on low-income households and the farm economy. As shown with the Food Assistance CGE model, the effects extend beyond these households and sectors, affecting the level and distribution of economic activity throughout the economy.

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Introduction

In 1999, the U.S. Department of Agriculture spent approximately $33 billion on domestic food and nutrition assistance programs, including the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), the Child Nutrition (School Lunch and Breakfast) programs, and the Food Stamp Program (fig. 1). These food assistance programs directly affect the health and well-being of recipient households. However, the impact of the programs does not stop there: food assistance programs have economic ramifications that extend beyond recipient households. Food assistance programs supplement household food budgets, triggering changes in household consumption expenditures and labor supply decisions. Likewise, because they are funded through taxes, food assistance programs affect nonrecipient household income, expenditures, and labor supply decisions. Eventually, changes in household expenditure patterns and labor supply decisions affect the general level and distribution of production and income throughout the economy. The level and distribution of economic activity in turn affects poverty levels and the need for food assistance programs.

The interaction between food assistance and the general economy depends on the economic interaction among households, industry, the government, and the rest of the world. This interaction involves a complex system of relationships and economic transactions. A Computable General Equilibrium (CGE) model describes this complex system. The Food Assistance CGE model developed at USDA's Economic Research Service (ERS) describes the U.S. economy, focusing on the relationships between food assistance programs, households, and general economic activity. It provides a mechanism for examining the impact of food assistance programs on general economic activity, and vice versa.

In this report we describe the Food Assistance CGE model and discuss the contributions an economywide framework makes to the analysis of food assistance programs. We also report on two simulation experiments, both of which demonstrate the strength of the Food Assistance CGE model in analyzing the impact of food assistance programs on the general economy. The first simulation experiment traces the impact of a reduction in Food Stamp Program funding. The second experiment simulates the conversion of food stamp benefits from vouchers to cash.

What Is a CGE Model?

A single-country CGE model is a set of equations describing the economic interaction between households, producers, the government, and the rest of the world. The circular flow diagram (fig. 2) describes the core of a CGE model. It depicts the market transaction between the two primary sets of actors in the economy: households and firms. The core circular flow diagram illustrates that, as owners of factors, households supply labor and capital services to firms, while receiving payment from them in the form of wages and capital income. Households also purchase goods and services from firms, which, in return, receive payment.

The market transaction between households and firms is driven by the desire of households to maximize utility

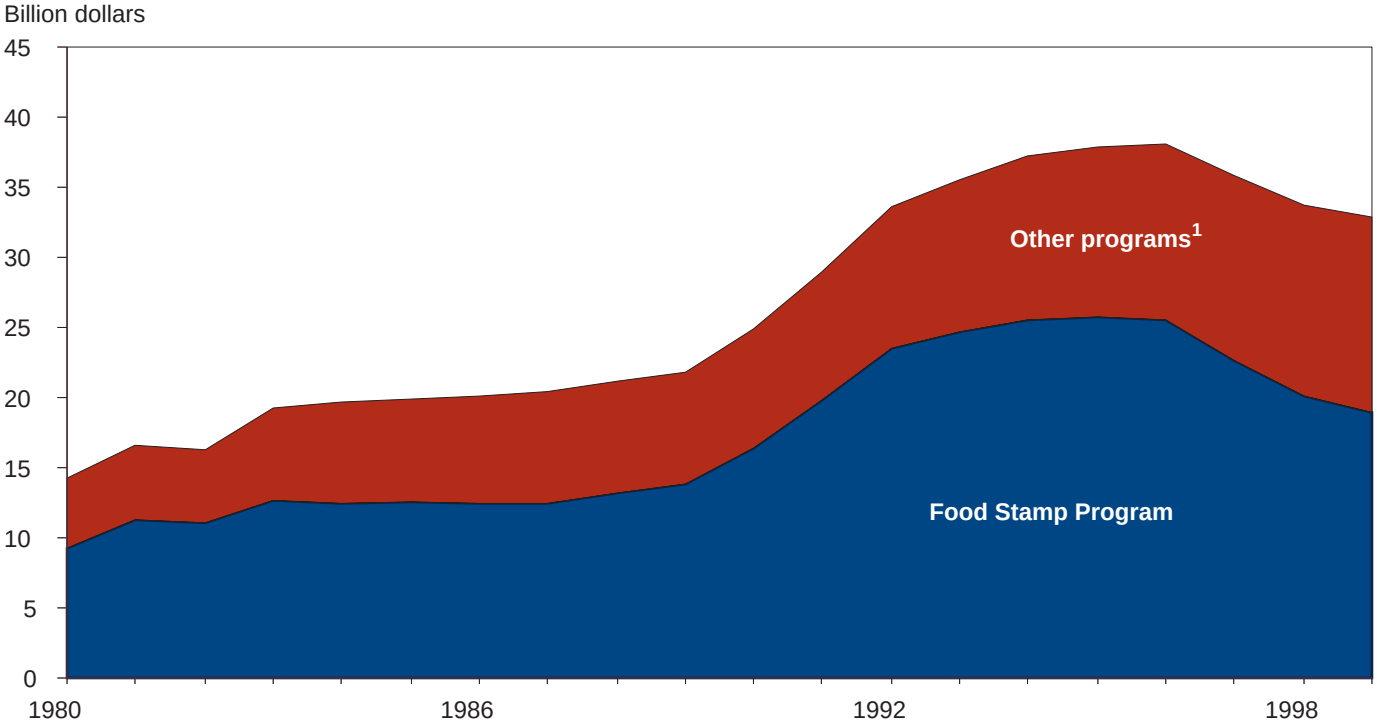
and of firms to maximize profits. Households maximize utility, a measure of their well-being, through the purchase of an array of goods and services (given their budget constraints) and the enjoyment of leisure (given the constraint on the total amount of time available for work and leisure). Firms maximize profits from the sale of goods and services (given their production technology). The exact forms of these behavioral functions (utility and profit maximization) are taken from the economic literature and incorporated into the CGE model.

The core circular flow diagram also includes a description of the interaction among firms. It illustrates that firms purchase inputs for their production processes from other firms. Input-output tables describe these inter-firm transactions or linkages. Because of these linkages, a change in household consumption that directly affects production in one set of industries leads to an indirect change in production in another set of industries (that is, in those industries supplying inputs to the directly affected industries).

Figure 3 adds three new actors to the core circular flow diagram: government, rest of world (ROW), and a capital account. The government collects taxes, purchases goods and services from firms, and disburses transfers to households and producers. The ROW supplies imports to the United States and purchases exports from the United States. The capital account describes the market for loanable funds. The demand for loanable funds (investment) is driven by the supply of loanable funds (savings). Total savings are from households, businesses, government surplus or deficit, and net capital inflows from the ROW. Business savings are from depreciation of capital stocks and retained earnings. Investment is divided between changes in inventory and the purchase of new capital stocks by industry and government (fixed investment). New capital stocks are produced through the purchase of capital goods and construction services.

A complete CGE model is a set of equations that describes the circular flow illustrated in figure 3. These equations describe the economic transactions of households, firms, government, the rest of the world, and capital accounts in the markets for factors of production, commodities, exports and imports, and loanable funds. The structural parameters for the equations come from a variety of sources. “Policy” parameters, such as tax rates and government assistance-program rules, are determined by government policy. “Share” parameters, such as household expenditure shares, savings rates, and

Figure 1
USDA outlays for food assistance programs, fiscal 1980-99



[1]Include child nutrition programs, WIC, food donation programs, and administrative costs.
Source: ERS Website, http://www.ers.usda.gov/briefing/foodnutritionassistance/gallery/outlays.htm

Figure 2

The basic CGE model: The circular flow

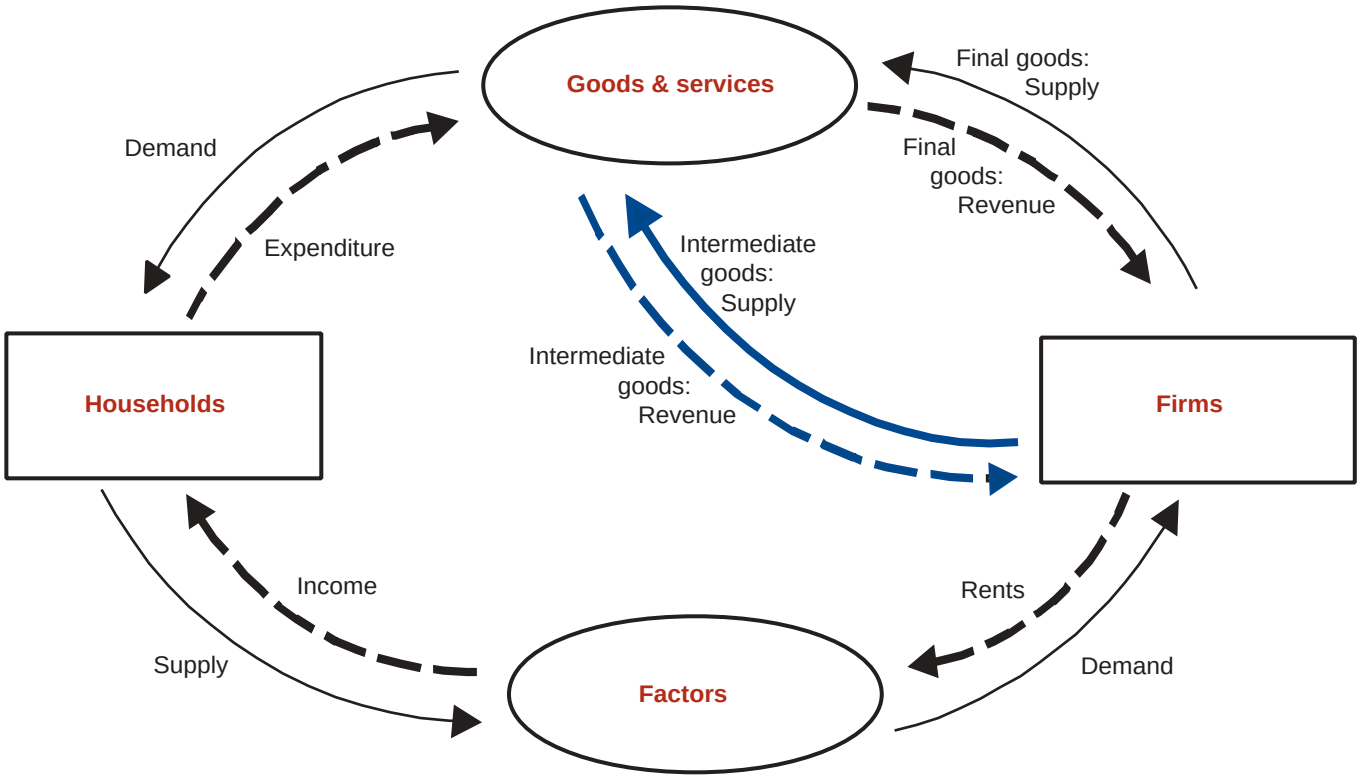
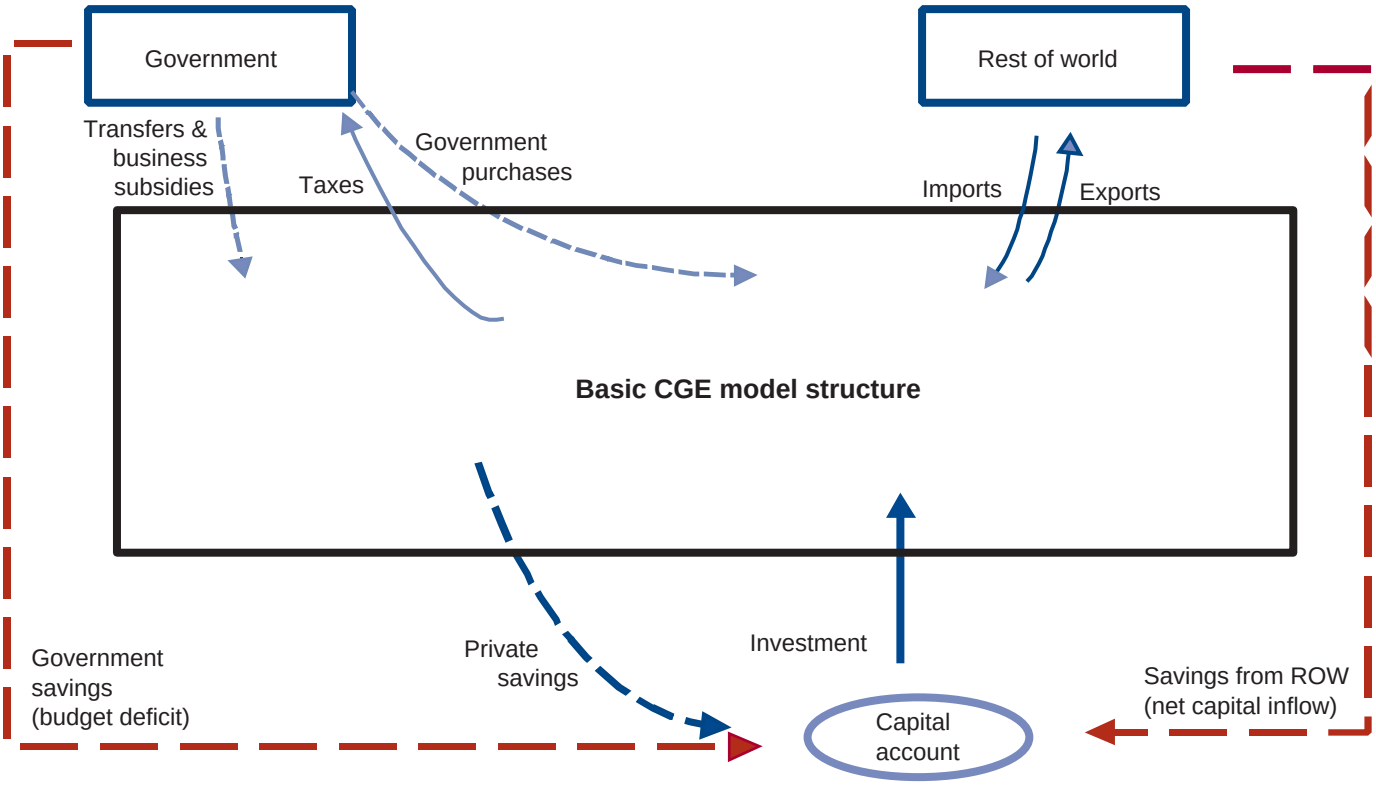


Figure 3

The full CGE model: Additional institutions



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.

Experiment 1: A Reduction in Food Stamp Benefits

In the first policy-experiment simulation, we assessed the economywide impacts of reducing annual food stamp expenditures by $5 billion. This simulation traces the impact of a redistribution of income from low-income households (by a cut in food stamps) to high-income households (by a cut in taxes). The economywide changes triggered by this redistribution followed a number of routes. The reduction in food stamps represented an immediate loss of food purchasing power by low-income households (modeled as proportional cuts in benefit payments to all recipient households with incomes at or below 130 percent of the poverty line). These households reacted to this reduction by reducing their consumption spending. The reduction in income taxes represented an immediate income gain to other, primarily high-income, households, which reacted to the rise in income by increasing their consumption spending and savings. Because lower income and higher income households spend their income on different arrays of goods, the redistribution of income triggered a redistribution in consumption demand. This shift in demand led to price and output adjustments. The output changes led to changes in labor demand. The interindustry linkages spread the impacts among the industries supplying intermediate goods.

Simultaneous with the changes triggered by adjustments in consumption, a set of changes was incited by adjustments in the amount of labor supplied by households. The loss in transfer benefits induced low-income households to increase their supply of labor. The reduction in taxes could induce higher income households to either increase their supply of labor (dominant compensated wage elasticity) or decrease it (dominant income elasticity). For the labor supply elasticities specified in table 5, labor supply increased. Together, changes in labor supply and demand then induced new equilibrium wages.

The general equilibrium framework of the Food Assistance CGE model allowed us to summarize the net results of all of the different adjustments described above. A redistribution of $5 billion is small relative to the whole economy, and the sectoral and economywide impacts are also rather small. However, they are not inconsequential. In the discussion that follows, we first describe the impacts of the $5 billion food stamp reduction on household spending on food and nonfood goods and services. Second, we examine the impacts on the farm, food processing, and other sectors of the economy. Third, we focus on adjustments in factor markets, such as the labor market. Finally, we summarize the distributional and aggregate impacts on households.

Impact on Household Consumption

In the simulation, the $5 billion reduction of food stamp benefits induced an economywide increase in consumption expenditures of $927 million.[9] Underlying this was an increase in consumption by mid- and high-income households of $5,892 million and a decrease in consumption by low-income households of $4,965 million (table 6). Since low-income households spend a larger amount of additional income (particularly food stamp benefits) on food than higher income households, the shift in income from low-income to mid- and high-income households resulted in a drop in food consumption of $1,222 million (and an increase in nonfood consumption of $2,118 million).

Mid- and high-income households devoted the largest share of their tax refund to nonfood consumption, with increased expenditures of between 0.08 and 0.16 percent on nonfood items. These households increased their consumption of food at home by only about $104 million (a change of roughly 0.03 percent). They increased their consumption of food away from home by $62 million (a change of roughly 0.03 percent).

As a result of the cut in food stamp benefits, low-income households reduced food-at-home expenditures by $1,326 million, with the largest reductions in miscellaneous foods ($560 million), red meat ($268 million), and fruits and vegetables ($249 million). These reductions amounted to between 3.1 and 3.5 percent of aggregate low-income household consumption of these items. Low-income households decreased consumption of food away from home by $32 million, or 0.32 percent. The reduced food consumption of low-income households did not equal the whole $5 billion food stamp benefit cut: these households also needed to make cuts in their nonfood budgets. Low-income household consumption of nonfood items dropped by $3,608 million, an average reduction of 1.5 percent of the aggregate expenditure on these items (table 6).

Impact on Farming, Food Processing, and Other Industries

The redistribution of consumption triggered by the reduction in food stamp funding caused a growth in overall production and a shift in production activity. Total real production grew by approximately $1,307

[9]Unless otherwise specified, all changes are in real dollars (valued at old equilibrium prices) to provide direct comparison with pre-policy change values.

million[10] and the aggregate number of jobs (full-time equivalent) increased by 22,000 (table 7). Aggregate nominal sector income rose by $949 million.[11]

A disaggregation of the growth in production reveals that some industries shrank while others grew. The farm and food processing sectors had production decreases of $1,288 million, nominal sector income losses of $437 million, and job losses of 7,500. The hardest hit farm sectors were livestock, feed crops, and fresh fruits and vegetables (table 7). The food processing sector showed similar results, with the largest declines in miscellaneous food (an aggregate of highly processed food products), meat processing, dairy, and processed fruits and vegetables. These results reflect the fact that the largest reductions in household consumption were for miscellaneous foods, red meat, fruits and vegetables, dairy, and poultry. The drop in the production of feed crops was due to the decreased demand for them from the dairy, poultry, and livestock sectors.

The drop in demand for farm and food processing triggered small price changes, with the producer price for farm products falling by 0.04 percent and the purchaser price falling by 0.01 percent (table 7). The purchaser price change combines the change to the producer price with any change to the trade and transportation margins (the share of the price change that is absorbed by marketing services). For food processing, both producer and purchaser prices fell by 0.01 percent.

Nonfarm and nonfood processing sectors of the economy grew by almost $2,600 million, with the biggest gains in other services, health services, durable goods, and energy. Nonfarm and nonfood processing sectors gained almost 30,000 jobs (table 7), with nominal income growth of $1,387 million. Though most nonfood prices remained steady, there was a slight decline in purchaser prices for energy and durable goods manufacturing (-0.01). Both of these sectors provide inputs to agricultural production and experienced an initial

[10]Changes in production are not identical to changes in consumption (as reported in table 6) because consumption values include retail margins (including transportation).

[11]Sector income measures value-added net of factor taxes and indirect business taxes. It equals the returns to the owners of factor services from labor, capital, and land in agriculture. Nominal sector income is measured in post-policy change dollars and therefore provides a measure of the profitability of an industry once price and wage changes have been accounted for.

Table 6—Changes in household consumption due to the food stamp cut
Total consumption rose, although food consumption and consumption by low-income households fell

Item	Change in consumption			
	All households	Low-income	Mid-income	High-income
	Million dollars			
Total consumption	926.60	-4,965.00	1,403.10	4,488.50
Food at home	-1,221.90	-1,325.80	50.40	53.50
Dairy	-120.00	-130.00	5.00	5.10
Poultry	-90.10	-97.00	3.50	3.50
Red meat	-251.50	-267.60	8.20	8.00
Fish	-20.10	-22.20	.90	1.20
Fruit and vegetables	-228.20	-248.90	9.80	10.90
Miscellaneous food	-512.00	-560.00	23.20	24.90
Food away from home	30.70	-31.60	25.30	37.10
Nonfood consumption	2,117.71	-3,607.67	1,327.40	4,397.98
Tobacco & alcohol	12.10	-11.30	5.50	17.90
Clothing	93.00	-81.20	35.30	138.80
Other nondurables	150.10	-206.80	94.40	262.60
Durables	506.50	-338.60	181.90	663.30
Petroleum	135.80	-33.80	30.90	138.70
Energy	188.80	-36.90	22.80	202.90
Housing and finance	21.30	-1,747.40	476.40	1,292.20
Health services	501.90	-822.80	325.70	999.00
Education	36.00	-32.40	13.10	55.30
Other services	472.30	-296.40	141.50	627.20

Note: These changes are in real dollars (in pre-food-stamp-cut prices).

drop in demand. The rise in demand for financial and real estate services triggered a price rise for this sector.

The production and job losses resulting from the simulation were distributed across the Nation, with the greatest losses occurring in nonmetropolitan areas specializing in livestock and feed crops. The hardest hit area was the Plains States, with 441 nonmetro jobs lost (table 8). However, many nonmetro areas gained jobs after the food stamp cut. In the aggregate, nonmetro employment expanded by over 1,000 jobs, supporting the observation that many nonmetro areas of the country have an economic base extending beyond agriculture. All metro areas of the country experienced job growth, gaining 21,000 jobs overall after the food stamp cut.

Impact on Factor Markets

The cut in food stamp benefits led to an increase of 22,000 jobs, with wages adjusting across skill levels to

Table 7—Changes in jobs, production, and sector income due to the food stamp cut
There was overall growth in production and jobs, but a reduction in farm and food processing production and jobs

	Change in:				
Industrial sectors	Jobs	Real production	Nominal sector income[1]	Producer prices	Purchaser prices[2]
	Thousands	*------Million dollars-----*		*------Percent-------*	
Total	22.1	1,307	949	0	0
Total nonfarm nonfood	29.7	2,596	1,387	0	0
Construction	.5	41	9	0	0
Energy	1.0	361	151	0	-.01
Trade and transportation	1.7	122	20	0	0
Tobacco and alcohol	0	7	5	0	0
Apparel	.8	69	23	0	0
Nondurable manufacturing	.6	143	72	0	0
Durable manufacturing	3.3	531	193	0	-.01
Finance and real estate	2.0	196	174	0	.01
Food services (restaurants, etc.)	1.3	44	18	0	0
Health services	7.5	510	354	0	0
Education	.9	43	28	0	0
Other services	10.1	529	340	0	0
Total farm	-4.2	-397	-196	-.04	-.01
Dairy	-.4	-40	-8	-.03	-.04
Poultry	-.4	-43	-8	-.02	-.01
Livestock	-1.5	-156	-33	-.03	-.02
Cotton	.0	3	0	-.02	0
Food grains	-.1	-10	-12	-.06	0
Feed crops	-.9	-70	-62	-.06	-.05
Oilseed crops	-.2	-12	-16	-.06	-.06
Fruits and vegetables	-.6	-52	-38	-.03	-.02
Other crops	-.2	-16	-20	-.04	-.02
Total food processing	-3.3	-891	-241	-.01	-.01
Fish	.0	-10	-2	0	0
Meat	-.8	-198	-26	-.02	-.02
Poultry	-.3	-71	-18	-.01	-.01
Dairy	-.3	-101	-22	-.02	-.01
Grains	-.2	-96	-15	-.04	-.02
Fruits and vegetables	-.5	-103	-40	.00	.00
Miscellaneous foods	-1.2	-311	-119	-.01	-.01

[1]Sector income is measure of value added net of factor taxes and indirect business taxes and equals the returns to the owners of factor services from labor, capital, and land in agriculture. Nominal sector income is measured in post-policy change prices.

[2]A change to the price paid by consumers (purchaser or retail price) combines the change to the producer price with any change to the trade and transportation margins.

equate demand and supply. In the Food Assistance CGE model there is no involuntary unemployment, a common assumption in neoclassical labor-market models. As a result of the cut in benefits, labor supply increased as households responded to the impact on nonlabor income and after-tax wages and to any market-clearing wage adjustments. Labor demand also grew as production increased and as market wages fell in response to increases in labor supply. The different mix of skill levels supplied by low- and high- income households and demanded by industry produced a differentiated impact on wages and employment for the various labor skill levels (table 9).

For most skill levels, wages did not change to a noticeable degree once the labor market had reached its new equilibrium. Labor demand accommodated the increase in supply as industry production shifted out of food and into various services and manufacturing sectors. However, for mid-skill level-1 occupations, wages fell because a relatively large number of farm jobs, which are included in this category, were lost as production shifted out of agriculture. For high-skill level-1 occupations, the increase in supply was less than the increase in demand under the initial wage offer, pushing wages up to clear the market.

Table 8—Employment changes due to the food stamp cut
The cut led to growth in both metro and nonmetro employment

Regions and States	Metro	Nonmetro	Total	Regions and States	Metro	Nonmetro	Total
		Thousand jobs				*Thousand jobs*	
Northeast	5.604	0.373	5.977	Southeast	2.823	.369	3.192
Connecticut	.370	.019	.389	Alabama	.267	.058	.325
Delaware	.064	-.009	.055	Arkansas	.074	-.009	.065
Maine	.055	.054	.109	Florida	1.219	.016	1.235
Maryland	.434	.013	.447	Georgia	.507	.103	.609
Massachusetts	.756	.008	.764	Louisiana	.383	.050	.433
New Hampshire	.072	.051	.123	Mississippi	.096	.075	.170
New Jersey	.804		.804	South Carolina	.279	.077	.356
New York	1.885	.091	1.976				
Pennsylvania	1.046	.104	1.150	Plains	2.007	-.441	1.567
Rhode Island	.103	.007	.110	Kansas	.138	-.128	.010
Vermont	.016	.035	.051	Nebraska	.058	-.221	-.163
District of Columbia	.166		.166	North Dakota	.025	-.025	-.001
				Oklahoma	.229	.025	.254
North Central	4.474	.102	4.576	South Dakota	.017	-.039	-.022
Illinois	.979	-.012	.967	Texas	1.541	-.052	1.488
Indiana	.466	.069	.534				
Iowa	.069	-.178	-.110	Mountain	1.194	.114	1.308
Michigan	.840	.092	.932	Arizona	.358	.031	.389
Minnesota	.371	-.043	.328	Colorado	.298	-.002	.296
Missouri	.422	.040	.462	Idaho	.017	-.033	-.016
Ohio	.991	.116	1.107	Montana	.023	.022	.045
Wisconsin	.337	.020	.357	Nevada	.242	.024	.265
Appalachia	1.716	.487	2.203	New Mexico	.086	.032	.118
Kentucky	.193	.078	.272	Utah	.154	.010	.164
North Carolina	.526	.120	.646	Wyoming	.016	.031	.047
Tennessee	.400	.125	.525				
Virginia	.524	.083	.607	Pacific	3.024	.062	3.086
West Virginia	.073	.081	.154	Alaska	.049	.019	.068
				California	2.353	.004	2.357
				Hawaii	.093	.020	.113
				Oregon	.190	.031	.221
				Washington	.338	-.012	.326
				Total	21.008	1.067	22.075

Source: For the nonagricultural sectors, employment by industry and region are from County Business Patterns (U.S. Bureau of Census, 1997). Data on State metro and nonmetro agricultural employment are USDA-ERS estimates. We distinguished metro from nonmetro counties according to definition set by the Office of Management and Budget [see, www.ers.usda.gov/Briefing/Rurality/WhatisRural/].

Table 9—Impacts on job totals of the food stamp cut

The number of jobs increased, though wages for farm and food-related jobs fell

Skill level	Change in number of jobs	Wage change
	Thousands	*Percent*
All labor	22.07	0
High-skill 1	1.6	0
High-skill 2	5.34	.01
Mid-skill 1	4.35	-.01
Mid-skill 2	4.53	0
Low-skill	6.24	0

Note: Low skill occupations includes 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 occupations.

While supplies of land and capital were fixed at the economywide level, these factors were mobile across the different production sectors.[12] Land moved among the different agricultural crops, with feed crops taking the biggest loss because of reduced livestock production. In addition to a reallocation of land among crops, the reduction in crop output linked to the fall in food demand induced a decrease in the aggregate price of land by 0.32 percent. Capital mobility was reflected in patterns of equipment purchases. With capital return differentials across industries, the reallocation of capital resulted in a slight (0.01 percent) increase in the aggregate returns to capital.

Impact on Household Income and Well-Being

Total net real income rose by $1,254 million dollars as a result of the food stamp cut, with the distribution of the income change following the tax and transfer change across households. Net real income fell by $4,965 million for low-income households and rose by $1,491 million for mid-income households and by $4,727 million for high-income households (table 10).

Every demographic type of household in the low-income group had a lower income after the food stamp cut. The magnitude of the fall in net real income for low-income households was approximately $36 million less than the initial $5 billion cut in food stamp benefits, for two reasons. First, low-income households increased their labor supply by the equivalent of 5,050 full-time jobs in response to the reduction in food stamp benefits. This labor adjustment plus wage adjustments generated an increase in real labor income of $12 million. Second, changes in real taxes and other components of income resulted in an increase in net real income of approximately $24 million.

Mid- and high-income households, including single-parent households, had an increase in income after the food stamp cut. The increase in net real income for these households was more than the initial $5 billion tax cut, for two reasons. First, mid- and high-income households responded to the increase in net wages (due to the cut in taxes) and the increase in labor demand (triggered by production shifts) by supplying more labor. Mid-income households increased their labor supply by the equivalent of 5,764 full-time jobs, generating an increase in real labor income of $206 million. High-income households increased their labor supply by the equivalent of 11,265 jobs and earned an additional $373 million in real labor income. Second, real taxes dropped by $151 million more than the $5 billion initial tax cut for mid- and high-income households due to adjustments triggered by a new set of prices and changes in the tax base.

Interestingly, elderly households, specifically mid- and high-income households, reduced their labor supply after the food stamp cut. This reduction is explained by the large increase in capital income (more than $120 million) that these households enjoyed thanks to the increases in production and returns to capital resulting from the food stamp cut. In response to this large income boost, these households reduced their labor supply (labor supply income elasticity is negative). High-income elderly households received almost 80 percent of their income from nonlabor sources (versus about 15 percent for two-parent high-income households), making them more responsive to changes in capital income than other household groups.

Experiment 2: A Cash-Out of Food Stamp Benefits

In the second policy simulation, we assessed the economywide impacts of converting the annual $18.75 billion of food stamp benefits paid to low-income households from coupons to cash transfers.[13] This conversion triggered a number of economic changes because con-

[12]An alternative shortrun scenario treats capital stocks as fixed at the sector level. In this scenario, the increase in labor supply was 1.5 times greater, price adjustments for the food and farm sectors were 3 times larger, and production responses in the farm and food sectors were about 20 percent less.

[13]For the simulation, we do not consider food stamp benefits paid to mid- or high-income households.

sumers treat food stamps and cash differently when making consumption decisions. As discussed earlier, in the Food Assistance CGE model, we set the marginal propensity to consume food out of food stamps at 17 percentage points higher than the marginal propensity to consume food out of cash income. As a consequence of this difference, converting program benefits from coupons to cash altered the mix of goods and services purchased by food stamp recipients. The change in the consumption mix in turn generated changes in production, labor demand, and wages. These changes then influenced both low-income and high-income household labor supply and resulted in new levels of employment and wages.

The general equilibrium framework of the Food Assistance CGE model allows us to summarize the net results of the different adjustments described above. In the discussion that follows, we first look at the impacts of cashing out the benefits of the Food Stamp Program on household spending on food and nonfood goods and services. Second, we examine the impacts on the farm, food processing, and other sectors of the economy. Third, we focus on adjustments in factor markets. We then examine the distributional effects on households.

Impact on Household Consumption

The cash-out of the Food Stamp Program, in which food stamp benefits were converted to cash payments, caused a fall in aggregate demand of $617 million,[14] with both large declines in food demand and large increases in nonfood demand (table 11). This pattern of change was primarily driven by the higher marginal propensity to consume food with food stamps than with cash income.

[14]Again, unless otherwise specified, all changes are real (valued at old equilibrium prices), to provide direct comparison with pre-policy change values.

Table 10—Household income changes after the food stamp cut
Income rose for mid- and high-income households and fell for low-income households

Type of household	Labor supply (jobs)	Food stamps (nominal)	Labor income (real)	Taxes (real)	Net income[1] (real)
	Number	*Million dollars*			
Total households	22,074	-5,000	590	-5,175	1,254
Low-income	5,047	-5,000	12	-24	-4,965
Mid-income	5,764	0	206	-1,260	1,491
High-income	11,263	0	373	-3,891	4,727
Two parent	10,441	-1,010	243	-1,658	960
Low-income	1,385	-1,010	4	-7	-999
Mid-income	2,788	0	91	-487	582
High-income	6,267	0	148	-1,164	1,377
Single parent	3,005	-3,007	28	-161	-2,808
Low-income	2,680	-3,007	3	-7	-2,997
Mid-income	6	0	6	-21	26
High-income	319	0	18	-134	163
Two adult	8,148	-212	184	-1,686	1,783
Low-income	251	-212	1	-2	-210
Mid-income	2,855	0	73	-519	601
High-income	5,042	0	110	-1,165	1,392
Single adult	968	-484	113	-989	718
Low-income	695	-484	3	-8	-473
Mid-income	136	0	34	-203	240
High-income	137	0	75	-778	952
Elderly	-488	-287	23	-681	600
Low-income	35	-287	0	0	-286
Mid-income	-21	0	3	-30	42
High-income	-502	0	20	-650	844

[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.

The cash-out induced a $3,274 million fall in demand for food at home. Low-income households were responsible for the bulk of this decline as they shifted their consumption toward nonfood items and services. Low-income households reduced their at-home food consumption by $3,273 million (8 percent). The largest drops in food demand were for miscellaneous foods, red meat, and fruits and vegetables. Food eaten away from home (not covered by food stamps) increased by $103 million for low-income households.

Aggregate nonfood consumption increased by $2,560 million, all of it from increases in consumption by low-income households. These households increased their nonfood consumption by $3,145 (1.3 percent), with the largest increases for housing, insurance, and finance ($1,296 million—1.35 percent); health services ($462 million—1.3 percent); and durable goods ($324 million—1.3 percent). For mid- and high-income households, aggregate nonfood consumption fell by $304 million and $281 million, respectively (approximately 0.1 percent). Thus, unlike the food stamp cut experiment, which generated higher levels of consumption for mid- and high-income households, the cash-out experiment resulted in lower levels of consumption for these households. As will be seen in the next two sections, this outcome was driven by a reduction in demand for the type of labor supplied by mid- and high-income households, which was in turn driven by the production shift triggered by the shift in consumption by low-income households.

Impact on Farming, Food Processing, and Other Industries

Changes in low-income household consumption induced changes in production, sector income,[15] and jobs: aggregate industry output fell by $2,840 million,[16] sector income fell by $426 million, and 5,600 jobs (full-time equivalent) were lost (table 12). Underlying these aggregate changes were industries that shrank and industries that grew, with the pattern of change following the shift in demand.

[15]Sector income is a nominal measure of value added (net of factor taxes and indirect business taxes) and equals the returns to the owners of factor services from labor, capital, and land in agriculture.

[16]Changes in production are not identical to changes in consumption (as reported in table 11) because consumption values include retail margins (including transportation).

Table 11—Household consumption changes after the food stamp cash-out
Total consumption fell, especially food consumption and consumption by mid- and high-income households

Item	Change in consumption			
	All households	Low-income	Mid-income	High-income
	Million dollars			
Total consumption	-616.7	-25.4	-308.6	-282.7
Food at home	-3,273.8	-3,272.9	-1.0	.2
Dairy	-318.4	-318.7	.1	.1
Poultry	-244.1	-244.1	0	0
Red meat	-671.4	-672.4	.7	.4
Fish	-53.3	-53.1	-.1	-.1
Fruit and vegetables	-611.8	-611.5	-.3	.0
Miscellaneous food	-1,374.8	-1,373.1	-1.3	-.3
Food away from home	97.0	102.8	-3.8	-2.0
Nonfood consumption	2,560.0	3,144.8	-303.8	-281.0
Tobacco and alcohol	89.2	91.2	-1.1	-.9
Clothing	186.8	196.7	-5.0	-5.0
Other nondurables	134.2	162.8	-16.0	-12.5
Durables	265.6	324.0	-28.9	-29.6
Petroleum	94.1	105.2	-5.0	-6.0
Energy	118.8	139.8	-6.1	-14.8
Housing and finance	1,035.0	1,296.4	-141.5	-120.0
Health services	331.3	462.4	-72.0	-59.2
Education	42.4	48.7	-2.7	-3.6
Other services	262.8	317.7	-25.4	-29.5

Note: These changes are in real dollars (pre-food-stamp cash-out prices).

Both the farm and food processing sectors had decreases in production averaging around 0.5 percent. In the farm sector, production fell by $1,085 million, nominal sector income by $540 million, and the number of jobs by 11,500. The most affected farm sectors were livestock production, feed crops, and fresh fruits and vegetables. The drop in the production of feed crops was due to reduced demand for them by the dairy, poultry, and livestock sectors. In the food processing sector, production shrank by $2,428 million, nominal sector income by $657 million, and jobs by 9,000. The biggest declines were in meat processing and miscellaneous food.

In general, prices fell for food and farm goods and services, with the biggest decreases in the producer prices of food and feed grains and fruits and vegetables. The fall in the producer price for food processing was smaller (0.04 percent) than that for producer farm prices (0.11 percent). The larger price impact on farm goods relative to processed foods reflected a greater degree of factor mobility in food processing than in

Table 12–Changes in jobs, production, and sector income after the food stamp cash-out
Production and jobs declined overall, but aggregate nonfarm, nonfood production and jobs increased

	Change in:				
Industrial sectors	Jobs	Real production	Nominal sector income[1]	Producer prices	Purchaser prices[2]
	Thousands	*------Million dollars-----*		*-----Percent-------*	
Total	-5.6	-2,840	-426	0	-.01
Total nonfarm nonfood	15.0	673	771	0	.00
Construction	.7	25	-26	0	0
Energy	.7	70	76	.01	0
Trade and transportation	-12.8	-1,145	-710	0	0
Tobacco and alcohol	.1	64	39	.01	0
Apparel	1.4	106	34	0	-.01
Nondurable manufacturing	-1.3	-242	-75	0	0
Durable manufacturing	2.3	80	45	0	0
Finance and real estate	6.6	1,092	918	.01	.02
Food services (restaurants, etc.)	2.8	97	49	0	0
Health services	5.4	328	250	.01	.01
Education	1.1	48	32	.01	.01
Other services	8.1	151	140	0	0
Total farm	-11.5	-1,085	-540	-.11	-.04
Dairy	-1.0	-109	-21	-.09	-.10
Poultry	-1.1	-117	-21	-.05	-.04
Livestock	-4.0	-423	-90	-.08	-.06
Cotton	0	5	-1	-.07	0
Food grains	-.4	-29	-35	-.18	0
Feed crops	-2.4	-193	-169	-.16	-.14
Oilseed crops	-.5	-36	-45	-.17	-.16
Fruits and vegetables	-1.5	-139	-102	-.09	-.05
Other crops	-.5	-44	-55	-.10	-.05
Total food processing	-9.0	-2,428	-657	-.04	-.02
Fish	-.1	-29	-8	-.01	-.01
Meat	-2.3	-536	-69	-.06	-.04
Poultry	-.8	-194	-49	-.03	-.03
Dairy	-.7	-272	-58	-.04	-.03
Grains	-.6	-267	-42	-.10	-.05
Fruits and vegetables	-1.3	-283	-110	-.01	-.01
Miscellaneous foods	-3.3	-847	-322	-.02	-.01

[1]Sector income is a nominal measure of value added net of factor taxes and indirect business taxes and equals the returns to the owners of factor services from labor, capital, and land in agriculture.

[2]A change to the price paid by consumers (purchaser or retail price) combines the change to the producer price with any change to the trade and transportation margins.

agriculture, due to an assumption that total land use in crop production was fixed in the aggregate. With a lower degree of quantity adjustment in agriculture, prices played a greater role in market adjustment.

As a result of the decrease in agricultural and food production, almost all nonmetro areas of the country experienced job reductions, losing almost 8,000 jobs in the aggregate. The hardest hit nonmetro areas were located in the Plains and North Central States (table 13). The negative impact of the cash-out spilled over into many metro areas as well, particularly in the North Central States, illustrating how widespread the economic linkages are between agricultural industries and other industries.

Real aggregate nonfarm, nonfood production increased by $673 million, with a growth of 15,000 jobs (table 12). The largest increases in production occurred for housing, insurance and finance, and for health services. Some nonfood, nonfarm industries also declined. Both trade and transportation, and nondurable manufacturing had production falls ($1,145 million and $242 million, respectively) and job losses (12,800 and 1,300, respectively). The reduction in trade and transportation reflects the relative importance of these services in bringing food from the farm to households via food processing. The reduction in nondurable manufacturing was due to its relative importance as a supplier of intermediate goods to farming and food processing. In general, prices rose

Table 13—Metro and nonmetro employment changes due to the food stamp cash-out

Regions and States	Metro	Nonmetro	Total	Regions and States	Metro	Nonmetro	Total
	Thousand jobs				*Thousand jobs*		
Northeast	2.006	-.191	1.815	Southeast	.202	-.926	-.724
Connecticut	.174	-.003	.171	Alabama	-.017	-.103	-.120
Delaware	.017	-.049	-.032	Arkansas	-.120	-.291	-.410
Maine	.009	-.011	-.002	Florida	.060	-.118	-.058
Maryland	.114	-.040	.074	Georgia	.065	-.180	-.115
Massachusetts	.364	.001	.365	Louisiana	.105	-.056	.050
New Hampshire	.017	.021	.038	Mississippi	.014	-.184	-.170
New Jersey	.159		.159	South Carolina	.095	.005	.100
New York	.996	-.029	.967				
Pennsylvania	.112	-.078	.033	Plains	.088	-2.542	-2.453
Rhode Island	.052	.004	.056	Kansas	-.028	-.600	-.628
Vermont	-.007	-.006	-.014	Nebraska	-.097	-.770	-.867
District of Columbia	.146		.146	North Dakota	-.022	-.151	-.172
				Oklahoma	.059	-.173	-.115
North Central	-.069	-2.696	-2.764	South Dakota	-.035	-.214	-.249
Illinois	-.054	-.437	-.491	Texas	.211	-.634	-.422
Indiana	-.006	-.209	-.214				
Iowa	-.197	-.845	-1.043	Mountain	.198	-.647	-.449
Michigan	.073	-.076	-.003	Arizona	.063	-.014	.049
Minnesota	-.007	-.426	-.433	Colorado	.026	-.185	-.159
Missouri	.050	-.220	-.170	Idaho	-.041	-.237	-.278
Ohio	.182	-.170	.012	Montana	-.003	-.083	-.086
Wisconsin	-.109	-.312	-.420	Nevada	.121	-.001	.120
				New Mexico	.018	-.045	-.027
Appalachia	.264	-.383	-.119	Utah	.011	-.056	-.045
Kentucky	-.027	-.157	-.183	Wyoming	.003	-.026	-.023
North Carolina	.107	-.146	-.039				
Tennessee	.030	-.018	.011	Pacific	-.532	-.475	-1.007
Virginia	.145	-.073	.073	Alaska	.034	-.014	.019
West Virginia	.010	.011	.020	California	-.432	-.144	-.575
				Hawaii	.033	-.025	.008
				Oregon	-.040	-.097	-.137
				Washington	-.127	-.194	-0.322
				Total	2.304	-7.860	-5.556

Source: For the nonagricultural sectors, employment by industry and region are from County Business Patterns (U.S. Bureau of Census, 1997). Data on State metro and nonmetro agricultural employment are USDA-ERS estimates. We distinguished metro from nonmetro counties according to definitions set by the Office of Management and Budget (see, www.ers.usda.gov/Briefing/Rurality/WhatisRural/).

slightly for nonfood nonfarm goods and services, with the biggest increase in the purchaser price of finance and real estate services.

Impact on Factor Markets

The cash-out simulation resulted in a decrease of 5,600 jobs and a decline in aggregate wages of 0.01 percent (table 14). These results were driven by the shift in the structure of low-income consumer demand and the impact this shift had on the structure of production and labor demand and, ultimately, on household labor supply decisions. As in the food stamp cut simulation experiment, wages adjust to equate supply and demand, and there is no unemployment.

The shift in consumption and production had the biggest impact on the two mid-skill labor categories. These skill levels were heavily employed by those sectors that had the biggest fall in production after the cash-out: over 90 percent of the labor employed in agriculture was mid-skill 1, over 50 percent of the labor employed in food processing was mid-skill 2, and over 50 percent of labor employed in trade and transportation was mid-skill 1 (table 4). For these skill levels, both employment and wages fell as demand shifted away from these sectors (table 14): the number of mid-skill jobs fell by 9,910 and wages fell by 0.04 percent for mid-skill 1 and by 0.02 percent for mid-skill 2. Aggregate demand shifted primarily into various service sectors, which use a greater percentage of high-skill professional workers. For high-skill labor, employment and wages both rose as demand shifted into these sectors (table 14): the number of high-skill jobs rose by 2,450 and high-skill 2 wages rose by 0.02 percent. The number of low-skill jobs also increased (1,900 jobs), and so did the wage rate (0.01 percent). These increases can be traced to the increase in production in housing, insurance, and finance. Over 12 percent of the labor employed in this industry is low skill.

Table 14—Impacts on job totals of the food stamp cash-out

The overall number of jobs decreased, but there was an increase in high-skill and low-skill jobs

Skill level	Number of jobs	Wage change
	Thousands	*Percent*
All Labor	-5.56	-.01
High-skill 1	.18	0
High-skill 2	2.27	.02
Mid-skill 1	-7.74	-.04
Mid-skill 2	-2.17	-.02
Low-skill	1.90	.01

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 occupations.

While supplies of land and capital were fixed at the economywide level, these factors were mobile across sectors. Land acreage moved among the different agricultural crops, with feed crops losing the most acres due to this sector's dependence on livestock production. The aggregate price of land fell by 0.9 percent. The reallocation of capital resulted in a slight (0.04 percent) increase in the aggregate return to capital.

Impact on Household Income and Well-Being

The cash-out experiment resulted in a net reduction in real income of $650 million. Net real income for high-income households fell by $300 million, for mid-income, $326 million, and for low-income households, $24 million (table 15). These changes stemmed from two primary sources. First, changes in labor supply and demand triggered changes in the amount and distribution of labor income. Mid- and high-income households held 5,414 fewer jobs after the cash-out. This decrease in the number of jobs, along with changes in wages, translated into a drop in real labor income of $314 million for mid-income households and $228 million for high-income households.

This result is explained by the high percentage of the labor supplied by mid- and high-income households is mid-skill labor, the type of labor hardest hit by the shift in production resulting from the cash-out. Almost 60 percent of labor supplied by mid-income households is mid-skill, as is about 50 percent of high-income household labor (table 3). Low-income households had only a small decrease in the number of jobs, losing only 143 full-time equivalent positions. Real labor income fell by $17 million for these households. This result stemmed from the increased demand for low-skill labor after the cash-out, and more than 50 percent of the labor supplied by low-income households is low-skill labor (table 3).[17]

[17]Each aggregate household type supplies labor among the occupations in a specific proportion (table 3), given the initial relative wages among these occupations. In response to a change in relative wages due to a policy or some other type of exogenous shock to the economy, households may adjust the occupational mix for which they supply labor. The adjustments are inelastic (small) and strongly influenced by the initial pattern of occupations that the household type supplied.

An important aspect of the labor market impacts to mid- and high-income households is the shift of low-income household consumption into housing. In the time horizon of our analysis, this shift in demand does not result in the construction of new housing stocks but in a demand for better, higher priced housing that already exists. The adjustment assumes there is available housing (with a longer run perspective, there would be a stimulus to generate new housing). A characteristic of the housing market, given existing stocks of housing, is that there is little to no employment associated with supplying the housing. So, as demand shifts away from economic activity with relatively high labor-to-production ratios to activity with low to zero labor-to-production ratios, there is a significant impact on the labor market.

The second source of change to household income and well-being came from a change in taxes. To maintain government expenditures and other transfer payments at initial levels, real taxes increased by approximately $65 million after the cash-out. This increase was due both to price adjustments that increased the cost of fixed real government purchases and to economywide adjustments that affected other tax revenues. High-income households paid all of the tax increase—in fact, mid-income households actually had a reduction in their taxes of $1 million (triggered by their large fall in labor income).

Conclusions

The results of the two policy simulations demonstrate the degree to which economic activity and food stamp

Table 15—Impact on household incomes from the cash-out
Income for all household types decreased, though mid- and high-income households were the hardest hit

Type of household	Labor supply (jobs)	Food stamp income (nominal)	Labor income (real)	Taxes (real	Net income[1] (real)
	Number	*Million dollars*			
Total households	-5,556	18,746	-559	65	-650
Low-income	-143	18,746	-17	0	-24
Mid-income	-2,821	0	-314	-1	-326
High-income	-2,593	0	-228	65	-300
Two-parent	-2,485	3,786	-210	18	-232
Low-income	-72	3,786	-8	0	-9
Mid-income	-1,329	0	-134	-1	-135
High-income	-1,083	0	-69	19	-89
Single-parent	-312	11,274	-39	1	-45
Low-income	-36	11,274	-4	0	-7
Mid-income	-91	0	-13	0	-14
High-income	-184	0	-22	1	-24
Two-adult	-2,145	796	-187	17	-210
Low-income	-13	796	-1	0	-2
Mid-income	-1,143	0	-110	0	-114
High-income	-989	0	-76	17	-94
Single-adult	-539	1,814	-98	12	-121
Low-income	-20	1,814	-4	0	-6
Mid-income	-246	0	-53	-1	-54
High-income	-273	0	-42	12	-62
Elderly	-76	1,077	-24	17	-42
Low-income	-1	1,077	0	0	-2
Mid-income	-12	0	-4	1	-9
High-income	-63	0	-19	17	-31

[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.

policy are interconnected. Hypothetical changes in food stamp policy triggered changes in production, labor demand, and sector income—not just for the farm and food sectors, which are most directly affected by food stamp spending, but also for other industries across the economy. Likewise, changes in food stamp policy triggered changes in consumption, labor supply, and household income—not just for low-income households, but for mid- and high-income households as well.

Both simulation experiments had an impact on the farm economy. The $5 billion food stamp cut (25 percent of the food stamp program) led to decreases in farm and food processing production of approximately $1.3 billion, nominal sector income losses of $440 million, and job losses of 7,500. These are all small impacts in that they amount to 0.2 percent of production, sector income, and jobs in the combined farm plus food processing sectors. The hardest hit farm sectors were livestock, feed crops, and fresh fruits and vegetables. The $18.5 billion food stamp cash-out led to decreases in farm and food processing production of approximately $3.5 billion, nominal sector income losses of $1.2 billion, and job losses of 18,500. In both simulation experiments, nonfarm and nonfood processing industries grew in aggregate, though in the cash-out experiment, some nonfarm, nonfood processing industries also declined. The production and job losses resulting from the experiments were distributed across the country, with the greatest losses occurring in nonmetropolitan areas specializing in livestock and feed crops.

The simulation experiments also reveal the effect of the food stamp policies on the level and distribution of income. Spurred by the reduction in food stamp benefits, low-income households sought more work hours but did not earn enough labor income to compensate for the drop in food stamp income. Even if the income elasticities of labor supply were quadrupled from those in the base CGE model, so that low-income households supplied over four times more labor in reaction to the food stamp cut, these households would not be able to substantially increase their total labor earnings.[18] In the absence of an exogenous increase in production and the demand for low-skill labor, the increase in low-skill labor supply would spur a drop in the wage rate for low-skill labor (with wages falling until supply equaled demand). As a result, without wage or other work supports, low-income households would be unable to compensate for lost food stamp benefits. The model does not consider adjustments to other government assistance programs such as the Earned Income Tax Credit or childcare supplements, which might offset some of the lost household income.

The effects of a food stamp cut are not favorable for low-income households. The results of the cash-out experiment also reveal a surprising negative effect on mid- and high-income households (an income drop of $626 million). In this case, the shift in low-income household consumption triggered a change in economic activity that reduced mid- and high-income household labor income and increased mid- and high-income taxes. The change in consumption led to reduced production in industries using a relatively large amount of mid-skill-level occupations. Since these occupations are primarily filled by mid- and high-income household workers, these households showed a decline in labor income. This result would have been dampened or reversed if the model had calculated longer term impacts on the housing market (and the economic activity linked to homebuilding).

The drop in real income for low-income households was relatively small ($24 million) in the cash-out experiment. However, in this case, the drop in income may understate changes in well-being because it does not measure any reductions in well-being that may result if food insecurity increases due to the cash-out (Bishop et al., 2000; Butler and Raymond, 1996; Devaney and Fraker, 1986). The relatively small reduction in real income for low-income households masks the very large shift in consumption from food to nonfood items. Food-at-home consumption fell over $3.2 billion while nonfood consumption rose over $3.1 billion for low-income households. This reduction may leave vulnerable household members with less access to food. Conversely, the drop in real income may overstate the decrease in household well-being because it does not reflect any increase in well-being gained by low-income households from having the opportunity to make unconstrained consumption choices.

The general equilibrium analysis reveals that a food assistance policy change that has effects that are seemingly isolated to low-income recipient households, such as the food stamp cash-out, may have ramifications that extend to other income groups. Any policy that changes the level or distribution of economic activity will have an impact on those households that have linkages to the economy through labor-force participation, capital income, or tax payments. The households with the strongest links are mid- and high-income households, and they will be affected by food

[18]Appendix C presents the results of sensitivity analysis for the labor supply elasticity assumption.

assistance policy to the extent that a policy impacts economic activity. In fact, as illustrated by the cash-out experiment, these households will be affected even more than low-income households (which tend to have fewer ties to the economy).

Three sets of assumptions built into the Food Assistance CGE model contributed to the results of the two policy simulations, though changes in only one set of assumptions led to substantial changes in the simulation results. The first set of assumptions involves the model's closure rules, particularly the balanced budget assumption. In the Food Assistance GCE model, 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, thereby leaving the government deficit unchanged. Instead of returning the revenues freed by a cut in food stamp benefits to taxpayers, the government could have used the money to finance other activities or to buy down the debt. However, unless the money was used to finance farm programs, the impact on the farm economy would remain virtually the same. The type of closure chosen for the government account primarily affects nonfarm, nonfood expenditures. Kuhn et al. (1995) showed that the impacts on food demand and agriculture with a deficit-reduction closure were essentially identical to the impacts with a tax-reduction rule. The only real difference they found was that the tax reduction had a greater impact on nonfood consumer goods and services, while the deficit reduction scenario had a greater impact on capital goods sectors.

The second important set of assumptions involves the labor supply elasticities embedded in the Food Assistance CGE model. To check the robustness of the simulation results to these elasticity assumptions, we tested the sensitivity of the results to a wide range of labor elasticities (appendix C presents this sensitivity analysis). The elasticity assumptions do have dramatic effects on labor supply; however, because of the neoclassical assumption about labor market behavior embedded in the model, labor supply changes do not trigger dramatic changes in household income. In the model, changes in labor supply trigger changes in the wage rate sufficient to equate labor supply and demand. As a result, increases in labor supply and the number of jobs do not result in large increases in labor income; wage-rate adjustments counterbalance the potential growth in labor income. In addition, wage adjustments for a particular skill level affect all labor income for all households supplying labor at that particular skill level. As a result, all households in the model, whether or not they actually adjust their own labor supply, experience changes in their wage rates and their labor income because of changes in aggregate labor supply. This assumption about labor market behavior leads to model results that accurately describe aggregate household effects but that may not reflect individual household experience.

The third and most critical set of assumptions concerns the consumption patterns of food stamp recipient households. Because the model incorporates a different marginal propensity to consume food with food stamps than with cash, an additional dollar of cash income produces a different mix of consumption than an additional dollar of food stamp benefits. Without this slippage effect, households would spend food stamp benefits the same way they spend cash. If that were the case, the results of the two simulation experiments would be different: a food stamp cut would affect the distribution of consumption only to the extent that high-income households spend money differently than low-income households, and a food stamp cash-out would not have an impact on consumption and therefore would not have an impact on general economic activity. A doubling of the slippage effect slightly more than doubles the reduction in food spending calculated in the simulation experiments (see Smallwood et al., 1995b, for sensitivity analysis of the slippage effect).

To the extent that assumptions about consumption patterns remain valid, the results of the simulations would have been similar, though of opposite signs, if we had flipped the questions to ask, "What if funding for the Food Stamp Program were increased by $5 billion?" and "What if cash benefits were converted to in-kind food benefits?" No matter which way the question is posed, changes in food assistance policy have profound effects on low-income households and the farm economy. And, as shown with the Food Assistance CGE model, these effects extend beyond these households and sectors, affecting the level and distribution of economic activity throughout the economy.

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Appendix A: Household Aggregation and Sources of Income

The unit of analysis we label "household" in the CGE model is our best approximation of a "consumption unit" and is not identical with the CPS household, which is defined by a common address. It is important to emphasize this because a "household" in the CPS data structure sometimes includes more than one "household" as we use the word (if there is a related subfamily, the CPS considers this unit as part of the primary family).

For the household aggregation, we first distinguished households by family structure: single-parent, dual-parent, single-adult, multi-adult, and elderly households. A household was categorized as elderly if the household head was 65 years old or older. This was the category of preference if the household fit in multiple categories. The presence of children was determined by whether any person in the household was under age 18 and not a reference person (respondent) or spouse in a primary family, nonfamily householder, or unrelated subfamily. That is, minors who were reference persons or spouses (except in a related subfamily) were not considered children for this classification. All units with children (except elderly-headed) were classified as dual-parent or single-parent, based on the "FKIND" variable in the CPS. All units with no children and without an elderly head were classified "multiple adult" if there was more than one person and "single adult" if there was only one person.

Within each of these five types of households, we distinguished three income classes: low-income, mid-income and high-income. The 1996 data for household income are from the 1997 March Supplement of the Current Population Survey (CPS), Bureau of the Census. The income classes were determined with respect to the poverty level for each household and to income quartiles for the household type.

The poverty level for each household type was defined according to Census Bureau guidelines. The official definition of poverty is based on pretax money income. It does not include capital gains or the value of noncash benefits such as employer-provided health insurance, food stamps, Medicaid, Medicare, or public housing. Specifically, for official poverty statistics, each household in the CPS sample was queried as to the amount of money income received by all persons age 15 and over in the preceding calendar year.

We excluded two types of households from the analysis: those whose head is in the military and who live off-base and those with large negative self-employed income for the year.[19]

Household Groups

Single Parent
Low-income—0 to 130% of poverty line
Mid-income—130% of poverty line to income below which 75% of households lie (31,000)
High-income—75% of households and above

Dual Parent
Low-income—0 to 130% of poverty line
Mid-income—130% of poverty line to income below which 50% of households lie (50% = 52,022)
High-income—50% and above

Single Adult
Low-income—0 to 130% of poverty line
Mid-income—130% of poverty line to income below which 75% of households lie (75% = 34,450)
High-income—75% and above

Multi-Adult
Low-income—0 to 130% of poverty line
Mid-income—130% of poverty line to income below which 50% of households lie (50% = 52,128)
High-income—50% and above

Elderly
Low-income—0 to 130% of poverty line
Mid-income—130% of poverty line to income below which 75% of households lie (75% = 33,973)
High-income—75% and above

[19]A small number of households with large negative self-employed income biased the characteristics of low-income household groups. Most of these households did not participate in welfare transfer programs despite their below-poverty level of income.

Sources of Income

Labor-related income
Wages and salaries, plus other labor income
Self-employed income, nonfarm
Self-employed income, farm

Capital-related income
Interest
Dividends
Rent

Retirement income
Federal employee
State and local employee
Private funds

Government transfers
Social Insurance fund plus veterans' benefits (less medical and Federal employee retirement):
- Workers' compensation
- Social Security income
- Survivor's income
- Disability income
- Veterans' Administration benefits

Unemployment compensation
Supplemental Security Income (SSI)
Aid to Families with Dependent Children (AFDC)
General Assistance
Education assistance

Income from government that is not part of money income for calculation of poverty levels but is included in net income calculations
Earned Income Tax Credit
Energy assistance

Noncash government transfers
Medicare (fungible value)
Medicaid (fungible value)
Food stamps (market value)
School lunch (market value)
Housing assistance (value)

Data in CPS but not used
Other income
Interhousehold transfers (not used, since the CPS data does not state from whom the income is received):
- Child support
- Alimony
- Financial assistance

Appendix B: Industry Aggregation

Industry data are from the 1992 Benchmark Input-Output Account, Bureau of Economic Analysis (*Survey of Current Business*, 77(11), November 1997). The benchmark accounts include about 500 industries, based on the Standard Industrial Classification (SIC). Pages 58-62 of the referenced I-O article include a list of the industries and their associated I-O codes and SIC codes. We maintain full industry detail in the database for the CGE model and aggregate the 500 industries to about 50 industries for policy analysis with the model. The aggregation procedure is flexible, so future applications may involve an alternative set of industries. The specific aggregation mapping is available on request. In summary form, the industry aggregation used in the policy experiment is:

DAIRY	Dairy farms
POULTRY	Poultry farms
LVSTK	Cattle, hogs, and miscellaneous livestock farms
COTTON	Cotton farms
FOODGRN	Food grain farms; wheat, rice and rye
FEEDCRP	Feed crop farms; corn, sorghum, barley, oats, hay
OILSEED	Oilseed farms; soybeans, sunflower, etc.
FFRTVEG	Fruit and vegetable farms
FTOBACO	Tobacco farms
OTHCROP	Other crops: sugar, nursery and greenhouse, miscellaneous
AGCHSERV	Agricultural chemicals and services
RESOURCE	Forestry, mining (except, coal and crude oil)
COALMINE	Coal mining
CRUDEOIL	Crude oil and natural gas mining
CONST	Construction: new and maintenance; residential, industry, and government
FRSHFISH	Fresh fish
PROCFISH	Processed fish
MEATMFG	Processed red meat products
POULTMFG	Processed poultry
DAIRYMFG	Processed dairy products; milk, ice cream, cheese, butter
GRAINMFG	Food grain processing
FEEDMFG	Prepared feeds
CORNMILL	Wet corn milling
SUGARMFG	Sugar processing
OILMILLS	Oil seed processing
ALCOHOL	Alcohol processing; beer, wine, distilled liquors
PFRTVEG	Processed fruit and vegetables; frozen, canned, dehydrated
MISCFOOD	Other food products; breakfast cereals, bakeries, candy, snacks, drinks, misc.
TOBACCO	Tobacco products
CLOTHING	Textile and apparel, footwear and leather
REFPETRO	Refined petroleum products; gasoline
CHEMRUB	Chemical, rubber, and plastic products, including drugs
OTHNDMFG	Other nondurable products; paper and printed products
METALMFG	Metal manufacturing
MACHINRY	Machinery manufacturing
ORDNANCE	Ordnance, small arms and ammunition, military arms
OTHELEC	Electronic equipment, computers, electrical industry equipment
CONELEC	Electronic equipment with household consumer focus, except computers
AUTOIND	Motor vehicles, cars and trucks
AEROSPCE	Aircraft and parts
OTHTRNEQ	Other transportation equipment; ships, boats, railroad equipment, motorcycles
OTHDMFG	Other durable goods manufacturing; wood, furniture, glass and stone, misc.
TRNSP	Transportation industry; motor freight, railroad, air, water, pipelines
ELECUTIL	Electric utilities, private and public
GASUTIL	Gas utilities, private and public
OTHUTIL	Other utilities; water and sanitary services, radio, TV, telephone
WHLSTRD	Wholesale trade
RTLTRD	Retail trade
FININS	Finance, insurance, real estate
OWNDWEL	Owner-occupied dwellings, imputed rents
RESTRANT	Restaurants or eating and drinking places
PERSERV	Personal services; lodging, laundry, repair shops (incl. auto), amusements
BUSERV	Business services; data, legal, accounting, engineering, advertising, misc.
HEALTH	Health services; doctors, dentists, nursing, hospitals, veterinary, other medical
EDUCATE	Education services; all levels
JOBTRAIN	Job training programs
CHILDCRE	Child day care services (private business)
RESDNCRE	Residence care
OTHSERV	Other services; social services, religious, other associations, post office
GOVIND	Government industry

Appendix C
Sensitivity Analyses

To examine the sensitivity of the experiment results to assumptions about labor supply elasticity, we repeated the simulation experiments using a number of different labor supply elasticities for low- and high-income households. We focused on the labor supply responsiveness of low- and high-income groups, since these are the groups most affected by the tax and transfer experiments examined here.

In the first set of scenarios, we held the compensated wage elasticities constant and varied income elasticities from the small to large values reported in table C-1. In one run, we assumed that higher income households had a larger reaction to changes in income, while poorer households responded less. In another run, the opposite was tested—elastic income response by the low-income households, with inelastic response by the high-income households. In the second set of scenarios, we held income elasticities constant and varied wage elasticities from the small to large values reported in table C-1. The most extreme wage elasticity case identified by economists is the possibility of backward-bending labor supply curves. This phenomenon occurs when an individual's reaction to rising wages is to work fewer hours. We considered this possibility by running simulations examining a negative uncompensated wage elasticity.

The primary observation generated by the sensitivity analysis is that though elasticity assumptions had dramatic effects on labor supply, these labor supply effects did not translate into dramatic changes in household income or consumption. The neoclassical assumption about labor market behavior embedded in the model requires that changes in labor supply trigger changes in the wage rate sufficient to equate labor supply and demand. As a result, increases in labor supply and the number of jobs did not result in large increases in labor income—wage-rate adjustments counterbalance the potential growth in labor income. In addition, wage adjustments for a particular skill level affected all labor income for all households supplying labor of that particular level. As a result, all households in the model, whether or not they actually adjusted their own labor supply, experienced changes in their wage rate and their labor income because of changes in aggregate labor supply.

Cut in Food Stamps: Sensitivity Analysis to Labor Supply Elasticities

Table C-2 presents the results of the sensitivity analyses for the simulation experiment in which Food Stamp Program funding is cut by $5 billion. The first row in the table presents the central base-case numbers (as reported in the body of the report) for comparison with the sensitivity results. In the first block of scenarios, we adjusted the compensated wage elasticity while holding income elasticities at the central-case value. Wage elasticities had little impact on low-income household labor supply or welfare. This is because the policy shock on low-income households was an income effect from the cut in food stamps. For high-income households the policy shock was an after-tax wage adjustment, so wage elasticities were more important than income elasticities, though there was an income effect related to the change in nonlabor income. For the high-income households, doubling the wage elasticities doubled the labor supply response, compared with the central-case scenario. With high wage elasticities for both low- and high-income households, the increase in real household consumption resulting from the increased labor supply was $1,550 million. This increase was $616 million higher than the increase generated under the base-case scenario. However, all of this increase accrued to high-income households.

The scenarios with backward-bending labor supply responses for high-income households resulted in a reduction in high-income labor as the wage rate increased. In comparison with the base case, the gain in real household income was small.

In the second block of scenarios, we adjusted income elasticities for low- and high-income households while holding uncompensated wage elasticities at the central-case value (compensated wage elasticities were adjusted to maintain uncompensated values). Income elasticities had a large effect on low-income households (the group experiencing the large cut in food stamp income) and a much smaller impact on high-income households (for whom income elasticities applied primarily to general equilibrium changes in capital income). In the food stamp cut experiment, low-income household labor supply increased by almost 22,000 jobs when the income elasticity was increased to -0.4, compared with 5,100 jobs in the central case with an income elasticity of -0.1. However, the potential gains in income from

an increase in employment were offset by a decrease in wages, as reflected in the constant real-consumption loss experienced by low-income households. For high-income households, an increase in income elasticity from -0.1 to -0.04 increased high-income labor by only 12,933 jobs, compared with 11,839 in the base case. When both low- and high-income households were given high income elasticities (-0.4), the high-income household labor supply response was dampened by the increase in low-income household labor supply. The large increase in low-income household labor supply contributed to lowering the wage rate for some occupations that both types of households supply (though in high-income households, lower skill jobs tend to be held by second earners).

Cash-out Food Stamps: Sensitivity Analysis to Labor Supply Elasticities

Table C-3 presents the results of the sensitivity analyses for the simulation experiment in which food stamp benefits are converted to cash. Again, the first row in the table presents the central base-case numbers (as reported in the body of the report) for comparison with the sensitivity results. In this policy scenario, there were no direct wage or income effects to drive a change in household labor supply. Instead, the impact of the simulations on wages and income arose through changes in the distribution of production and labor demand.

In the first set of scenarios, we adjusted wage elasticities and held income elasticities constant at central-case values. Variation of the wage elasticities had a noticeable but small impact on the labor supply and consumption of households. For low-income households, the scenarios with low wage elasticities led to slight increases in labor supply relative to the central case and, due to wage changes, even smaller impacts on real consumption. This result was driven by the fact that even though wages for low-skill labor rose as a result of the cash-out, wages for mid-skill labor fell by even more. With low wage elasticities, low-income households (who supply almost an equal amount of low- and mid-skill labor) responded less to the larger wage decrease than they did in the base case. With high wage elasticities and falling mid-skill wages, low-income households reduced their labor supply relative to the base case. The impact on low-income household consumption was similar to the base case.

For the high-income households, doubling wage elasticities increased their labor supply response (a reduction in labor supply) by 50 percent, compared with the central-case scenario. It appears that with high wage elasticities, the reduction in household labor supply in reaction to the decrease in mid-skill wages was larger than the increase in household labor supply in reaction to the smaller increase in high-skill wages. The loss of real household consumption was only slightly larger than in the central case.

In the scenarios with backward-bending labor supply responses for high-income households, a decrease in the net wage led to an increase in high-income household labor. Real income did not change very much in comparison with the base case.

As it turns out, the income effects were so small that the impact of alternative income elasticities on household labor supply was negligible, as illustrated in the third block of scenarios.

Appendix table C-1—Labor supply elasticities for sensitivity analysis

	Central case			High-elasticity values			Low-elasticity values		
Household type	Income	Uncompen-sated wage	Compen-sated wage	Income	Uncompen-sated wage	Compen-sated wage	Income	Uncompen-sated wage	Compen-sated wage
Single adult no children:									
Low-income	-0.100	0.050	0.150	-0.4	0.5	0.9	-0.01	0.01	0.020
Mid-income	-.100	.050	.150						
High-income	-.100	.050	.150	-.4	.1	.5	-.01	-.05	-.040
Single adult with children:									
Low-income	-.100	.125	.225	-.4	.2	.6	-.01	.01	.020
Mid-income	-.100	.125	.225						
High-income	-.100	.125	.225	-.4	.2	.6	-.01	-.1	-.090
Married couple no children:									
Low-income—									
Husband	-.025	.050	.075	-.1	.1	.2	-.01	.005	.015
Wife	-.200	.400	.600	-.8	.8	1.6	-.08	.04	.120
Mid-income—									
Husband	-.025	.050	.075						
Wife	-.200	.400	.600						
High-income—									
Husband	-.025	.050	.075	-.1	.1	.2	-.01	-.01	0
Wife	-.200	.400	.600	-.8	.8	1.6	-.08	-.08	0
Married couple with children:									
Low-income—									
Husband	-.025	.050	.075	-.1	.1	.2	-.01	.005	.015
Wife	-.200	.400	.600	-.8	.8	1.6	-.08	.04	.120
Mid-income—									
Husband	-.025	.050	.075						
Wife	-.200	.400	.600						
High-income—									
Husband	-.025	.050	.075	-.1	.1	.2	-.01	-.01	0
Wife	-.200	.400	.600	-.8	.8	1.6	-.08	-.08	0
Elderly	-.100	0	.100						

Appendix table C-2—Labor supply sensitivity analysis for food stamp cut

Scenario	Change in labor supply				Change in real consumption			
	All households	Low-income	Mid-income	High-income	All households	Low-income	Mid-income	High-income
	Thousand jobs				*Million dollars*			
1. Base case-central value income and wage elasticities	23,178	5,081	6,258	11,839	928	-4,965	1,404	4,489
2. Central income elasticities and wage elasticities set at:								
a. low values for low-income households and high values for high-income households	37,963	5,071	7,711	25,181	1,546	-4,961	1,550	4,957
b. high values for low-income households and negative (backward bending) values for high-income households	4,177	5,211	4,489	-5,523	133	-4,970	1,215	3,888
c. low values for low-income households and negative (backward bending) values for high-income households	4,082	5,107	4,494	-5,519	131	-4,970	1,215	3,886
d. high values for low- and high-income households	37,909	5,013	7,715	25,181	1,544	-4,961	1,550	4,955
3. Central uncompensated wage elasticities and income elasticities set at:								
a. low values for low-income households and high values for high-income households	15,503	1,037	6,648	7,817	645	-4,965	1,342	4,269
b. high values for low-income households and low values for high-income households	40,240	21,953	5,352	12,934	1,445	-4,968	1,497	4,916
c. low values for low- and high-income households	20,413	1,030	6,450	12,933	864	-4,964	1,396	4,432
d. high values for low- and high-income households	32,989	21,994	5,297	5,699	1,127	-4,971	1,420	4,678

Appendix table C-3—Labor supply sensitivity analysis for food stamp cash-out

Scenario	Change in labor supply				Change in real consumption			
	All households	Low-income	Mid-income	High-income	All households	Low-income	Mid-income	High-income
	Thousand jobs				*Million dollars*			
1. Base case-central value income and wage elasticities	-3,654	-83	-1,970	-1,600	-614	-24	-308	-282
2. Central value income elasticities and uncompensated wage elasticities set at:								
a. low values for low-income households and high values for high-income households	-5,311	3	-2,320	-2,993	-683	-24	-324	-334
b. high values for low-income households and negative values (backward bending) for high-income households	-1,547	-248	-1,545	245	-527	-23	-288	-216
c. low values for low-income households and negative values (backward bending) for high-income households	-1,323	-1	-1,558	236	-520	-23	-286	-210
d. high values for low- and high-income households	-5,520	-222	-2,307	-2,991	-689	-24	-326	-340
3. Central value compensated wage elasticities and income elasticities set at:								
a. low values for low-income households and high values for high-income households	-4,079	-89	-2,055	-1,936	-631	-24	-312	-295
b. high values for low-income households and low values for high-income households	-3,549	-58	-1,957	-1,534	-610	-24	-307	-279
c. low values for low- and high-income households	-3,579	-90	-1,955	-1,534	-611	-24	-308	-280
d. high values for low- and high-income households	-4,051	-55	-2,057	-1,939	-631	-24	-312	-295