How Does the Supplemental Nutrition Assistance Program Affect the U.S. Economy?

Jeffrey J. Reimer, Senal Weerasooriya, and Tyler T. West

The impact of the Supplemental Nutrition Assistance Program (SNAP) on the national economy is examined using a general equilibrium model and comparing measures of the economy from 2010 to a simulation of that economy without SNAP. Without the SNAP program, the overall size of the economy hardly differs—demand for labor increases slightly. However, households that would be eligible for SNAP experience a net loss. They have 5.5 percent less disposable income while ineligible households have approximately 1 percent more income without SNAP, and output of products eligible for purchase with SNAP funds declines approximately one billion dollars.

Key Words: consumer demand, food assistance, general equilibrium, policy, poverty, SNAP

The U.S. Supplemental Nutrition Assistance Program (SNAP) has grown rapidly in recent years in the wake of the recession that followed the rapid decline in real estate prices starting in 2007, along with policy changes that expanded access to the program. In 2012, expenditures reached $78 billion with the number of SNAP recipients at 47 million, up from 27 million in 2007 (Food and Nutrition Service (FNS) 2014). Concurrent with that growth was a rapid expansion in the body of literature examining the economics of the program. Nearly all of this research has focused on the microeconomics of SNAP, including its effects on the food security and health of participants (e.g., Ratcliffe, McKernan, and Zhang 2011, Castner and Henke 2011, Burgstahler, Gundersen, and Garasky 2012, Mabli et al. 2013). While this literature has shed much light on the functioning of the program, comparatively little is known about the effect of SNAP on the economy as a whole, which is the focus of the study at hand.

Studying the program from the perspective of aggregate economic outcomes can inform our understanding of the efficiency of resource allocation and the distributional effects of this program, including its effects on different households, sectors, and institutions within the economy.

A focus on economy-wide impacts requires analysis of the links between key components in the economy, including public financing, markets for goods, and

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factor markets. In terms of public financing, SNAP could affect the welfare of households that are *not* eligible for SNAP (in addition to those that are eligible and participate in the program) through its effect on taxes and disposable income. With respect to markets for goods, SNAP could indirectly affect economic sectors such as durable good manufacturing and medical services in addition to economic sectors that could be more directly affected by SNAP, such as food manufacturing and crop agriculture. By enabling purchases of food, the program potentially sends ripple effects through markets for other goods and services. Finally, factor markets are another link between SNAP and households, both eligible and ineligible. Through its effect on consumer spending, SNAP could influence the aggregate demand for labor and capital and, therefore, could affect the incomes of a wide range of households.

It is useful to classify goods and services into two broad groups, luxuries and staples. A good is a luxury if quantity consumed increases more than proportionately as income rises; it has a high income elasticity of demand. A good is a staple if demand for it increases proportionately less than income when there is a rise in income; it has a low income elasticity of demand.

As mentioned, one effect of SNAP is on households that are not eligible for SNAP benefits. For a household of three, this is roughly those with incomes of more than $25,000 per year (FNS 2014). Much of the funding for SNAP comes through taxation of higher-income, ineligible households. Their consumption patterns likely differ from those of low-income, SNAP-eligible households. If an extra dollar is received, a higher-income household may spend less of it on food at home, a staple, than would a low-income family since their needs are already mostly met. Thus, in the absence of SNAP, higher-income households could in theory have more after-tax income and would increase consumption of some goods and services more than proportionately. Offsetting this effect, however, is that without SNAP, current participants would have to cut back on nonfood expenditures as they struggle to pay for food (a staple) with what money they have. By supporting food expenses, SNAP frees up money for goods and services that might otherwise be unaffordable, including rent and utilities (Edin et al. 2013). For SNAP-eligible households, these nonfood expenses may need to be deferred or cut relative to food.

In summary, SNAP potentially influences spending patterns for a broad range of goods and services and, by extension, the economic sectors in which these goods and services are produced, along with associated factor markets. SNAP allows more spending by low-income households and limits spending on a somewhat different set of goods and services by higher-income, SNAP-ineligible households.

This study addresses three primary questions: How does SNAP affect the size of different sectors of the economy? How much do various types of households gain or lose from the program? What influence does SNAP have on primary factor markets and the gross domestic product (GDP) of the United States as a whole?

The study questions are answered using a computable general equilibrium (CGE) model for the United States as a whole. This modeling approach is appropriate when the researcher seeks to capture economy-wide consequences of policies and programs (Waters, Holland, and Weber 1997, Randhir and Hertel 2000, Reimer and Li 2009, Bauer and Wing 2010).

To investigate how SNAP affects the U.S. economy, one must have an estimate of what the economy would be like without the program in place. Predicted values from this sort of CGE experiment can then be compared to a baseline

data set that embeds the effects of SNAP. In the model simulation, it is assumed that current SNAP transfers are eliminated and the money is left with higher-income taxpayers from whom the transfers are recorded in the data. This is a means of representing what is otherwise an unobservable scenario.

After evaluating the overall impact of SNAP, the model is used to examine how projections of SNAP funding over the next decade will likely impact different parts of the U.S. economy. This second simulation is based on projections from the Congressional Budget Office (CBO) and provides an alternative context by which to view how SNAP operates through the links previously discussed.

The study makes several contributions to the literature. Few prior studies have employed a multi-sector, multi-household model to study food assistance policies. One such study is Hanson et al. (2002), which developed a model to analyze what would happen if food assistance spending was reduced by $5 billion from a baseline year (1996), among other possibilities. The study found that such a reduction led to a $1.3 billion decrease in farm and food processing production and a loss of 7,500 jobs in 1996. In another study, Hanson (2010) focused on the stimulus effect of SNAP benefits under the American Recovery and Reinvestment Act of 2009. The study used the U.S. Department of Agriculture's (USDA's) Food Assistance National Input-Output Multiplier model to measure links between domestic food assistance programs, the agricultural sector, and the U.S. economy and found that $1 billion of SNAP spending resulted in $1.79 billion of economic activity—a $9 increase in economic activity for every $5 of SNAP benefits an individual received.

A key message from these studies is that SNAP affects much more than just benefit-recipient households; it also affects agricultural producers, food processors, food retailers, and ineligible households. The present study explores this possibility in greater detail by econometrically estimating the parameters of the general equilibrium model's demand system to better show how consumption bundles react to changes in spending power.

In estimating the demand system, studies have consistently found that, for all types of households, the share of the budget spent on food falls as disposable income rises. In other words, demand for food is income inelastic. Meanwhile, demand for services and manufactures is income elastic. The results of this study largely mirror those of studies that quantitatively analyzed consumer demand, including Reimer and Hertel (2010), Castner and Mabli (2010), and Mabli and Malsberger (2013), which focused on spending patterns of SNAP participants, nonparticipants, and ineligible nonparticipants. Income level is found to play a role in household budget shares. Unlike the current study, the prior studies did not consider how SNAP affects the U.S. economy.

The results of this study suggest that, without SNAP, the net number of jobs in the U.S. economy would fall by 5,641 and there would be larger underlying changes by sector (some positive, some negative). The number of jobs lost is small relative to the number of jobs in the economy because SNAP funds are not eliminated from the economy; instead, the funds are used by a different group of citizens. This result is based on an assumption of constant wages. If wages instead of jobs are allowed to adjust, there is a slight rise in wages in the economy without SNAP and a small decline in capital returns. For households that would have been eligible for SNAP, the change in earnings is not large enough to compensate for loss of SNAP benefits; those households reduce purchases of all types by 5.5 percent on average. Households that would not have been eligible for SNAP increase purchases by an average of 1 percent.

Without SNAP, the food-at-home sector would be $1.008 billion (0.2 percent) smaller than it is at present. This sector shrinks a small amount because low-income households no longer have assistance for making purchases from the sector. Higher-income households fill back in some but not all of the loss of food-at-home expenditures in the economy. Other sectors, including housing, manufactured goods, utilities, and transportation, tend to be larger without the program.

In terms of GDP, the economy would be slightly smaller without SNAP but would not lose enough GDP under this revenue-neutral scenario to be considered significant. The change is extremely slight compared to the program's effect on the spending power of low-income households. According to this study's results, SNAP has a small effect on the U.S. economy as a whole but has a nontrivial effect on the well-being of program beneficiaries as well as smaller effects on the output of certain industries.

Background

To be eligible for SNAP benefits, a household must meet three requirements. First, it must have a gross income at or below 130 percent of the poverty line, which corresponds to an annual income of about $24,100 for a household of three. Second, it must have a net income after relevant deductions at or below the poverty line—about $18,500 per year. Third, it must have assets of $2,000 or less. These criteria do not strictly apply for households in which members are elderly or disabled or in states with certain eligibility requirements (Center on Budget and Policy Priorities (CBPP) 2012, Strayer, Eslami, and Leftin 2012). Most people who receive SNAP benefits live in low-income households. In 2010, the average annual income of a benefit-recipient household was $8,800. The average benefit was $287 per household per month (FNS 2014).

The FNS (2014) reported that federal government spending on SNAP reached approximately $78 billion in 2012. Of that, 95 percent went directly to benefits and 5 percent went to administrative costs. The 2007 recession induced by the housing bubble, in combination with eased eligibility requirements in some states, contributed to an increase in the number of households that qualified for the program. The number of participants appears to have peaked in 2013 and has fallen since then, perhaps reflecting general improvement in economic conditions. According to the CBO's 2014 projections, inflation-adjusted SNAP expenditures will fall approximately 32 percent by fiscal year 2024.

Model and Data

A mathematical presentation of the general equilibrium model used in this study is found in Lofgren, Harris, and Robinson (2002) and additional documentation is presented in Waters, Holland, and Weber (1997). The model incorporates government spending and taxation, utility-maximizing households, profit-maximizing firms, intermediate input use, inter-household and government fund transfers, savings and investment, and trade with the rest of the world. The households receive income from labor, capital, inter-household transfers, federal and state government transfers, and investment income and spend money on commodities, inter-household transfers, federal and state taxes, and investment. Household linear-expenditure-system (LES) demand functions

indicate how a household's optimal bundle of goods will change in response to changes in prices and their spending constraints.

Domestic production of a commodity combines intermediate inputs and value added (capital and labor) using a constant elasticity-of-substitution function. The representative firm for each sector shifts how it uses capital and labor based on changes in their prices and available technology. Output is sold to a variety of domestic and foreign buyers based on relative price differences and demand schedules. Changes in demand of any household can be transmitted broadly to every other part of the economy directly through consumer accounts and less directly through input-output accounts and transfers. Market equilibrium is reached by agents optimizing objective functions subject to macroeconomic constraints that include the balance of payments, savings-investment balance, government budget balance, and a constraint on the aggregate supply of primary factors.

Most of the model parameters are calibrated using 2010 data from IMPLAN (2011) that provide detailed information on consumer expenditures, household characteristics, production accounts, use of intermediate inputs, taxes and transfers, exports, and imports. This data set can be broken down into as many as 440 sectors; in this case, it is aggregated into six consumption categories that are commonly used in estimating a complete system of demand functions. The approach is standard with the exception of distinguishing SNAP-eligible purchases, called food at home, as its own spending category. This has also been done in studies such as Castner and Mabli (2010) and Mabli and Malsberger (2013). This study analyzes the United States as a whole because SNAP is a federal program, and markets for goods and labor are reasonably integrated across regions.

The data set assigns each household observation to one of nine categories that are based on annual income. Table 1 describes how those nine categories are aggregated to the four household types used in the model. First, a social accounting matrix for 2010 is generated from the IMPLAN data using the basic condition for SNAP eligibility—annual household income at or below 130 percent of the poverty line, which corresponds to three-person households that earn approximately $24,100 or less annually (CBPP 2012). Furthermore, the 2010 Consumer Expenditure Survey (BLS 2011) indicated that income

Table 1. Household Categories

Model Category	Income Bracket	No. of U.S. Households in 2010	Correspondence to the IMPLAN Household Categories
Snap-eligible	0–25,000	33,693,574	1–3
Snap-ineligible			
Low-income	25,000–50,000	34,477,753	4–5
Mid-income	50,000–100,000	34,894,547	6–7
High-income	Greater than 100,000	14,443,939	8–9

Note: The IMPLAN data set breaks out nine household types that are aggregated to four in the CGE analysis.
Sources: IMPLAN (2011); BLS (2011).

from public assistance programs, including SNAP, rises for households with income up to $15,000 and then declines and drops sharply for households with income exceeding $30,000. On this basis, it is assumed that IMPLAN household categories 1–3, which cover incomes between $0 and $25,000, consist of households that are eligible for SNAP benefits and the other six categories are taken as ineligible. The ineligible households are then assigned to subcategories of low, mid, and high income (see Table 1).

The approach differs from ones used in studies such as Mabli and Malsberger (2013), which examined three groups: SNAP participants, eligible nonparticipants, and higher-income nonparticipants. The aggregation choice in this study was motivated by the IMPLAN data income categories. The degree of detail available in the data set is less important for the focus of this study and could complicate reporting of the results. A division between participating and nonparticipating households was deemed more difficult to achieve with these data and perhaps less necessary since the simulations are constructed using administrative program data.

A common concern in SNAP research is that respondents to the Consumer Expenditure Survey and other surveys like it tend to under-report reliance on government benefits, including SNAP (Meyer, Mok, and Sullivan 2009, Meyer and Goerge 2011). Thus, as one compares food expenditures among households at successively higher income levels, the jump in food spending may appear to be larger than it actually is as income increases beyond the SNAP-eligible range. As these data are used in estimating the elasticity of food expenditure, the estimates may therefore be larger than they should be. To the extent that bias is present, the model will predict larger changes in food expenditures when SNAP transfers are eliminated. This may be a concern, but it is important to emphasize that the consumer expenditures are used only to estimate one type of parameter, and the study uses many other types of data, including program administrative data, for the central feature of the analysis. The latter data concern actual participation and are not associated with the same issues as the survey data.

The six categories of consumer expenditures included in the model are reported in Table 2. The SNAP food-at-home category includes most of the food and agricultural sectors of the economy, including food processing and production of vegetables, fruits, dairy products, grains, oilseeds, poultry, cattle, and hogs. The table also reports actual budget shares for the consumption categories based on the IMPLAN data. Food at home comprises 12.1 percent of the budgets of SNAP households and 8.8 percent of the budgets of the highest-income ineligible households.

The social accounting matrix is used to calibrate a number of model parameters, including the production-shift function and share parameters for each sector. During calibration, all of the prices are set to unity, and the base-year factor levels and matrix flows are substituted into the model as equilibrium values of the model variables.

The model also contains a number of exogenous parameters set by the user. Examples include the elasticity of demand for world exports, the elasticity of substitution for production, the Armington trade function, and the transformation between domestic and foreign demand. These are set at values that have commonly been employed in CGE analyses and are available from the authors upon request (see also Waters, Holland, and Weber (1997) and Lofgren, Harris, and Robinson (2002)).

Table 2. Demand-system Estimation and Expenditure Elasticities

	Percent of Actual Budget Share by Household Type Used in the CGE Analysis				Estimation of LES Demand System			
		SNAP-ineligible Households						
	SNAP-eligible Households	Low Income	Mid Income	High Income	β_i	γ_i	R^2	Expenditure Elasticity Evaluated at the Mean Budget Share
Food at home (SNAP-eligible purchases)	12.1	10.4	9.5	8.8	0.096*** (0.0045)	–22.419** (11.137)	0.80	0.659*** (0.0045)
Food away from home	5.1	5.8	7.1	7.7	0.056*** (0.0028)	–0.443 (0.399)	0.58	1.047 (0.0028)
Alcohol and tobacco	2.5	2.3	2.1	1.7	0.016*** (0.0017)	0.029 (0.021)	0.26	0.878 (0.0017)
Housing, manufactured goods, and utilities	39.0	33.1	28.9	26.7	0.426*** (0.0083)	–0.216** (0.103)	0.91	0.966* (0.0083)
Transportation	14.9	20.4	22.6	21.9	0.213*** (0.0084)	1.779*** (0.118)	0.64	1.293*** (0.0084)
Services and other manufacturing	21.9	22.2	22.9	26.2	0.191*** (0.0064)	–1.180** (0.529)	0.71	1.080** (0.0064)

Notes: The actual budget shares are from IMPLAN (2011). For the econometric results, robust standard errors are shown within parentheses. ***, **, and * indicate rejection of a hypothesis at the 1 percent, 5 percent, and 10 percent level, respectively. In the case of β and γ, the null hypothesis is that the coefficient equals 0. For the elasticity, the null hypothesis is that it equals 1.

Key Model Assumptions

While many of the CGE model features previously described are unlikely to be controversial, some may play a particularly large role in the results of this study: (i) labor market assumptions and (ii) characterization of consumer demand. The LES demand system is given by

$$w_{ij} = \frac{p_{ij}\gamma_i}{y_j} + \beta_i\left(1 - \frac{\sum_i p_{ij}\gamma_i}{y_j}\right) + \varepsilon_{ij} \qquad \forall\, i, j$$

where w_{ij} is the budget share of expenditure category i for observation j, p_{ij} is the price for expenditure category i and observation j, γ_i is the subsistence level of category i, β_i is the marginal budget share for category i, and y_j is total spending by observation j for all expenditure categories combined. The error terms ε_{ij} are assumed to be jointly normal and independent over observations with zero mean and a constant covariance matrix. Unknown parameters to be estimated are β_i and γ_i. Since the model is nonlinear in these parameters, nonlinear estimation techniques are used. The restrictions $\sum_i \beta_i = 1$ and $\beta_i > 0$ for all i ensure the adding-up property of demand systems.

The data used in the model represent 865 consumer units from the 2010 Consumer Expenditure Survey conducted by BLS. The annual income of consumer units in the sample ranges from less than $5,000 to more than $150,000. The expenditure categories are as shown in Table 1, and the data are aggregated from the BLS categories to match the study's IMPLAN aggregation. Prices are given by a consumer price index for each category as reported by BLS (2011) and taken as common to all of the observations in 2010.

Figure 1 presents actual budget shares plotted against the log of total expenditure for each consumer unit. To conserve space, only one category is plotted: food at home, which is comprised of all goods that can be purchased with SNAP funds. As the figure demonstrates, the share of household expenditures devoted to food at home clearly falls as income rises, and it has the most dramatic change in budget share across income levels of all of the categories analyzed.

The expenditure elasticities are calculated as $\varepsilon_{ij} = \beta_i / w_{ij}$. The estimated demand system parameters and expenditure elasticities (with robust standard errors shown in parentheses) are reported in Table 2.

Results of the Regressions

Ten of the twelve parameter estimates are statistically different than zero at the 5 percent level of significance and four of the six expenditure elasticities are statistically different than 1.0 (the default assumption in CGE models) at the 10 percent level of significance. The most inelastic expenditure elasticity, 0.659, is for food at home. The most elastic response, 1.293, is for transportation.

These results can be compared to existing studies. Huang (1993), for example, estimated an average expenditure elasticity of 1.17 for nonfood items and 0.27 for food as a whole in a study involving estimates for 39 food categories that ranged from –0.57 for other meats to 1.29 for other fresh vegetables. Reimer and Hertel (2004) found inelastic expenditure elasticities for food items with estimates for a variety of food categories that generally fell below 0.6. That

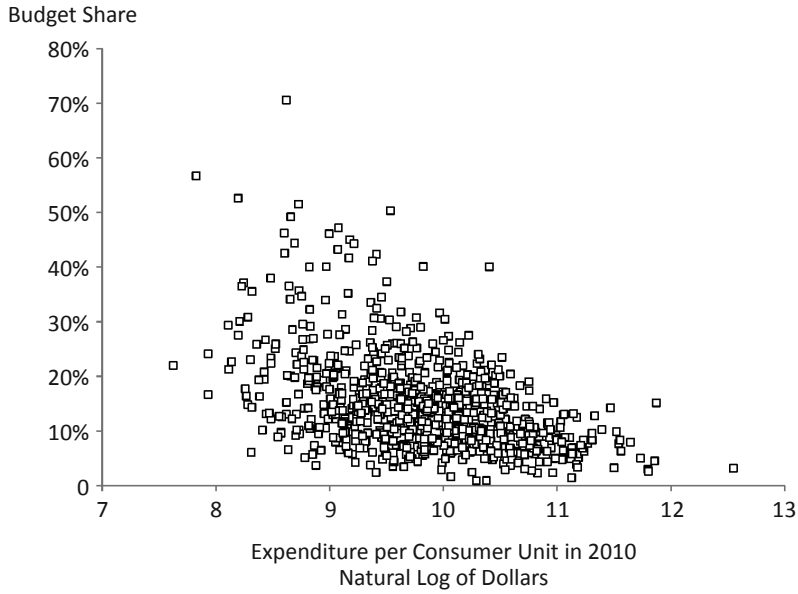

Figure 1. Actual Budget Shares for SNAP-eligible Purchases of Food at Home

Note: The budget shares for the other five expenditure categories are not displayed because they cannot be reliably interpreted. In general, there is a less pronounced pattern in those categories.
Source: BLS (2011) for 865 consumer units as used in the demand system estimation.

study used cross-country data with many less-developed countries included. For this reason, it has numerous observations for which expenditure per person is an order of magnitude smaller than that found within the United States, and spending on food was as much as two-thirds of a household's budget. Variation in spending across the observations in this study is small by comparison. In addition, Reimer and Hertel (2004) employed a relatively flexible demand system, AIDADS (an implicitly directly additive demand system), that relaxes the constancy of marginal budget shares assumed with LES.

Another key model assumption is choice of closure regarding the primary factor markets. One of the virtues of CGE analysis is the opportunity to link changes in demand for goods, for example, to changes in demand for labor and capital. A number of closure options are possible. See the numerical results for their descriptions.

Policy Experiments

The primary experiment regards the economic impact of SNAP, which is determined by way of a simulation of how the economy would be different if SNAP was not in place. In the 2010 baseline data, the federal government spent $68.3 billion dollars on SNAP (FNS 2014); $64.7 billion went directly to benefits and the rest went to administrative costs. The counterfactual scenario considers elimination of all SNAP benefits in 2010, along with elimination of the associated administrative costs.

The counterfactual scenario is carried out by manipulating a federal income tax parameter in the model denoted *ty* that represents the percentage of income

that households pay to (or receive from) the federal government's non-defense account, which included SNAP funding.

SNAP households start out with a negative income tax to the federal government non-defense account of –$13.2 billion with a corresponding tax rate of –0.9 percent (implying they are net receivers of funds). Eliminating the $64.7 billion in SNAP benefits means that SNAP households have an income tax rate of 3.7 percent. Tax rates of the SNAP-ineligible households are reduced so that there is a revenue-neutral change overall. In effect, SNAP spending and taxation are completely eliminated from the baseline data.

In 2010, SNAP-ineligible households paid an income tax of $912.2 billion, resulting in an average tax rate of 8.1 percent. After subtracting the $68.3 billion in taxes for SNAP, their tax rate falls to 7.5 percent. The reduction in taxes in absolute terms for ineligible households is greatest for the high-income ineligible households and smallest for the low-income ineligible households. Solving for the model's endogenous variables under these new rates effectively removes SNAP from the 2010 baseline data.

These tax rates are for the federal government's non-defense spending account and therefore do not represent taxes to other government accounts such as the federal defense account or state government accounts. The federal non-defense account was chosen because SNAP expenditures are included in that account in the IMPLAN data.

The General Algebraic Modeling System and PATHNLP solver are used to construct and solve the simultaneous system of nonlinear equations that comprise the model, and the results of the counterfactual scenario consist of new equilibrium values of the endogenous variables under the revised tax and transfer scheme. There are a variety of effects to consider. The most fundamental change is in disposable income by household type. From this comes a succession of effects: consumption by household, production by economic sector, and firms' demand for labor, capital, and other inputs, which in turn would further affect household incomes. Changes to household welfare and to GDP are also reported.

Results of the Counterfactual Simulation

Table 3 reports the results of the counterfactual simulation for household consumption, and disposal income is represented by total expenditures for each group. Without SNAP, overall spending by formerly eligible households is $72.1 billion, which represents a 5.5 percent drop in disposable income. Among ineligible households, the low-income group spends $6.6 billion, the mid-income group spends $24.4 billion, and the high-income group spends $41.0 billion, which represent improvements in disposable income of 0.3 percent, 0.7 percent, and 1.2 percent, respectively (see Figure 2). SNAP-eligible households clearly experience the largest change in disposable income, and it is the only change that is negative.

Table 3 also presents important differences in individual expenditure categories that come directly and indirectly (through price responses) from changes in disposable income in the absence of the SNAP program. The table reports the absolute change and average dollar change per household in consumption, and associated percentage changes are shown in Figure 3. Changes in households' overall consumption mostly reflect changes in disposable income.

In the absence of the SNAP program, previously eligible households must use more of their self-generated income for consumption. And in response, various sectors expand or contract because of variations in expenditure elasticities. In relative terms, the largest drops in consumption by eligible households are for transportation, food away from home, and services and other manufacturing (Figure 3).

Among ineligible households, the largest absolute and percentage increases in consumption are for the high-income group, and the sectors in which

Table 3. Differences in Household Consumption without SNAP in Million 2010 Dollars

	Households			
		SNAP Ineligible		
Commodity	SNAP Eligible	Low Income	Mid Income	High Income
Food at home (SNAP-eligible purchases)	–2,915 (–87)	269 (8)	831 (24)	1,075 (74)
Food away from home	0 (0)	0 (0)	0 (0)	0 (0)
Alcohol and tobacco	–425 (13)	44 (1)	162 (5)	305 (21)
Housing, manufactured goods, and utilities	–22,014 (–653)	2,202 (64)	7,791 (223)	13,050 (904)
Transportation	–31,505 (–935)	2,772 (80)	10,874 (312)	19,576 (1,355)
Services (education, medical, entertainment) and other manufacturing	–15,257 (–453)	1,338 (39)	4,777 (137)	7,028 (487)
Total	–72,117 (–2,140)	6,624 (192)	24,436 (700)	41,035 (2,841)

Note: The average change per household is shown in parentheses.

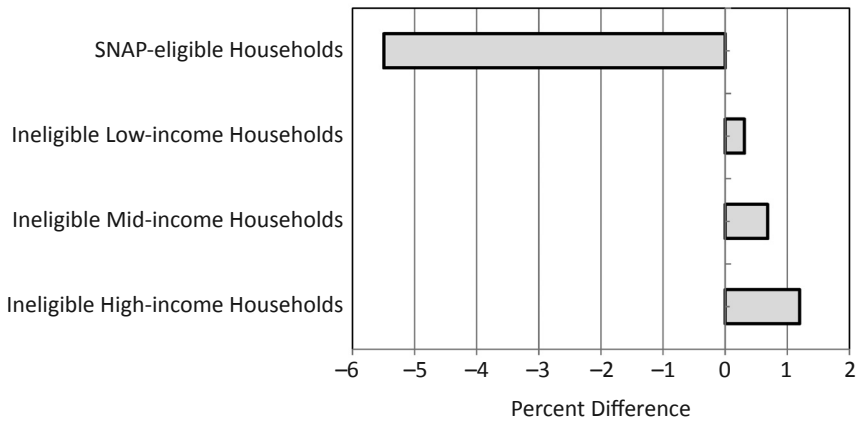

Figure 2. Percent Difference in Disposable Income without SNAP

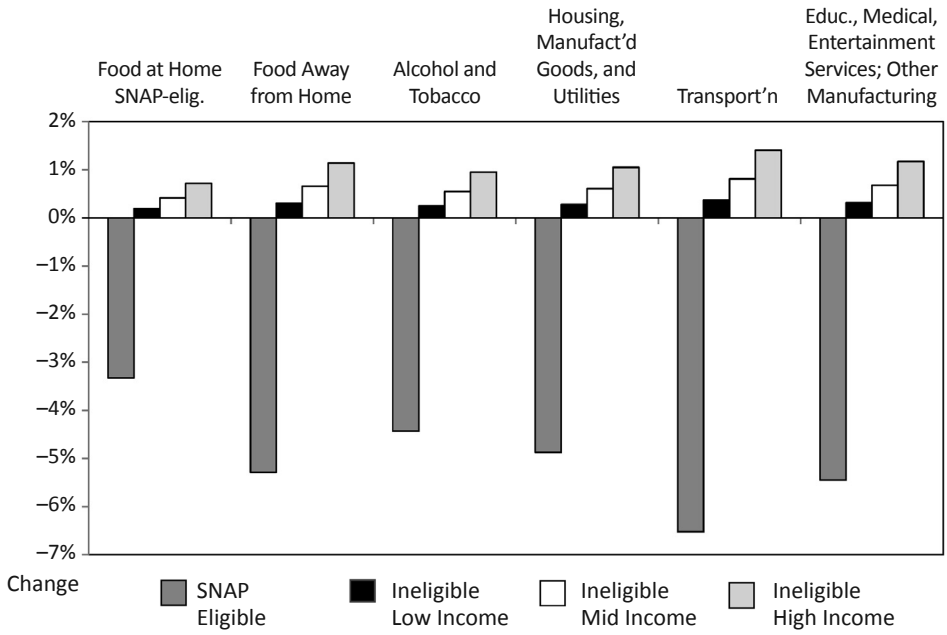

Figure 3. Percentage Difference in Consumption without SNAP

consumption increases most are food away from home, transportation, and services and other manufacturing. This pattern is again driven largely by the estimated income elasticities of demand.

Table 4 reports changes in the value of sales by economic sector. Prices change very little (those results are not presented); consequently, a change in the value of outputs can be viewed as a change in the physical quantity. Without SNAP, the food-at-home sector would be $1.008 billion smaller than its 2010 baseline value of $1,091.3 billion. Most of the other sectors expand slightly. The exception is services, which contracts by $2.274 billion from an initial baseline value of $6,047.6 billion.

The percentage differences in output are reported in Figure 4. All are less than 0.1 percent in absolute value. Despite their small size, they follow a pattern that derives primarily from the parameters of the demand system. As after-tax income shifts from eligible households to higher-income ineligible households when SNAP is eliminated, the share of expenditures devoted to food declines and a greater share of household spending is allocated to relatively income-elastic categories, particularly alcohol, tobacco, and transportation services.

With respect to the effect of SNAP on factor markets, both labor and capital have fixed supplies and are mobile across sectors. According to the social accounting matrix, eligible households would, in the absence of SNAP, get 83 percent of their total capital-labor earnings from labor. For the high-income ineligible households, the corresponding figure is 68 percent.

As shown in Table 5, the allocation of labor in the economy is found to be somewhat different in an equilibrium that does not have SNAP in place. Under the base assumption for the factor markets, $333 million in additional labor would be required in the housing, manufactured good, and utility sectors and $505 million in additional labor would be required in the transportation

Table 4. Differences in Output without SNAP in Million 2010 Dollars

		Estimated Expenditure Elasticities		Unitary Expenditure Elasticities (default of CGE models)	
	2010 Baseline	Without SNAP	Difference	Without SNAP	Difference
Food at home (SNAP-eligible purchases)	1,091,330	1,090,322	–1,008	1,089,709	–1,621
Food away from home	24,541	24,541	0	24,541	0
Alcohol and tobacco	31,080	31,105	25	31,112	32
Housing, manuf'd goods, and utilities	12,938,212	12,939,290	1,078	12,939,556	1,344
Transportation	5,683,207	5,684,974	1,767	5,684,939	1,732
Services (education, medical, entertainment) and other manufacturing	6,047,578	6,045,304	–2,274	6,045,347	–2,231

sector. Other contracting sectors would release this labor. For example, it would be drawn out of services ($743 million) and the food-at-home sector ($101 million). Ultimately, payments (factor returns) to labor in the economy would increase $114 million without SNAP while payments to capital would decrease $113 million.

These results suggest that eliminating SNAP would create an overall bias toward economic activities that are labor-intensive, although this does not necessarily translate into higher numbers of jobs. Since the supplies of labor

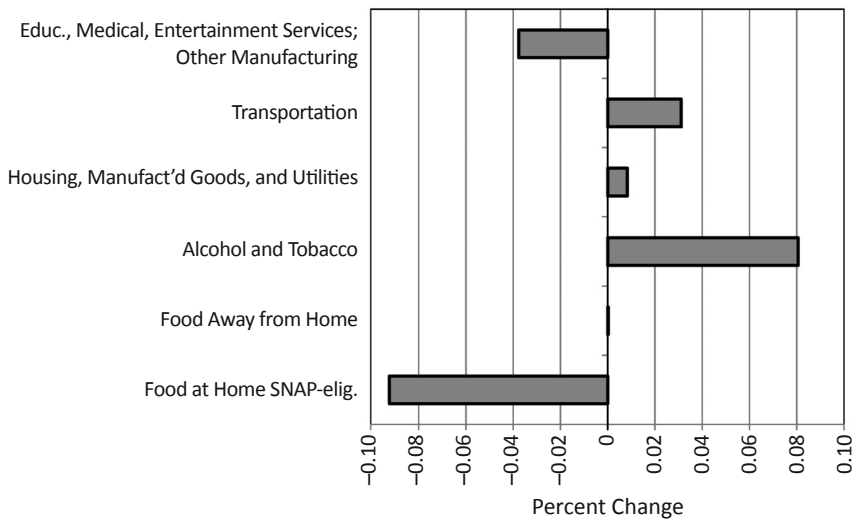

Figure 4. Percentage Difference in Output without SNAP

and capital are fixed during the simulation (results of alternative simulations follow), these changes reflect wage changes. Despite the higher demand for labor, low-income SNAP-eligible households do not earn enough extra income to compensate for the loss in SNAP benefits.

With respect to macroeconomic effects, several measures of GDP can be considered. One is components of GDP by expenditure (consumption plus investment plus government spending plus exports less imports). Using that measure, U.S. GDP would decline by $19.882 million without SNAP. Another

Table 5. Sensitivity of Results to Characterization of Labor Supply

	Million Dollars			
	Base Level	**Base: Fixed Labor Variable Wages**	**Alternative 1: Variable Labor Fixed Wages**	**Alternative 2: Unemployment Is Possible**
Factor Returns				
Labor	7,980,612	114	232	365
Capital	5,545,188	–113	–126	–16
Labor Income by Household Type				
SNAP-eligible	301,415	4	9	14
Ineligible low income	1,223,668	18	36	56
Ineligible mid income	2,873,523	41	83	132
Ineligible high income	2,642,192	38	77	121
Labor Demand by Activity				
Food at home (SNAP-eligible)	105,469	–101	–158	–154
Food away from home	6,157	0	0	0
Alcohol and tobacco	7,205	7	8	9
Housing, manufactured goods, and utilities	4,558,723	333	539	662
Transportation	1,548,652	505	678	748
Services and other manufacturing	1,754,407	–743	–964	–900
Value of Output (Sales)				
Food at home (SNAP-eligible)	1,091,330	–1,008	–1,011	–996
Food away from home	24,541	0	0	1
Alcohol and tobacco	31,080	25	24	25
Housing, manufactured goods, and utilities	12,938,212	1,078	1,228	1,393
Transportation	5,683,207	1,767	1,877	2,021
Services and other manufacturing	6,047,578	–2,274	–2,744	–2,626

measure is value added (total output activity minus intermediate costs) minus indirect business taxes. In that case, GDP decreases $22.218 million in the counterfactual scenario. Both results represent less than 0.01 percent of the base GDP, however, and do not suggest that SNAP has an economically significant effect on GDP, at least under the revenue-neutral approach.

Measures of welfare can also be considered, such as equivalent variation. According to this measure, the average beneficiary household requires $2,140 to be as well off without SNAP as with it. Ineligible low-income households would require $192, mid-income households would require $700, and high-income households would require $2,841 to be as well off with SNAP as without it. The corresponding aggregate dollars of disposable income are $72.1 billion for former beneficiary households, $6.6 billion for low-income ineligible households, $24.45 billion for medium-income ineligible households, and $41.0 billion for high-income ineligible households.

Sensitivity to Alternative Assumptions

Many standard CGE models implicitly assume that expenditure elasticities are unity. The last column of Table 4 reports changes in sector value if expenditure elasticities are unity. This sets up an interesting contrast. Food at home is predicted to be $1.621 billion smaller while the counterfactual simulation using estimated expenditure elasticities results in a reduction of approximately $1.008 billion. For housing, manufactured goods, and utilities, there is an increase of $1.344 billion under the unity assumption and $1.078 billion under the simulation. A similar gap is found for predicted GDP—a decrease of $16.469 million under unity versus $19.882 million using the estimated elasticities.

Table 5 reports the sensitivity of the results to key assumptions about the supply of labor. The assumption underlying the results to this point has been that labor is mobile across different sectors of economic activity with supply fixed at the 2010 baseline level. The economy-wide wage has varied to assure that the sum of labor demands from all activities equals this initial quantity supplied. Capital, similarly, is mobile across sectors and fixed in supply.

Recall that payments to labor overall in the economy increase $114 million while payments to capital decrease $113 million. This is driven entirely by higher wages, on the one hand, and a reduction in the return to capital on the other since the supply of these factors is fixed in the simulation. These changes may seem small in the context of the national economy, but they mask much larger changes in some sectors.

Alternative assumptions about the labor market change the results to some extent. The first alternative assumes that capital is activity-specific and fixed in supply; the wage is assumed fixed while the quantity of labor adjusts to equilibrium in the labor market. Without SNAP, employment is greater overall, such that payments to labor increase by $232 million. The change in the total number of hours worked, however, is so small (0.001291 percent) as to be insignificant. Owing to the extra hours worked, income from labor is higher for each household type over the base assumption. Demand for labor by sector follows the same pattern as under the base assumption but the magnitudes are higher.

Under alternative 2, wages are again fixed but this time the labor market closure does not require that labor demand equal labor supply; that is, unemployment

is possible. This is interesting to consider because unemployment is presently a prominent concern that coincides with demand for programs such as SNAP. With labor markets no longer constrained to clear perfectly, it turns out that there is not unemployment; rather, there is even higher demand for labor under alternative 2 when there is no SNAP ($365 million). Labor incomes are higher for all households, and movements in the demand for labor and sales by sector are proportionately higher as well.

In summary, relaxation of the labor-supply assumptions leads to larger returns to labor—$232 million under alternative 1 and $365 million under alternative 2 compared to $114 million under the base unity assumption. These values may provide an upper bound on what might be expected given an elimination of SNAP. The direction of the results is not sensitive to changes in these assumptions. Overall, the conclusions drawn appear to be robust to changes in factor-market closure.

Changes in labor payments associated with alternative closures (reported in Table 5) can be converted into changes in the number of jobs using wage data for each sector from the Bureau of Economic Analysis. Under alternative 1, it is calculated that without SNAP there would be 5,641 fewer total jobs in the U.S. economy. This relatively small net effect, however, masks much larger changes in some sectors. In particular, the food-at-home and service sectors lose 6,190 and 27,074 jobs, respectively, while the housing/manufacturing and transportation sectors gain 11,793 and 15,621 jobs, respectively. The other sectors show minimal job gains.

Compare these estimates to the results of Hanson et al. (2002), which considered a $5 billion cut in SNAP funding versus elimination of the program (as a means of eliciting its overall effect on the economy). Although differences in the scenarios in the two studies make a direct comparison difficult, the former study tended to predict larger job number changes than this study (e.g., that study showed that 7,500 jobs would be lost under a hypothetical $5 billion cut). The estimates in this study may be smaller in magnitude because of the estimated expenditure elasticities. Even if SNAP benefits are cut, households in this study are estimated to divert less money away from food-at-home purchases than might have been the case in Hanson et al. (2002). Since spending on categories such as SNAP is likely to be maintained, this sector is estimated to decrease very little in size.

Alternative Policy Scenario

Recently, the CBO (2014) projected a reduction of approximately 32 percent in annual funding for SNAP over the next ten years after adjusting for inflation. Thus, it is useful to look beyond the initial analysis of SNAP's effect on the U.S. economy, which simulated elimination of the program, to investigate what is predicted to happen in reality over the next several years. This second policy analysis simulates a 32 percent reduction in SNAP expenditures from the baseline 2010 level while holding all else constant. It is important to understand that this second scenario is not a prediction of how the economy will actually evolve by 2024 because SNAP funding is the only element of the economy that changes.

Table 6 summarizes the results of the second scenario for value of output (sales), net household income, and factor returns and compares those results to the results from the no-SNAP simulation. The direction of change for all

of the variables in scenario 2 is the same as those for the no-SNAP scenario. The magnitudes in scenario 2 typically are smaller, however. For example, contraction of the food-at-home sector is predicted to be $1.008 billion when SNAP is eliminated and $461 million under the 2024 projection. As with scenario 1, the biggest change for scenario 2 occurs for services and other manufacturing, which falls by $1.081 billion, less than half of the $2.274 billion lost under the no-SNAP scenario. Similarly, the loss of household income under the reduction is $31.939 billion compared to $72.117 billion under full elimination. The results from scenario 2 for the other measures are proportionately smaller in magnitude relative to the no-SNAP scenario. For factor returns under scenario 2, returns to labor rise $53 million while returns to capital fall $52 million. This again is roughly half the size of the changes that would occur under elimination of SNAP.

This second simulation hints at what might happen as funding for SNAP changes in the next decade. The results show that the predicted evolution of SNAP leads to changes that are similar in direction and smaller in magnitude than the ones induced by absence of the program. That observation is tempered by the fact that all of the other factors of the economy, including policies, technologies, and demographic characteristics (all likely to change), were held

Table 6. Comparison of the Economic Effects of Reducing versus Eliminating SNAP

	Difference in Million Dollars		
	Base Level	**Scenario 1: Elimination of SNAP**	**Scenario 2: Reduced SNAP Funding**
Value of Output (Sales)			
Food at home (SNAP-eligible purchases)	1,091,330	–1,008	–461
Food away from home	24,541	0	0
Alcohol and tobacco	31,080	25	12
Housing, manufactured goods, and utilities	12,938,212	1,078	504
Transportation	5,683,207	1,767	840
Services and other manufacturing	6,047,578	–2,274	–1,081
Net Household Income			
SNAP-eligible	1,312,237	–72,117	–31,939
Ineligible low income	2,143,436	6,624	5,669
Ineligible mid income	3,578,492	24,436	4,380
Ineligible high income	3,426,770	41,035	21,902
Factor Returns			
Labor	7,980,612	114	53
Capital	5,545,188	–113	–52

constant. The flexibility of the CGE approach, however, allows the analyst to vary assumptions in accordance with predictions of those variables in the future as well. It therefore provides an *ex ante* prediction framework that is grounded in data.

Conclusions

This study sheds light on how the Supplemental Nutrition Assistance Program affects aggregate economic outcomes. Macroeconomic links are investigated quantitatively with a CGE model that is parameterized using a variety of data sources. The main simulation compares the baseline economy in 2010 to a counterfactual scenario without SNAP in which all funds are left with those who would have funded the program through their taxes. In the absence of SNAP, spending power among currently eligible households decreases about 5.5 percent and the spending power of currently ineligible higher-income households increases about 1 percent on average.

These changes in spending power reverberate through the demand side of the economy, influencing nearly every sector in some way. Engel's law predicts that, as their disposable incomes change, low- and high-income households will spend their money differently. In particular, higher-income households are less likely to spend an extra dollar on the food-at-home sector (the one most closely associated with SNAP) than would low-income households. This is confirmed by estimates of the complete system of consumer demands in the simulation model. The results show that the elasticity of the expenditure plays a key role in many of the results.

Without SNAP, national economic activities would differ in a number of ways. The food-at-home sector (which includes much of the agricultural sector) would shrink $1.008 billion, which is only a fraction of overall SNAP spending because previously eligible households do not reduce spending proportionately due to Engel's law. In turn, since elimination of the program would ease the tax burden on higher-income households, those households would fill back some, but not all, of the food-at-home expenditures in the economy.

In the end, the food and agricultural sector as a whole is not necessarily adversely affected by cuts in SNAP. It shrinks by less than 0.1 percent. However, within the food and agricultural sector, there may be changes in demand for individual products that are not captured in this analysis. For example, higher-income households may prefer to spend more to obtain higher-quality versions of a product (e.g., steak versus hamburger) or on products produced in a certain way (e.g., organic versus conventional production). SNAP could have an important impact on such outcomes. This possibility is not explored in this analysis due to the level of aggregation used to estimate the complete system of demands that is the basis for the model's representation of households. Exploration of relatively narrow, product-level effects of SNAP could be a useful emphasis in future work.

The study shows that all sectors of the economy expand to some extent except for services (education, medical, entertainment), which contract $2.274 billion. All of those differences constitute less than 0.1 percent of the value of output in these sectors. While the net changes are small, there is a change in the mix of households that spend on a given sector. Without SNAP, higher-income households do much of the spending previously done by SNAP beneficiaries.

In the absence of SNAP, the net number of jobs in the U.S. economy declines by 5,641 and there are larger changes in individual sectors. For example, the food-at-home and service sectors lose 6,190 and 27,074 jobs, respectively, while the housing/manufacturing and transportation sectors gain 11,793 and 15,621 jobs, respectively.

The United States' GDP would drop by approximately $19.882 million without SNAP. While that amount is trivial compared to total GDP, absence of the program also affects the distribution of spending power and some sectors expand or contract more significantly.

While this study has emphasized the overall impact of SNAP to the U.S. economy, the framework is also used to analyze the effects of projected changes in the size of the program. The qualitative results of this change are similar to those of the primary findings concerning the overall impact of SNAP. The impacts of alterations to SNAP, such as stricter eligibility requirements, will vary by sector as well as by household group.

The effects of changes to SNAP on the U.S. economy as a whole, on individual sectors, and on higher-income households are fairly small, but the effect of such changes on the spending power of low-income households could be substantial.

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