Methodology

Scenario analysis with an economywide simulation model provides a method for gaining insight into the labor market outcomes of welfare reform. When evaluating the effects of welfare reform, how to model the labor market is an issue. We chose to use an economywide model that takes into account the change in not only the supply of labor but also the demand for labor. By including all of the economy, we can analyze the direct and indirect effects of a labor supply shift due to changing economic circumstances or policy. By including product markets, the demand for labor is derived as an input into production, and as production changes, so does the demand for labor. By including the industry detail making up the economy, with each industry having its own occupational employment pattern, we are able to be more specific about how changing economic circumstances affect labor demand. In addition, the occupational detail allows us to determine which parts of the labor market are affected.

The purpose of this type of analysis is known in the forecasting literature as scenario analysis. The purpose is "not strictly to predict the future but to facilitate a systematic exploration of … critical events within some explicit time frame" (Granger, 1989, p. 224). A base set of assumptions is made, which is the "most probable" or "surprise-free" case. Plausible alternative scenarios are compared against the base case. Scenario analysis produces qualitative forecasts, not quantitative, point forecasts.

Because most economic modeling, and time-series modeling in particular, extrapolates past trends into the future, major changes or shifts cannot always be incorporated into the model. Policy changes by their very nature change the environment, and so past trends of behavior under previous policies may not indicate behavior under a new policy. In addition, changing macroeconomic conditions make it difficult to isolate the impact of a policy change. Consequently, scenario analysis is useful in analyzing policy changes, such as how welfare reform will fare in the face of alternative macroeconomic conditions.

A Model for Scenario Analysis

A computable general equilibrium (CGE) model is an economywide computer simulation model that captures, in a stylized manner, the economic interactions among households, producers, and government (Hanson, 2002). Each of these economic entities has multiple roles, and all interact with each other. Households supply labor to producers and consume goods and services using the income they earn. In addition, they receive income from the ownership of capital, receive government transfer payments, save, and pay taxes. Producers make goods and services for the market and use labor inputs, capital stocks, and other goods. The government provides transfers and public services to households and collects tax revenue.

Each of these economic entities may be aggregated at different levels of detail, refining the model's specification. In this study, we aggregate producers by industry groups using the Input-Output Accounts (U.S. Department of Commerce, Bureau of Economic Analysis, 1997). We segment households into a number of social-economic categories using data

from the Current Population Survey (CPS), March Supplement (U.S. Department of Commerce, Bureau of Census, 1997). The unit of analysis that we label "household" is our best approximation of a "consumption unit" and is not identical with the CPS household defined by a common address. Households are distinguished in a way that allows the scenario analysis with the model to focus on changes in the workforce status of household members who receive public assistance.

For the household aggregation, we use four characteristics (family structure, income, workforce status of primary and secondary earners, and participation in public assistance programs) to segment households into distinct groups (see box, "Four Characteristics Distinguish Household Types"). Not all combinations of household characteristics occur in the data, so the model includes 99 household groups.[8] The detail in classifying households and labor occupations distinguishes this model from the model in Hanson et al. (2002).

Family Structure. We base the family structure of a household on head-of-household type: single-parent, dual-parent, single-adult, multi-adult, and elderly. A household is categorized as elderly if the household head is age 65 or older. The presence of children is determined by whether any person in the household is under age 18 and not a reference person or spouse in a primary family, nonfamily householder, or unrelated subfamily. All households with children (except elderly headed) are classified as either dual-parent or single-parent households. All households with no children and

[8]We excluded two types of households from the analysis: (1) households in which the head is in the military living on- or off-base, and (2) households in poverty with large negative self-employed income. Most of these households do not participate in government programs and tend to bias the characteristics of low-income household groups.

Four Characteristics Distinguish Household Types

1. Family type
   - Married couple families, with children under 18 years old
   - Married couple families, with no children
   - Single-parent families, with children under 18 years old
   - Other types of families with no children, including single-person families and single-parent families with adult children
   - Elderly families, with the reference person over age 65

2. Income level for each family type
   - Low-income families—income below 130 percent of the poverty threshold
   - Mid-income families—income between the low- and high-income families
   - High-income families—income in the top 25 percent of households

3. Work status of primary and secondary earners in each family type at each level of income
   - Primary earner not working, working part-time, or working full-time
   - Secondary earner not working, working part-time, or working full-time

4. Welfare program participation for low-income families
   - Food Stamp Program plus AFDC participation
   - Food Stamp Program participation only
   - No participation in the Food Stamp Program or AFDC

Source: ERS.

without an elderly head are classified as "multi-adult" if there is more than one adult and "single-adult" if there was only one person.

Income. We break down the five family structure types into three income classes: low income (130 percent of the poverty level), middle income, and high income. The income classes are based on the Federal poverty level for each household, as defined by Census Bureau guidelines.

Workforce Status. We base the work status of both primary and secondary earners for each family structure type at each level of income on whether (1) the primary earner does not work, works part-time, or works full-time, and where appropriate (2) the secondary earner does not work, works part-time, or works full-time.[9] The primary earner is defined as the household member with the greatest earnings. Though we do not distinguish households by the status or reason for not working, we do keep track of whether the nonworking primary and secondary adults are unemployed or not in the labor force (NILF), and for NILF, we distinguish the reasons as retired, disabled, and other.

Program Participation. We determine three possibilities for household participation in the FSP and the AFDC-TANF programs of public assistance: (1) participate in the FSP only; (2) participate in the FSP plus AFDC-TANF; and (3) no participation in the FSP or AFDC-TANF. The few households that participate in AFDC-TANF but not the FSP are treated as if they participate in both programs. Households are not further distinguished by their participation in other public assistance programs, but the cash and cash value of in-kind benefits from these other programs are included in the household's income.

Households receive income from both the private sector and the government (see box, "Sources of Household Income"). The sources of income include earnings from wages, salaries, and self-employment; capital income from the ownership of assets (dividends, interest, and rent); and transfer income from government programs, including programs of public assistance for low-income households. In addition to food stamps and AFDC-TANF, cash and the cash value of in-kind benefits from other programs are treated as sources of income. Households use their income to consume goods and services, pay taxes, and save. Household expenditure shares are derived from the 1996 Current Expenditure Survey (CES) (U.S. Department of Labor, Bureau of Labor Statistics, 1997). Savings and taxes are specified as fixed saving rates and tax rates specific to each household group. An average tax rate is derived from National Economic Accounts, while tax rate differentials by household group are derived from the CPS March Supplement. Similarly, an average savings rate is derived from National Economic Accounts, while savings rate differentials by household group are derived from the Federal Reserve, Survey of Consumer Finances, as presented in Bosworth, Burtless, and Sabelhaus (1991).

We also treat labor supply and demand in detail. Using CPS data, we categorize into skill levels the mix of occupations that the primary and secondary earner of each household type supplies to the labor force. Similarly, we categorize the occupational mix of labor that each industry demands using data from the U.S. Department of Labor, Occupational Employment Statistics. For both labor supply and demand, we grouped

[9]To simplify the modeling of households, we excluded work force status and earnings of additional (more than two) adults in a household.

Sources of Household Income

Private sector of the economy:

1. Earnings or labor-related income:
   - Money wages and salaries, before deduction for taxes, pensions, union dues
   - Net income from self-employment, farm and nonfarm

2. Capital-related income:
   - Interest and dividends
   - Rents and royalties
   - Periodic payments from estate or trust funds

3. Retirement income (annuities or pensions not counted above)
   - Federal employee
   - State and local employee
   - Private funds

4. Inter-household transfers:
   - Child support
   - Alimony
   - Financial assistance (periodic payments; excludes gifts, loans, or sporadic assistance)

Government transfers counted in money income:

5. Social insurance fund plus veterans benefits (less medical and government employee retirement):
   - Workers compensation
   - Social Security income
   - Survivor's income
   - Disability income
   - Veterans administration benefits

6. Unemployment insurance

7. Supplemental Security Income (SSI)

8. Public assistance
   - Cash benefits from Temporary Assistance for Needy Families (TANF)
   - Cash benefits from General Assistance

Private sector and government sources:

9. Other periodic income (such as foster care, military family allotments, and foreign government pensions)

Cash benefits from government assistance programs:

10. Earned income tax credit (EITC)

11. Energy assistance

12. Education assistance (Pell grants, government education assistance, scholarships or grants, and financial assistance from employers, friends and family outside the home)

Noncash benefits from government assistance programs, included in the CPS:

13. Medicare

14. Medicaid

15. Food stamps

16. School lunch and breakfast

17. Housing assistance

Source: U.S. Department of Commerce, Census Bureau, Current Population Survey (1997).

occupations into the 11 education and training categories developed by the U.S. Department of Labor (Wash, 1995-96) and used in the occupational employment projections (U.S. Department of Labor, Bureau of Labor Statistics, 1998; Hecker, 2001). The occupational categories are listed in the box titled "Labor Occupations by Education and Training Categories."

Clearly, as consumers, producers, and government interact, a rather complicated economic process is taking place, involving the creation or loss of jobs as well as the production and consumption of goods and services. A CGE model captures this economic process and provides a way to examine how shocks, such as changes in policy, affect the economy. A CGE model captures the linkages among economic entities and thus can isolate and trace the impacts from a shock through the economy.

One major contribution of a CGE model is its comprehensive look at the impact of policy change on the economy, as it works through the various linkages among the economic entities. In the case of welfare reform, the policy of interest is the shift from AFDC to TANF and the impact it may have on the labor market. This policy change entails recipients shifting from welfare to work, whereby transfer payments decrease and labor market participation increases. The initial impact is reduced government spending on low-income families and increased labor supply for low-skill jobs. The reduction in government expenditure is assumed to be offset by a decrease in personal income taxes. The assumed tax reduction maintains a budget-neutral policy change, which is standard in analysis of tax incidence. The CGE model can trace changes in household labor force participation through the labor market to industry demand for labor and back to households through earnings. Other households are also affected as labor markets adjust to absorb the new labor supply. Each direct effect of a policy change creates its own set of ripple effects, captured by the CGE model. The power of the model is in capturing the linkages among the different economic entities of the economy.

The database underlying a CGE model consists of a Social Accounting Matrix (SAM), quantity measures for factors of production (labor, capital, and land), and elasticity parameters. For this analysis, we are using a 1996 SAM developed and maintained at USDA-ERS. We have chosen 1996 as our base year for policy analysis because it is the last year before welfare reform and the year for which all data were available at the start of this project.

Simulating a policy change in our CGE model is an exercise in comparative statics, a what-if comparison of two equilibrium states of the economy. The results of comparative static analysis are in terms of changes in economic activity when the economy moves from the base equilibrium with the existing policies in place to a new equilibrium with the policy changes. The length of the period to a new equilibrium depends on assumptions about price-quantity responsiveness (elasticities) and aggregate supply of capital. The new equilibrium is characterized by prices, which equate supply and demand in markets for goods and services, and satisfy the model closure rules. A CGE model describes the new equilibrium and not the adjustment process.

All of our analysis is aggregated at the national level. Consequently, we neither disaggregate the labor force by State nor consider the variation in State welfare policies.

Assumptions

Several key assumptions are made to perform this analysis. First, an estimate must be made of the size of the influx of new workers into the labor force. Second, labor demand must be specified. Third, the relevant labor market or markets must be identified. Fourth, the relationship between the unemployment rate and public assistance caseloads must be examined. These assumptions are discussed here.

Influx of New Workers

A review of the literature indicates that estimates of the expected increase in labor supply from welfare reform range from 1 million to 3 million workers. The approach used to estimate the potential number of new workers varies across studies, but all were made before welfare reform and, consequently, rely on prewelfare reform data.

Labor Occupations by Education and Training Categories

Postsecondary Awards

- Professional degree (for example, law, medicine, dentistry, and clergy)
- Doctoral degree
- Master's degree
- Work experience plus bachelor's or higher degree (mostly managerial occupations that require experience in a related nonmanagerial occupation)
- Bachelor's degree
- Associate's degree
- Postsecondary vocational training (these occupations require a training program and may also require a licensing exam)

Work-Related Training

- Work experience in a related occupation (some occupations are supervisory or managerial occupations, but also others require skills and experience gained in other occupations such as police detectives, who are selected based on their experience as police patrol officers)
- Long-term on-the-job training (occupations that usually require more than 12 months of on-the-job training or combined work experience and formal classroom instruction before workers develop the skills needed for average job performance, such as electrician, bricklayer, and machinist, that normally require apprenticeships lasting up to 4 years)
- Moderate-term on-the-job training (workers can achieve average job performance after 1 to 12 months of combined job experience and informal training, such as dental assistants, drywall installers and finishers, and machine operators)
- Short-term on-the-job training (workers usually can achieve average job performance in just a few days or weeks, such as cashier, bank teller, and messenger)

Source: U.S. Department of Labor, Bureau of Labor Statistics.

Burtless (1998, revised in 2000) estimated that the PRWORA work requirements would affect between 2.5 million and 3 million adults on welfare. He calculated the number of new workers as 83 percent of the 1996 caseload for the single-adult households in the program, plus 2 times 8 percent of the caseload for the two-adult households.[10] This sum is reduced by 20 percent for those households exempt from the work requirements due to disability or other hardship. The resulting estimate is 3 million new workers. His lower estimate of 2.5 million results from an additional adjustment for the program recipients who are already working.

McMurrer, Sawhill, and Lerman (1997) estimated that welfare reform would add over 800,000 new workers between 1997 and 2002, or roughly 140,000 per year. Their estimate is derived from the requirements for participation in work activities that increase each year to 50 percent by 2002 for single adult families. Bartik (2000) estimates between 1 million and 1.4 million new workers between 1993 and 2005, and uses 1.4 million in his analysis of the labor market impacts. He assumes that, for every single adult family that leaves welfare, the labor supply increases by 0.47—an assumed 60 percent labor force participation rate of welfare leavers minus 13 percent labor force participation rate for single mothers on welfare. Mishel and Schmitt (1995) used an estimate of 1 million by 2000. Holzer (1996) used an estimate of 2 million—half the 4 million to 5 million caseload required to be working by 2002.

The studies above developed *ex ante* estimates of the influx of workers. In appendix A, we develop an *ex post* estimate of the influx of workers from the reduction in public assistance caseload using administrative data on public assistance caseload from 1996-2000. Our estimate of 2.4 million new workers from 1996 through 2000 is well within the range of estimates in the literature, of 1 million to 3 million.

Labor Demand

Labor demand is derived demand and a result of demand for goods and services. Labor demand is derived from the production function, which in our model is a constant elasticity of substitution (CES) industry production function. Given our assumption about the elasticity of substitution—a CES elasticity of substitution of 1.1 for nonagricultural sectors and 0.5 for the agricultural sectors—and labor's share of value added, constant-output labor demand elasticity by industry ranges from -0.15 to -0.92, with an average elasticity of -0.27. These values represent inelastic demand for labor. They are consistent with others' estimates and are within the range found by Hamermesh in his survey of labor demand elasticities (Hamermesh, 1993, p. 92).

Total labor demanded in each industry's production function is an aggregate of the demand by occupation. In our model, total labor demand is a CES aggregation of occupations, with an elasticity of substitution of 0.5. The constant output labor demand elasticity for low-skilled occupations (see below for definition of low skill) ranges between -0.25 to -0.5 across industries, depending on the occupation's share of the industry's labor.

Relevant Labor Markets

An increase in the labor force of 2.4-million workers from a reduction in public assistance caseload is small relative to an average total employment

[10]The remaining 9 percent of the caseload are child-only cases with no labor supply impact.

of 130 million during 1996 to 2000. Such a small change in labor supply (2 percent) could be expected to have a negligible impact on wages. However, public assistance recipients would be expected to be concentrated in the low-skill labor market (Burtless, 1995; Bernstein and Hartmann, 1999; Acs and Loprest, 2001; Brauner and Loprest, 1999; Loprest, 1999). Consequently, their entry into the labor force could have a large impact. Identifying the jobs that public assistance recipients enter is important in analyzing the impact of welfare-to-work.

How the relevant labor market is defined varies by study, and as a result, findings differ. The literature analyzing skill levels is voluminous, so only a few examples will be mentioned here. Burtless (1995) found that, "[a]mong women in their mid-twenties who are most dependent on AFDC, roughly half have not completed high school." In addition, "less than one out of eight has received any schooling beyond high school" (p. 71). He concluded that, "the low educational attainment and poor test scores of welfare-dependent mothers severely restrict the kinds of jobs most of them can obtain." (p. 78).

However, education level is not the only, or the appropriate, instrument for characterizing skill when looking at both the supply and demand of labor. In a survey of small business owners, Levin-Waldman (1999) found that the main skills they required for entry-level jobs are general experience, specialized experience, clerical, computer and technical, and ability to deal with people. Having a high school diploma is not a specific skill characteristic required by employers of potential entry-level employees. Employers typically will use education levels as a screen for potential employees in a soft labor market, but lower or eliminate the education thresholds in a tight labor market. Education levels, especially for less than a college degree, are then not a job requirement but may be used as a screening device depending on economic conditions.

Burtless (1998) defined the low-skill labor market as consisting of the short-term on-the-job training occupations, as classified by the education and training categories of occupations (see box "Labor Occupations by Education and Training Categories"). There were 54 million such workers in 1996, according to Burtless. Lerman and Ratcliffe (2001), in their discussion of how well urban labor markets can absorb recipients of public assistance, defined the low-skill labor market as the share of jobs in short- and medium-term on-the-job training occupations that are held by workers with a high school diploma or less. Bartik (2000) considers two definitions of the low-skill labor market defined as female head of household with less than college education, and with less than a high school degree. His estimate of a 1.4 million-worker increase in labor supply is about 3 percent of the female labor force with less than a college education and 9 percent of the female high school dropouts. Holzer (1996) uses high school dropouts plus the bottom quintile of high school graduates for 28 million workers. Mishel and Schmitt (1995) use the lowest 30 percent of wage earners for 31 million workers. Alternative definitions of the relevant labor market results in a workforce of 30 million to 54 million workers, so a 1 million- to 3 million-worker change to the labor supply would result in a 3 percent to 10 percent impact.

We use skill level instead of education in identifying and defining the relevant labor markets for welfare recipients. In classifying skill level, we use the education and training occupational categories developed by the Office of Employment Projections, Bureau of Labor Statistics, U.S. Department of Labor (see box "Labor Occupations by Education and Training Categories"). Occupations are classified into 1 of 11 categories that describe the education and training needed by most workers to become fully qualified.

The three lowest skill levels of the education and training categories are long-term on-the-job training (OJT), moderate-term OJT, and short-term OJT. Occupations in these three categories are considered entry-level jobs, as they do not require formal training or experience for hiring. Long-term OJT occupations usually require more than 12 months of on-the-job training or combined work experience and formal classroom instruction before workers develop the skills needed for average job performance. Examples are electrician, bricklayer, and machinist, which normally require apprenticeships lasting up to 4 years. In moderate-term OJT occupations, workers can achieve average job performance after 1 to 12 months of combined job experience and informal training, such as dental assistants, drywall installers and finishers, and machine operators. Short-term OJT occupations are those where workers usually can achieve average job performance in just a few days or weeks, such as cashier, bank teller, and messenger. Of particular interest is the short-term OJT category, as its skill requirements are the lowest of all the categories. We consider these short-term OJT occupations as low-skill.

Short-term OJT occupations were 39 percent (55 million jobs) of total employment in 1998 while all entry-level jobs were 63.4 percent of total employment, with total employment at 140 million jobs. Much of the employment growth from 1996 through 2000 was at entry-level occupations, 3 million per year. About 20 percent of that entry-level job growth can be attributed to public assistance recipients moving into the labor force.[11] (See appendix A for more discussion.)

Methodology Summary

By using an economywide CGE model, we can capture the labor market impacts from a change in public assistance caseload that enters the labor force. By developing the labor market component of the model we created a richness of detail about skill levels that makes this CGE model unique and relevant to analyzing labor market impacts of welfare reform. We build on others' research by using their findings as key assumptions in the model.

[11]Due to changes in the detailed classification of occupations between 1996 and 2000, it is not possible to compare the job growth for low-skilled occupations, while the change in entry-level jobs is comparable.