2.2. U.S. EARNINGS (MODSOL2)

2.2.a. *Overview*

In the CPS data, E is separated by class of worker. The broad categories include wage and salary workers (EW), the self-employed (ES), and unpaid family workers (EU). For the nonagricultural sector, the self-employed participation rate (SEPR) is defined as the ratio of ES to E, the proportion of employed persons who are self-employed. For the agricultural sector, the SEPR is defined as the ratio of ES to the civilian noninstitutional population.

MODSOL2 projects quarterly values for these principal classes of employment. Equations 2.2.1 through 2.2.4 outline the subprocess' overall structure and solution sequence.

$$\text{SEPR} = \mathit{SEPR}(\cdot) \tag{2.2.1}$$

$$\text{ES} = \text{SEPR} * \text{E} \tag{2.2.2}$$

$$\text{EU} = \mathit{EU}(\cdot) \tag{2.2.3}$$

$$\text{EW} = \text{E} - \text{ES} - \text{EU} \tag{2.2.4}$$

In the National Income and Product Accounts (NIPA), the Bureau of Economic Analysis (BEA) publishes historical quarterly estimates for gross domestic product (GDP), real GDP, and the GDP price deflator (PGDP). Real GDP is equal to the ratio of nominal GDP to PGDP. Potential (or full-employment) GDP is a related concept defined as the level of real GDP that is consistent with a full-employment aggregate RU.

MODSOL2 projects quarterly values for these output measures. Potential GDP is based on the change in full-employment values for: (1) E (including U.S. armed forces), (2) average hours worked per week, and (3) productivity. Full-employment values for E are derived by solving USEMP under full-employment conditions, while the full-employment values for the other variables (average hours worked and productivity) are set by assumption. RTP is the ratio of real GDP to potential GDP and is set by assumption. RTP reaches 1.0 in the short-range period (defined as the first 10 years of the projection) and remains at 1.0 thereafter. Projected real GDP is set equal to the product of potential GDP and RTP. Nominal GDP is the product of real GDP and PGDP. The growth rate in PGDP is set by assumptions.

The BEA also publishes quarterly values for the principal components of U.S. earnings, including total wage worker compensation (WSS), total wage and salary disbursements (WSD), and total proprietor income (Y). These concepts can be aggregated and rearranged. Total compensation (WSSY) is defined as the sum of WSS and Y. The total compensation ratio (RWSSY) is defined as the ratio of WSSY to the GDP. The income ratio (RY) is defined as the ratio of Y to WSSY. The earnings ratio (RWSD) is defined as the ratio of WSD to WSS.

MODSOL2 projects quarterly values for these principal components of U.S. earnings using Equations 2.2.5 through 2.2.11.

$$RWSSY = RWSSY(\cdot) \quad (2.2.5)$$

$$WSSY = RWSSY * GDP \quad (2.2.6)$$

$$RY = RY(\cdot) \quad (2.2.7)$$

$$Y = RY * WSSY \quad (2.2.8)$$

$$WSS = WSSY - Y \quad (2.2.9)$$

$$RWSD = RWSD(\cdot) \quad (2.2.10)$$

$$WSD = RWSD * WSS \quad (2.2.11)$$

2.2.b. *Input Data*

Long-Range OASDI Projection Data

1. Demography- (See Section 2.1.b.)

2. Economics - Data from Section 2.1 include the total employed (E), E by age and sex, LFPRs by age and sex, the aggregate unemployment rate (RU), and the full-employment concepts for LC, RU, and E.

3. *Trustees Assumptions* - (See Section 2.1.b.)

Addfactors

4. Addfactors were included on some employment and output variables to smooth the transition between the latest historical data and the projected values. The need for addfactors is reviewed each year and they are implemented if necessary.

Other input data

5. Data from the NIPA (1929 (varies) through the third quarter of the year prior to the Trustees Report) for GDP, income, wages, compensation, personal consumption expenditures, investment, employer contributions for employee pension and insurance funds, and employer contributions for government social insurance. They are published by the BEA quarterly and/or annually. This subprocess updates the data several times a year.

6. OASDI employee, employer, and self-employed tax rates from 1937 to 2105.

These contribution rates are set according to the Social Security Act of 1935 as amended through 2015. The rates are updated when legislation mandates a change.

7. The historical Consumer Price Index (CPI) is published monthly (1913 (varies) through November of the year prior to the Trustees Report) by the BLS. This subprocess updates the data several times a year.

8. The historical CPI for medical services is published monthly by the BLS (January 1956 to November of the year prior to the Trustees Report). Quarterly values are projected based on the projected growth in the aggregate CPI and an additional amount defined as the growth rate differential in the two price measures that was assumed in the latest President's Fiscal Year Budget. The series is updated annually.

9. U.S. armed forces (EDMIL) by age and sex were estimated by the Department of Defense and published by the Census Bureau on a monthly basis (1948-2000) by single year of age (17 to 64) and sex. These data are no longer produced by Census.

10. EDMIL by age and sex are estimated by the Economic process as the difference in the monthly resident plus Armed Forces overseas population and the monthly civilian population. These two populations are available from the Census Bureau on a monthly basis (April 2000 to December of the year prior to the Trustees Report) by single year of age (16 to 69) and sex. These data are updated once a year.

11. Wages for railroad workers are wages covered by the Railroad Retirement Act. The annual data are for the period 1971 to the third year prior to the Trustees Report.

12. Unpublished data from the CPS (1988 through the second year prior to the Trustees Report) on employment by class of worker (i.e., agricultural, nonagricultural, unpaid family, private industry, government, wage and salary, self-employed). These data are available from the BLS by age group and sex. These data are updated by the BLS annually. This subprocess updates the data annually.

13. Data from the NIPA (1947 through the third quarter of the year prior to the Trustees Report) for wages and compensation of households and institutions are published by the BEA quarterly. This subprocess updates the data several times a year.

14. Other program-related parameters, including the average wage index wage, the benefit increase, the taxable maximum, and the annual retirement earnings test exempt amounts, are obtained annually from the OCACT's Office of Short-Range Actuarial Estimates. This subprocess updates the data annually.

15. Unpublished data from the CES & CPS for total hours worked in the economy. These data are available from the BLS. These data are updated by the BLS quarterly (1948 through the third quarter of the year prior to the Trustees Report) and annually (1948 through the second year prior to the Trustees Report). This subprocess updates the data several times a year.

16. The Federal minimum hourly wage is based on the Fair Labor Standards Act from the Department of Labor for 1938 to the year prior to the Trustees Report. The wage is updated when there is legislation mandating a change.

17. Time trends (set by Economic process) are used in the agriculture sector for employment, real output, and compensation in the short-range period. These short-range trends are extended for each year's Trustees Report, reflecting a new short-range period.

2.2.c. *Development of Output*

Equation 2.2.1 - Self-Employed Participation Rate (SEPR)

The SEPR is disaggregated by age, sex, and industry. The age groups include 16-17, 18-19, 20-24, 25-34, 35-44, 45-54, 55-64, and 65 and over. The industry groups include agriculture and nonagriculture.

For the nonagriculture sector, the SEPRs by age and sex are defined as the ratio of the nonagriculture self-employment to total employment. Thus, the aggregate nonagriculture SEPR is dependent on the projected distribution of employment by age and sex. All nonagriculture SEPRs by age and sex are dependent on the RTP. Increases in the RTP lead to decreases in the SEPRs.

For the agriculture sector, the male SEPRs by age (as well as the female SEPR for ages 16-17) are defined as the ratio of agriculture self-employment to the civilian noninstitutional population. Thus, the aggregate agriculture SEPR for men is dependent on the projected distribution of the population by age. The agriculture SEPRs for men by age are dependent on the ratio of total agriculture employment (EA) to the total civilian population aged 16 and over. (EA is projected in a farm sub-program. Real farm output is projected to increase with the population, while farm productivity, defined as output per worker, is projected to continue to follow its historical trend. EA is projected as the ratio of farm output to farm productivity.) An increase in the ratio of EA to the total civilian population aged 16 and over leads to an increase in the agriculture SEPRs for men.

The female SEPRs by age (for ages 18 and higher) for the agriculture sector are defined as the ratio of the female to male agriculture self-employment. Thus, the aggregate agriculture SEPR for women is dependent on the projected distribution of male agriculture employment by age. For female age groups age 18 and over, the SEPRs are dependent on the RTP and the corresponding ratio of total female to male employment. Generally, an increase in the RTP

leads to increases in the SEPRs. An increase in the total employment ratio also leads to an increase in the SEPR.

Equation 2.2.2 – Self-Employed Workers (ES)

ES is disaggregated by age, sex, and industry. The age groups include 16-17, 18-19, 20-24, 25-34, 35-44, 45-54, 55-64, and 65 and over. The industry groups include agriculture and nonagriculture. For the nonagricultural sector, ES is derived from SEPR by scaling it to the total nonagricultural self-employed workers (ENAS), which is projected as a constant share of nonagricultural employment over the long range. For the agricultural sector, it is similarly scaled to the total agricultural self-employed workers (EAS), which is projected as the residual after subtracting projected wage workers and unpaid family workers from total agricultural employment.

Equation 2.2.3 - Unpaid Family Workers (EU)

EU is disaggregated by age, sex, and industry. The age groups include 16-17, 18-19, 20-24, 25-34, 35-44, 45-54, 55-64, and 65 and over. The industry groups include agriculture and nonagriculture.

From 1970 to 2014, the level of EU fell from about 0.5 to 0.02 million in the agriculture sector and from about 0.5 to 0.06 million in the nonagricultural sector. For projections, the levels of EU by age and sex in the agriculture sector are assumed constant at about five thousand or less. The EUs by age and sex in the nonagricultural sector are projected as a constant ratio to ES.

Equation 2.2.4 - Wage Workers (EW)

For the nonagricultural sector, the number of wage workers is the residual after subtracting self-employed workers and unpaid family workers from total workers. For the agricultural sector, we first project wage workers, and the number of self-employed workers is the residual after subtracting wage workers and unpaid family workers from total agricultural workers. Agricultural wage workers in each age/sex group are projected as a function of the business cycle and the age-sex-group's share of total US workers. The age groups include 16-17, 18-19, 20-24, 25-34, 35-44, 45-54, 55-64, and 65 and over. The nonagriculture sector is further disaggregated: private household workers are projected by age and sex, while Federal Government (Civilian and Military, separately) and State & Local Government workers are projected in total.

Equation 2.2.5 - Total Compensation Ratio (RWSSY)

The Trustees set the ultimate annual growth rate for RWSSY. For the short-range period, total WSS, WSD, and Y are aggregated from sector components. Total GDP, WSS, and WSD are divided into the farm and nonfarm sectors. The nonfarm sector is further separated into the government and government enterprises, households, nonprofit institutions, and residual (private nonfarm business excluding government enterprises (PBNFXGE)) sectors.

Total Y is divided into the farm and residual (i.e., PBNFXGE) sectors.

The methodology used to estimate GDP, WSS, WSD, and Y differs by sector.

Farm - Nominal GDP is the product of real GDP and the farm price deflator. Real farm GDP is projected from estimates of real farm per capita output. EA is projected from estimates of farm productivity. EAW is projected to continue its historical increase relative to EA. Farm compensation (WSSPF) is the product of estimates for average farm compensation (AWSSPF) and EAW, while farm proprietor income (YF) is the product of estimates of average farm proprietor income (AYF) and EAS. AYF is projected based, in part, on the growth in AWSSPF.

Government and Government Enterprises - This sector is further disaggregated to Federal Civilian, Federal Military, and State and Local. In each sector, WSD is the product of estimates for average wages and employment. WSS is the sum of WSD and estimates for non-wage components of compensation. GDP is the sum of WSS and estimates of consumption of fixed capital.

Household - WSS is the product of estimates for average compensation and employment. WSD is WSS less employer contributions for the OASDHI tax. GDP is the sum of WSS and the gross value added of owner-occupied housing.

Nonprofit Institutions - The Nonprofit Institutions sector is further disaggregated to Health, Education, and Social Services sectors. In each sector, WSS is the product of estimates for average compensation and employment. WSD is WSS less the estimates for non-wage components of compensation. GDP is WSS plus a residual component of output.

Private Nonfarm Business Excluding Government Enterprises (PBNFXGE) - GDP in the PBNFXGE sector is total economy-wide GDP less the sum of the other sector GDPs. WSS is projected as a ratio to GDP less Y. The ratio is projected to be mostly stable, varying only temporarily with changes in RTP. Y is projected to grow with GDP and the ratio of EAS to total employment in the sector.

Thus, total labor compensation (WSSY) is summed from sector components, while the total compensation ratio (RWSSY) is the ratio of total WSSY to total GDP. It is important to note that the pure program-generated estimate for the total RWSSY is adjusted to ensure a smooth transition between the latest historical data and the Trustees' ultimate assumptions.

Equation 2.2.7 - Income Ratio (RY)

Y is disaggregated to the farm and PBNFXGE sectors. (see description for Equation 2.2.5)

Equation 2.2.10 - Earnings Ratio (RWSD)

In the NIPA, the difference between WSS and WSD is defined as employer contributions for employee pension and insurance funds (OLI) and employer contributions for government

social insurance (SOC). OLI is mostly health and life insurance, and pension and profit sharing. SOC is composed of employer contributions to Federal and State & Local government social insurance funds. Federal government funds include OASDI, HI, UI, and other small groups. State and Local government funds mostly include workers' compensation.

RWSD is defined as the ratio of WSD to WSS. RWSD is projected to mostly decline on a year-by-year basis over the entire 75-year projection horizon due to projected increases in employer contributions to employee group health insurance premiums (ECEGHIP) and pensions. ECEGHIP is projected by the Center for Medicare and Medicaid Services (CMS). Employer contributions to employee pension funds are assumed to increase as life expectancy increases.