Bureau of Labor Statistics, Office of Productivity and Technology

Major Sector Productivity and Costs   March 31, 2006

Construction of Employment and Hours for Self-employed and other Nonfarm workers and for all Farm workers, using Current Population Survey data for primary and secondary jobs.

To construct hours for productivity measurement, the BLS Division of Major Sector Productivity (DMSP) relies primarily upon data from the BLS Current Employment Statistics program (CES, or establishment survey). Because the CES excludes nonfarm proprietors, unpaid family workers, and all farm workers, DMSP uses data from the BLS Current Population Survey (CPS, or household survey), to construct estimates of employment and hours at work for these workers. CPS data are also the basis for estimates of average weekly hours of government workers. For business sector productivity measurement, 86 percent of hours were obtained from the CES, and 14 percent from the CPS, in 2005.

The establishment survey measures jobs, counting a person who is employed by two or more establishments at each place of employment. In contrast, featured household survey measures of employment count each person only once and classify each person according to his or her primary job. Moreover, hours worked at all jobs by that person accrue to his or her primary job. Beginning with data for 1994, the Current Population Survey has collected information on employment and hours worked at primary (or main) jobs and all other jobs, separately, on a monthly basis. In June 2005, DMSP began to use this information to improve its measures of employment and hours of all persons by adjusting them to take proper account of multiple jobholders. [1]

In the productivity measures, employment and hours for workers obtained from the CPS are now measured by job. Adjusted employment is the sum of primary jobs and

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[1] Multiple jobholders are employed persons who, during the reference week, had either two or more jobs as a wage and salary worker or were self-employed and also held a wage and salary job or worked as an unpaid family worker and also held a wage and salary job.

secondary jobs in the relevant industries by class of worker.[2] Hours are constructed to include hours worked in both primary and secondary jobs in these categories while excluding hours worked by a self-employed person (etc.) in any secondary job as a nonfarm wage and salary worker. The latter are picked up through the CES.

Methodology — current data (1994 forward)

The first step in constructing quarterly hours measures using CPS data by job is to obtain monthly data on employment and hours at work in main jobs and in all other jobs, separately, for proprietors and unpaid family workers in the nonfarm sector and employees, proprietors, and unpaid family workers in the farm sector.[3] The labor force variables for the number of jobs in which persons were "employed and at work" and the number of jobs in which persons were "employed and absent" are obtained and summed. Numbers of hours worked during the survey week at main jobs and at other jobs are obtained separately. The numbers of jobs and hours must be weighted to reflect the relationship between the survey sample and the population. One weighting variable is selected to weight main job responses, while another is selected for other jobs. [4]

Class of worker variables are obtained for main jobs and other jobs, separately. Industry variables are needed for the primary job and for other jobs, and reflect the North American Industry Classification System (NAICS).   Farm sector workers are those

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[2] Class of worker distinctions include working without pay at a family farm or business, unincorporated self-employed, private wage and salary workers, and government wage and salary workers.
[3] These data are extracted using a computer utility called DataFerrett to access the CPS data. Both the data and the utility are maintained on a website by the Bureau of the Census and the Centers for Disease Control. See Appendices for the extraction codes used.

[4] Each month a sample of eight panels (called rotation groups) is interviewed in the CPS. The following month, two of these panels drop out of the survey and two new ones enter. An unbiased estimator for any characteristic investigated in the survey is obtained by multiplying the value of that characteristic for each sample unit (person or household) by the reciprocal of the probability with which that unit was selected, and summing the products over all units in the sample. Because questions related to second or other jobs are only asked of the outgoing rotation groups, one weighting variable is used to weight main job responses, while another weighting variable, approximately four times as large, is selected for other jobs. For more information see Technical Paper 63RV: Current Population Survey - Design and Methodology, issued March 2002: U.S. Department of Labor, Bureau of Labor Statistics and U.S. Department of Commerce, Bureau of Census.

engaged in crop production (NAICS industry 111) and animal production (NAICS industry 112). Other agricultural workers (NAICS industries 113, 114, and 115) are included in the nonfarm business sector, with nonagricultural workers.

The employment (jobs) count is calculated as the sum of the number of main jobs and the number of all other jobs, for proprietors and unpaid family workers in the nonfarm sector and employees, proprietors, and unpaid family workers in the farm sector. Corresponding average weekly hours at work are computed as a weighted average of hours worked in main jobs and hours worked in all other jobs during the survey week.[5]

Hours are computed as the product of the number employed, average weekly hours, and 52 weeks per year. To take into account the fact that those who are employed but not at work have zero hours at work, we adjust average weekly hours downward by multiplying the average weekly hours of those at work times the ratio of the number at work to the number employed. This adjustment is made to every category of worker except unpaid family workers, who are only counted as employed if they are at work for at least 15 hours in the survey week.

Next the monthly employment and average weekly hours series are seasonally adjusted. DMSP uses concurrent seasonal adjustment of these CPS-based series, and adjusts two prior months of data each time the current month of data is processed and added. This mirrors the BLS practice of revising two prior months of CES data on employment and average weekly hours of employees each month. Revisions of historical data for the most recent five years will be made early in each calendar year. X12-ARIMA software is used to seasonally adjust the household survey data using ten years of monthly observations. The seasonally adjusted monthly data are subsequently averaged to yield quarterly data.

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[5] Estimates of postal worker average weekly hours are also prepared, for use in estimating hours worked by employees of federal government enterprises. Public administration worker average weekly hours serve as a proxy for state and local government enterprise average weekly hours.

Methodology — historical data (1947-93)

In the basic monthly CPS survey prior to 1994, respondents were asked to report hours worked at all jobs, but to provide industry and occupation information for their primary jobs only. Thus, all hours were attributed to the respondents' primary jobs and employment was equal to the number of primary jobholders in an occupation and industry. However, information on the industry and occupation of the second job, and hours worked at each job, were collected in supplements to the CPS conducted in May of 1969-80, 1985, 1989, and 1991. This information was used by DMSP to adjust existing CPS-based measures of employment and hours by occupation and industry for multiple jobholders, putting the employment and hours underlying published productivity statistics on a jobs basis prior to 1994.

Separate extractions were performed to capture data for first jobs and for secondary jobs from this dataset. In both cases variables were specified for class of worker, labor force status, weighting, and industry. For May of all years in which multiple jobholder data were collected, we constructed measures of hours and employment by class of worker and industry. But for months where supplemental information was not available, we had to make estimates to adjust these measures. Using the data for each May in which a multiple jobholder supplement was collected, we calculated ratios of hours and employment adjusted for multiple jobholding to hours and employment that were not adjusted.

To construct monthly adjustment ratios, we assumed that May was representative of all months and linearly interpolated between the available May ratios.[6] We also computed similar ratios for January 1994 based on the currently published CPS series and interpolated from May 1991 through January 1994. Ratios for May 1969 were held constant back to January 1947. The resulting historical monthly ratios were

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[6] Using data from 1994-2000, we assessed how May adjustment ratios compared to other monthly, and quarterly and annual average adjustment ratios. We found no consistent bias in the May data.

multiplied times the seasonally-adjusted employment and average weekly hours series underlying our published hours measures for the pre-1994 period, by class of worker and industry sector, in order to convert major sector hours and employment to a "jobs" basis.[7]

For a description of data and methods used to estimate major sector productivity and costs see **"Productivity Measures: Business Sector and Major Subsectors"**, Chapter 10 of the BLS Handbook of Methods, BLS Bulletin 2490, April 1997, pp. 89-102, or contact the BLS Division of Major Sector Productivity (**DPRWEB@BLS.GOV** , 202-691-5606).

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[7] The adjustment to employment was tantamount to adding an estimated number of secondary jobs to the number of primary jobs represented by the existing series. Conceptually, hours were adjusted by deducting hours worked in any secondary job as a nonfarm employee by a proprietor or other CPS-covered worker from the level as previously defined to avoid double-counting, and by adding hours worked as a proprietor or other CPS-covered worker in any secondary job by a person who is primarily an employee.

Appendix 1: Extraction codes for the main (primary) job

Weighting variable: PWSSWGT (NWSSWGT for 2000-2002)

Labor force variables:

Hours worked: PEHRACT1

**Labor force status: PEMLR = 1 (employed, at work) and
PEMLR = 2 (employed, absent)**

Industry and Occupation variables:

	Class of worker	Industry
2003 forward		
Farm wage and salary workers	PRDTCOW1=1	PEIO1CD=170,180
Farm proprietors	PRDTCOW1=3	PEIO1CD=170,180
Farm unpaid family workers	PRDTCOW1=4	PEIO1CD=170,180
Other agricultural proprietors	PRDTCOW1=3	PEIO1CD=190,270,280,290
Other agricultural unpaid family workers	PRDTCOW1=4	PEIO1CD=190,270,280,290
Non-agricultural proprietors	PRDTCOW1=10	
Non-agricultural unpaid family workers	PRDTCOW1=11	
Non-ag. private household workers	PRDTCOW1=5	
Non-agricultural govt. wage and salary	PRDTCOW1=7,8,9	
Public administration wage and salary		PRMJIND1=13
Postal workers		PEIO1CD1=6370
2000-2002		
Farm wage and salary workers	NRDTCOW1=1	NEIO1CD=170,180
Farm proprietors	NRDTCOW1=3	NEIO1CD=170,180
Farm unpaid family workers	NRDTCOW1=4	NEIO1CD=170,180
Other agricultural proprietors	NRDTCOW1=3	NEIO1CD=190,270,280,290
Other agricultural unpaid family workers	NRDTCOW1=4	NEIO1CD=190,270,280,290
Non-agricultural proprietors	NRDTCOW1=10	
Non-agricultural unpaid family workers	NRDTCOW1=11	
Non-ag. private household workers	NRDTCOW1=5	
Non-agricultural govt. wage and salary	NRDTCOW1=7,8,9	
Public administration wage and salary		NRMJIND1=13
Postal workers		NEIO1CD=6370

1994-1999

Farm wage and salary workers	PRDTCOW1=1	PEIO1CD=10,11
Farm proprietors	PRDTCOW1=3	PEIO1CD=10,11
Farm unpaid family workers	PRDTCOW1=4	PEIO1CD=10,11
Other agricultural proprietors	PRDTCOW1=3,10	PEIO1CD=30,31,32,230
Other agricultural unpaid family workers	PRDTCOW1=4,11	PEIO1CD=30,31,32,230
Non-agricultural proprietors	PRDTCOW1=3,10	PEIO1CD=all except 10,11,30,31,32,230
Non-agricultural unpaid family workers	PRDTCOW1=4,11	PEIO1CD=all except 10,11,30,31,32,230
Non-ag. pvt. household wage and salary	PRDTCOW1=1,5	PEIO1CD=all except 10,11,30,31,32,230, and PRMJIND1=12
Non-ag. pvt. household proprietors	PRDTCOW1=3,10	PEIO1CD=all except 10,11,30,31,32,230, and PRMJIND1=12
Non-agricultural govt. wage and salary	PRDTCOW1=2,7,8,9	PEIO1CD=all except 10,11,30,31,32,230
Public administration wage and salary		PRMJIND1=22
Postal workers		PEIO1CD=412

Appendix 2: Extraction codes for the second (or other) job

Weighting variable: PWORWGT (NWORWGT for 2000-2002)

Labor force variables:

Hours worked: **PEHRACT2**

**Labor force status: PEMLR = 1 (employed, at work) and
PEMLR = 2 (employed, absent)**

Industry and Occupation variables:

	Class of worker	**Industry**
2003 forward		
Farm wage and salary workers	PRDTCOW2=1	PEIO2CD=170,180
Farm proprietors	PRDTCOW2=3	PEIO2CD=170,180
Farm unpaid family workers	PRDTCOW2=4	PEIO2CD=170,180
Other agricultural proprietors	PRDTCOW2=3	PEIO2CD=190,270,280,290
Other agricultural unpaid family workers	PRDTCOW2=4	PEIO2CD=190,270,280,290
Non-agricultural proprietors	PRDTCOW2=10	
Non-agricultural unpaid family workers	PRDTCOW2=11	
Non-ag. private household workers	PRDTCOW2=5	
Non-agricultural govt. wage and salary	PRDTCOW2=7,8,9	
Public administration wage and salary		PRMJIND2=13
Postal workers		PEIO2CD=6370
2000-2002		
Farm wage and salary workers	NRDTCOW2=1	NEIO2CD=170,180
Farm proprietors	NRDTCOW2=3	NEIO2CD=170,180
Farm unpaid family workers	NRDTCOW2=4	NEIO2CD=170,180
Other agricultural proprietors	NRDTCOW2=3	NEIO2CD=190,270,280,290
Other agricultural unpaid family workers	NRDTCOW2=4	NEIO2CD=190,270,280,290
Non-agricultural proprietors	NRDTCOW2=10	
Non-agricultural unpaid family workers	NRDTCOW2=11	
Non-ag. private household workers	NRDTCOW2=5	
Non-agricultural govt. wage and salary	NRDTCOW2=7,8,9	
Public administration wage and salary		NRMJIND2=13
Postal workers		NEIO2CD=6370

1994-1999

Farm wage and salary workers	PRDTCOW2=1	PEIO2CD=10,11
Farm proprietors	PRDTCOW2=3	PEIO2CD=10,11
Farm unpaid family workers	PRDTCOW2=4	PEIO2CD=10,11
Other agricultural proprietors	PRDTCOW2=3,10	PEIO2CD=30,31,32,230
Other agricultural unpaid family workers	PRDTCOW2=4,11	PEIO2CD=30,31,32,230
Non-agricultural proprietors	PRDTCOW2=3,10	PEIO2CD=all except 10,11,30,31,32,230
Non-agricultural unpaid family workers	PRDTCOW2=4,11	PEIO2CD=all except 10,11,30,31,32,230
Non-ag. pvt. household wage and salary	PRDTCOW2=1,5	PEIO2CD=all except 10,11,30,31,32,230, and PRMJIND2=12
Non-ag. pvt. household proprietors	PRDTCOW2=3,10	PEIO2CD=all except 10,11,30,31,32,230, and PRMJIND2=12
Non-agricultural govt. wage and salary	PRDTCOW2=2,7,8,9	PEIO2CD=all except 10,11,30,31,32,230
Public administration wage and salary		PRMJIND2=22
Postal workers		PEIO2CD=412