Industry Productivity and Costs

Date Range: 2006 – 2024Q3

Last Updated: December 19, 2024

Update Frequency: Quarterly, after 3rd Estimate of GDP

Variable Reference: All variables are seasonally adjusted. All growth rates are quarterly and reported as annualized rates: $400*(\log(X_t) - \log(X_{t-1}))$.

Variable	Units	Description	Data Sources
Labor Productivity	Index, 2017 = 100	Real value added/total hours	FRBCHI calculation
Real Output Growth	Percent	Real value added growth	BEA GDP by Industry
Employment	Level	Number of employees (including self-employed and family workers)	BLS CES and CPS aggregated to BEA IO industry groups
Employment Growth	Percent	Growth in number of employees	
Total Hours	Level	Sum of average weekly hours * employment across industry sub-groups, annualized	BLS CES and CPS aggregated to BEA IO industry groups
Total Hours Growth	Percent	Growth in total hours	
Hourly Compensation	Nominal dollars	Total compensation/total hours in IO industry groups	BLS CES aggregated to BEA IO industry groups
Hourly Compensation Growth	Percent	Growth in hourly compensation	
Total Compensation	Nominal dollars	Hourly compensation from CES * total hours	BLS CES and CPS aggregated to BEA IO industry groups
Total Compensation Growth	Percent	Growth in total compensation	
Nominal Output	Nominal dollars	Value added	BEA GDP by Industry
Nominal Output Growth	Percent	Growth in nominal output	
Payroll Share	Fraction	Total compensation/nominal output	BLS CES and CPS for total compensation, BEA GDP by Industry for nominal output

Payroll Share Growth	Percent	Growth in payroll share	
Unit Labor Cost	Index, 2017 = 100	Total compensation/real value added	Total compensation from BLS CES and CPS and real value added from BEA GDP by Industry

Methodology

BEA Data

GDP by Industry and sub-industry groups is used for quarterly value added. As of December 2024, industry level quarterly value added is available through 2024Q3.

BLS Data

CES

We use the Current Employment Statistics release for employment, average weekly hours (AWH), and average hourly earnings (AHE) by industry. Industries are classified with six-digit NAICS codes. Hours per week is the product of AWH and Employment in an industry. Total compensation per week is the product of hours per week and AHE. For some industries, we impute missing data with similar industries' statistics[i]. Employment, hours, and compensation are aggregated across NAICS codes into BEA IO industries. AWH and AHE are recalculated for BEA IO industries using aggregated hours, employment and compensation.

CPS

We use the Current Population Survey to measure the employment and hours worked of family and self-employed workers. We calculate employment in an industry with the Composite Weight for replicating BLS labor force estimates and employment status in the CPS. Hours worked in an industry are calculated with the Composite Weight for replicating BLS labor force estimates and hours worked in the last week in a respondent's main job. We calculate these by industry according to the 1990 Census Bureau industrial classification system. Employment and hours worked are summed across industry classifications into BEA IO industries.

Aggregating CES and CPS data

We combine employment and hours from the CES and CPS at the BEA IO industry level. We use AHE from the CES to calculate total compensation for all workers, from the CES and CPS. We recalculate AWH from total hours and employment from our combination of CES and CPS data. This measurement of AWH and total compensation now includes all employees in administrative data from the CES and self-employed/family workers in the CPS at the BEA IO industry level. Monthly data is annualized at the quarterly frequency.

Seasonal Adjustment

We do all the aggregation of CES and CPS data into BEA IO industries and the combination of CES and CPS with non-seasonally adjusted data. Combined BLS data is seasonally adjusted with the Census Bureau's X-13 seasonal adjustment software.

Aggregation

Aggregating employment data

For each industry, employment is the sum of employment in industry sub-levels. Total compensation is the sum of the product of employment, AHE, and AWH in each industry sub-level. Total hours is the sum the product of employment and AWH in each industry sub-level. Average wage is recalculated for each industry as total compensation divided by total hours in the industry. Hours is sum of the product of employment and hours across each industry sub-level divided by employment in the industry.

Aggregating value added data

Nominal value added by industry is the sum of nominal value added across industry sub-levels. Real value added is chain-weighted index of real value added across industry sub-levels.

Labor productivity, and payroll share is calculated from aggregated industry data.

[i] Imputing CES Data: AHE and AWH for the education sub-sector is calculated from the residual of total hours and total earnings per week from the education and health sector. Employment data for the rail, water, and pipeline transportation sectors are imputed with data from the air, truck, and transit and ground passenger transportation. Employment data for the petroleum and coal products and all other motor vehicle parts sectors are imputed with data from all other manufacturing sub-sectors. Employment data for scenic and sightseeing transportation are imputed with data from the other sub-sectors in other transportation and support activities: support activities for transportation and couriers and messengers. Employment data for lessors of nonfinancial intangible assets are imputed from data for the rental and leasing services sub-sector.