Impacts of Jobs Requiring Close Physical Proximity and High Interaction with the Public on U.S. Industry Employment Change During the Early Stages of the COVID-19 Pandemic

Gabe, Todd and Florida, Richard

University of Maine, University of Toronto

1 February 2021

Impacts of Jobs Requiring Close Physical Proximity and High Interaction with the Public on U.S. Industry Employment Change During the Early Stages of the COVID-19 Pandemic

Todd Gabe (University of Maine) and Richard Florida (University of Toronto)

Corresponding author:
Todd Gabe (todd.gabe@maine.edu)
School of Economics
5782 Winslow Hall
University of Maine
Orono, Maine 04469 USA

Abstract:

This paper examines the factors affecting U.S. industry employment change in the early months of the COVID-19 pandemic. Results show that the percentage of industry employment in occupations that require close physical proximity has a negative impact on year-over-year employment change in the six months of April through September of 2020, which is likely the result of the shutdown and COVID-related measures to encourage social distancing. The percentage of industry employment in jobs that involve high interaction with the public has a negative impact on year-over-year employment change in April and May—presumably due to measures that prohibited the assembly of large groups—but not in the months of June to September.

Keywords: COVID-19; U.S. Industry Employment Change; Occupations; Physical Proximity; Public Interaction

JEL Categories: L83, I18, J24

Impacts of Jobs Requiring Close Physical Proximity and High Interaction with the Public on U.S. Industry Employment Change During the Early Stages of the COVID-19 Pandemic

1. Introduction

COVID-19 is not just a public health crisis, but it has taken a huge toll on the economy, with the lockdown and related measures causing a contraction more severe than any since the Great Depression. For example, the U.S. economy fell sharply due to the COVID-19 pandemic as year-over-year nonfarm private employment decreased by 15.2 percent in April of 2020 (U.S. Bureau of Labor Statistics).[1] Furthermore, COVID-19 has contributed to large changes in household spending patterns, impacts on financial markets, increased unemployment and an overall reduction in economic activity (Baker et al. 2020; Carvalho, Peralta and dos Santos 2020; Kong and Prinz 2020; Lewis, Mertens and Stock 2020; Mamaysky 2020).

The economic fallout from the pandemic has been highly uneven across industries and occupations. On the one hand, industries related to leisure and hospitality have been hard hit (Bartik et al. 2020), with substantial employment reductions in sectors such as Amusement, Gambling, and Recreation (56.8 percent decline from April 2019 to 2020) and Food Services and Drinking Places (48.2 percent decline).[2] These industries experienced particularly severe impacts because they require close physical proximity and high interaction with the public. On the other hand, sectors such as Oil and Gas Extraction (6.4 percent increase), Computer and Periphery Equipment Manufacturing (6.3 percent increase) and Waste Management and Remediation Services (0.2 percent increase), which typically involve low proximity to others and scant interaction with the public, performed significantly better.

[1] Year-over-year U.S. nonfarm private employment increased by 0.5 percent in March of 2020 (the period immediately before the pandemic) and fell by 12.7 percent in May (the second month of the crisis).
[2] These figures are from the Current Employment Statistics series of the U.S. Bureau of Labor Statistics.

This paper examines the effects of two occupational characteristics—requiring close physical proximity and high interaction with the public—on U.S. industry employment change in the early months of the COVID-19 pandemic. The actions taken by state and local governments, and even businesses themselves, to limit the spread of COVID-19 encouraged social distancing and prohibited groups of more than (in some places) ten people. These measures likely had particularly severe impacts on businesses and industries where people work within arm's length and interact with members of the public. Although U.S. health and government officials began taking measures against COVID-19 in March of 2020, the impacts on U.S. employment statistics surfaced in April.[3] As shown in Figure 1, the first three months of 2020 saw year-over-year U.S. employment growth, followed by steep employment declines starting in April.

Previous research has examined the economic and financial effects of the pandemic (Bauer and Webber 2020; Cajner et al. 2020; Gupta et al. 2020; Harjoto, Rossi and Paglia 2020), and the characteristics of occupations that are most impacted by measures used to limit the spread of COVID-19 (Dingel and Neiman 2020; Leibovici, Santacreu and Famiglietti 2020). For example, Mongey and Weinberg (2020) and Mongey, Pilossoph and Weinberg (2020) show that people in jobs with higher barriers to working from home and in closer physical proximity to others have less education, lower income and liquid assets, and are less likely to have employer provided healthcare and own their homes. Likewise, research by Malkov (2020) found that workers in jobs that are "non-teleworkable" and that require "high-contact-intensity" may face adverse long-run employment and earnings impacts. The research presented in this paper looks at similar types of

[3] For example, the United States approved widespread testing for Coronavirus on March 3, a national emergency was declared on March 13, and the U.S. Centers for Disease Control and Prevention (CDC) issued a recommendation against gatherings of 50 or more people on March 15 (Taylor 2020).

occupational characteristics—physical proximity and interaction with the public—as factors impacting U.S. industry employment change in the early stages of the COVID-19 pandemic.

2. Analysis and Results

To estimate the impacts of occupations that require close physical proximity and high interaction with the public on industry employment change during the early stages of the COVID-19 pandemic, we use the following regression model:[4]

$$\textit{Industry Employment Change} = \beta_0 + \beta_1 \textit{ Close Physical Proximity} + \beta_2 \textit{ High Public Interaction} + \beta_3 \textit{ Past Industry Growth} + \beta_4 \textit{ Establishment Size} + \beta_5 \textit{ Computer Occupations} + \beta_6 \textit{ New York Metro}$$

The dependent variable (*Industry Employment Change*) is the percentage change in year-over-year (2019 to 2020) seasonally adjusted industry employment. We estimate nine separate regression models for the months of January to September, which captures three months prior to the outbreak of COVID-19 in the United States, and the first six months of the pandemic.

The analysis focuses on 116 non-overlapping NAICS sectors (e.g., Utilities: NAICS 22), subsectors (e.g., Textile Product Mills: NAICS 314) and industry groups (e.g., Automobile Dealers: NAICS 4411) that are covered in the Current Employment Statistics series of the U.S. Bureau of Labor Statistics. The industries included in the study account for about 99 percent of total nonfarm private U.S. employment. April 2019 to 2020 employment growth rates in these sectors ranged from a decline of 65.3 percent (Scenic and Sightseeing Transportation) to an increase of 8.0 percent (Couriers and Messengers), with median and mean employment change of 7.8 percent and 12.9 percent declines.

[4] The regression model also includes dummy variables, shown in Table 1, that control for major industrial category.

The explanatory variables of key interest are the percentages of workers, by industry, in occupations that require close physical proximity (*Close Physical Proximity*) and that involve high interaction with the public (*High Public Interaction*). Information on these two characteristics is from the Occupational Information Network (O*NET) of the U.S. Department of Labor. For the work context characteristic of "Physical Proximity," O*NET reports an index score where values of 75 or higher represent jobs that have workers within an arm's length. These occupations are counted as requiring close physical proximity, and occupations are matched to industries using a crosswalk from the U.S. Bureau of Labor Statistics.[5]

For the work activity attribute of "Performing for or Working Directly with the Public," O*NET reports a score for the "importance" of this characteristic to the job and the "level" of this characteristic required. Occupations with index values of 75 or higher for either "importance" or "level" are counted as involving high interaction with the public. Across all 116 sectors included in the analysis, the weighted averages for the percentage of people in jobs that involve close physical proximity and high interaction with the public are 28.3 and 25.0 percent of U.S. workers, respectively, and these industry-level percentages have a correlation of 0.27 across the 116 sectors.

Additional variables used in the regression model are the industry's employment growth rate between 2010 and 2019 (*Past Industry Growth*), average employment size of industry establishments (*Establishment Size*), the share of industry employment in computer-related occupations (*Computer Occupations*), the percentage of industry establishments located in the New York metropolitan area (*New York Metro*), and dummy variables indicating the major industry category.[6] The 2010 to 2019 employment growth rate controls for a sector's longer-term

[5] Leibovici, Santacreu and Famiglietti (2020) also classified index values of 75 and above as "high contact-intensity" occupations.

[6] Industry employment growth rates from 2010 to 2019, and the share of industry employment in computer-based occupations are from the U.S. Bureau of Labor Statistics; and average employment size and the percentage of industry

trends and average business size examines whether industries characterized by small (or large) businesses were differentially impacted by the COVID-19 pandemic.[7] The percentage of industry workers in computer-related occupations is a proxy for the extent to which a sector can operate with workers connecting remotely via information technologies.[8] Finally, the percentage of industry establishments in the New York Metropolitan Area, which ranges from zero (e.g., Coal Mining) to 18.2 percent (e.g., Apparel Manufacturing), controls for a sector's exposure to what was an initial epicenter of the COVID-19 virus in the United States.

Regression results shown in Table 1 indicate negative and statistically significant relationships between industry employment growth rates from April 2019 to 2020, which captures the first month of the COVID-19 pandemic, and both the percentages of industry workers in occupations that require close physical proximity and high interaction with the public. These two explanatory variables do not have statistically significant effects on year-over-year industry employment change in the first three months of 2020, which is prior to the COVID-19 outbreak. As shown in Figure 2, the explanatory variable capturing the percentage of jobs that require close physical proximity has a negative and statistically significant effect on year-over-year employment change in all six months (April to September) of the COVID-19 pandemic. The variable measuring the percentage of jobs that involve high interaction with the public has a negative impact on year-over-year employment change in May—along with the similar effect in April—but this variable does not have a statistically significant impact on industry employment change in the later months of June to September.

establishments located in the New York Metropolitan Area are from County Business Patterns of the U.S. Census Bureau.

[7] The 2010 to 2019 employment growth rate is calculated using the same month as examined in the dependent variable. For example, the analysis of industry employment change from January 2019 to 2020 includes an explanatory variable measuring *Past Industry Growth* between January 2010 and 2019.

[8] Dingel and Neiman (2020) show that 100 percent of the jobs in the major occupational category of "Computer and Mathematical Occupations" can be performed at home.

Other results presented in Table 1 provide evidence on the factors that affected industry employment change in the early months of the COVID-19 pandemic. Similar to the variable measuring jobs that require close physical proximity, the share of industry employment in the New York Metropolitan Area has a negative and statistically significant effect on year-over-year employment change in the six months of April to September of 2020, but not the first three months of the year. Whereas the industry growth rate between 2010 and 2019 has a positive and statistically significant effect on year-over-year employment change in the months of January to March of 2020—prior to the COVID-19 outbreak—this variable does not have a statistically significant effect on year-over-year employment change in the first two months of the pandemic (April and May). Finally, the share of industry employment in computer occupations has a positive and statistically significant effect on industry employment change in eight of the nine months.[9]

3. Conclusions

In response to the COVID-19 outbreak, public officials implemented measures that required social distancing and prohibited the assembly of large groups. These actions contributed to a large decrease in U.S. employment and adversely impacted virtually every indicator of economic activity. The COVID-19 pandemic, however, has led to largely uneven impacts on U.S. industries and occupations. Our results show that industries with higher percentages of workers in occupations that require close physical proximity and high interaction with the public experienced sharp declines in employment in April and May of 2020, with the negative impacts associated with physical proximity lasting through (at least) September.

[9] The estimated coefficient corresponding to the *Computer Occupations* variable increases from 0.075 to 0.316 between March and April, which likely signifies the ability of computer-intensive sectors to pivot to remote working arrangements in response to the pandemic.

The combination of these short-term impacts at the beginning of the pandemic, combined with the results of Malkov (2020) suggesting that workers in these types of jobs may face adverse long-run employment and earnings prospects, point to the need for policy intervention and support. Policy measures to mediate the negative economic impacts of the pandemic through assistance to industries, workers and communities should be undertaken with these characteristics of occupations in mind, focusing on industries in hospitality, leisure and related sectors that are bearing a disproportionately high impact of the pandemic.

References

Baker, Scott R., Robert A. Farrokhnia, Steffen Meyer, Michaela Pagel, and Constantine Yannelis. 2020. "How Does Household Spending Respond to an Epidemic? Consumption During the 2020 COVID-19 Pandemic." *Covid Economics* 18 (15 May), 73-108.

Bartik, Alexander W., Marianne Bertrand, Feng Lin, Jesse Rothstein, and Matthew Unrath. 2020."Measuring the Labor Market at the Onset of the COVID-19 Crisis." Working Paper 27613, National Bureau of Economic Research, Cambridge MA, July 2020.

Bauer, Anja, and Enzo Weber. 2020. "COVID-19: How Much Unemployment was Caused by the Shutdown in Germany?" *Applied Economics Letters*, forthcoming.

Cajner, Tomaz, Leland D. Crane, Ryan A. Decker, John Grigsby, Adrian Hamins-Puertolas, Erik Hurst, Christopher Kurz, and Ahu Yildirmaz. 2020. "The U.S. Labor Market During the Beginning of the Pandemic Recession." Working Paper 27159, National Bureau of Economic Research, Cambridge MA, May 2020.

Carvalho, Bruno P., Susana Peralta, and João Pereira dos Santos. 2020. "What and How Did People Buy during the Great Lockdown? Evidence from Electronic Payments." *Covid Economics* 28 (12 June), 119-158.

Dingel, Jonathan I., and Brent Neiman. 2020. "How Many Jobs Can be Done at Home?" Working Paper 26948, National Bureau of Economic Research, Cambridge MA, April 2020.

Gupta, Sumedha, Laura Montenovo, Thuy D. Nguyen, Felipe Lozano Rojas, Ian M. Schmutte, Kosali I. Simon, Bruce A. Weinberg, and Coady Wing. 2020. "Effects of Social Distancing Policy on Labor Market Outcomes." Working Paper 27280, National Bureau of Economic Research, Cambridge MA, May 2020.

Harjoto, Maretno A., Fabrizio Rossi, and John K. Paglia. 2020. "COVID-19: Stock Market Reactions to the Shock and the Stimulus." *Applied Economics Letters*, forthcoming.

Kong, Edward, and Daniel Prinz. 2020. "The Impact of Shutdown Policies on Unemployment During a Pandemic." *Covid Economics* 17 (13 May), 28-76.

Leibovici, Fernando, Ana Maria Santacreu, and Matthew Famiglietti. 2020. "Social Distancing and Contact-Intensive Occupations." Technical Report, St. Louis Federal Reserve Bank—On the Economy Blog March 2020.

Lewis, Daniel, Karel Mertens, and James Stock. 2020. "US Economic Activity During the Early Weeks of the SARS-Cov-2 Outbreak." *Covid Economics* 6 (17 April), 1-21.

Malkov, Egor. 2020. "Nature of Work and Distribution of Risk: Evidence from Occupational Sorting, Skills and Tasks." *Covid Economics* 34(3 July), 15-49.

Mamaysky, Harry. 2020. "Financial Markets and News about the Coronavirus." *Covid Economics* 38 (16 July), 68-128.

Mongey, Simon, Laura Pilossoph, and Alex Weinberg. 2020. "Which Workers Bear the Burden of Social Distancing Policies?" Working Paper 27085, National Bureau of Economic Research, Cambridge MA, May 2020.

Mongey, Simon, and Alex Weinberg. 2020. "Characteristics of Workers in Low Work-From-Home and High Personal-Proximity Occupations" Becker Friedman Institute White Paper, March 2020.

Taylor, Derrick Bryson. 2020. "How the Coronavirus Pandemic Unfolded: A Timeline." *New York Times*, June 9.

Table 1. OLS Regression Results: Factors Impacting Year-over-Year U.S. Industry Employment Change, 2019 to 2020 (n=116)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Constant	-0.009	-0.009	-0.014	-0.025	-0.016	-0.020	-0.017	-0.017	-0.016
	(0.009)	(0.009)	(0.010)	(0.045)	(0.038)	(0.032)	(0.031)	(0.030)	(0.028)
Close Physical Proximity	-0.007	0.005	-0.005	-0.206**	-0.212***	-0.207***	-0.187***	-0.187***	-0.182***
	(0.018)	(0.018)	(0.019)	(0.089)	(0.076)	(0.063)	(0.062)	(0.059)	(0.055)
High Public Interaction	-0.008	-0.003	-0.012	-0.134**	-0.110**	-0.048	-0.023	-0.014	-0.011
	(0.012)	(0.012)	(0.013)	(0.062)	(0.053)	(0.044)	(0.043)	(0.041)	(0.038)
Past Industry Growth	0.041***	0.043***	0.051***	0.048	0.076	0.086*	0.080*	0.086**	0.090**
	(0.011)	(0.011)	(0.013)	(0.058)	(0.050)	(0.042)	(0.041)	(0.039)	(0.036)
Establishment Size	-1.8E-05	-2.9E-05	-6.1E-06	1.5E-04	9.5E-05	5.7E-05	5.1E-05	5.6E-05	5.0E-05
	(2.8E-05)	(2.8E-05)	(3.0E-05)	(1.4E-04)	(1.2E-04)	(1.0E-04)	(9.8E-05)	(9.4E-05)	(8.7E-05)
Computer Occupations	0.071**	0.064**	0.075**	0.316**	0.245*	0.219**	0.204*	0.175*	0.148
	(0.031)	(0.030)	(0.033)	(0.155)	(0.131)	(0.110)	(0.107)	(0.102)	(0.096)
New York Metro	-0.004	0.012	-0.094	-1.052**	-0.865**	-0.803***	-0.761**	-0.696**	-0.626**
	(0.084)	(0.084)	(0.092)	(0.426)	(0.361)	(0.303)	(0.295)	(0.281)	(0.262)
Broad Industry Controls:									
Manufacturing	0.004	0.004	0.010	-0.030	-0.024	-0.001	-0.008	-0.008	-0.006
	(0.010)	(0.010)	(0.011)	(0.052)	(0.044)	(0.037)	(0.036)	(0.034)	(0.032)
Trade and Transportation	0.011	0.008	0.018	0.009	-0.013	0.000	-0.003	0.002	0.001
	(0.011)	(0.011)	(0.012)	(0.056)	(0.047)	(0.039)	(0.039)	(0.037)	(0.034)
Information	0.017	0.012	0.019*	0.039	0.013	0.007	-0.003	-0.006	-0.004
	(0.011)	(0.010)	(0.011)	(0.053)	(0.045)	(0.038)	(0.037)	(0.035)	(0.033)
Professional and Business Services	0.034***	0.025**	0.030**	0.122*	0.117**	0.120***	0.105**	0.100**	0.094**
	(0.012)	(0.012)	(0.013)	(0.063)	(0.053)	(0.044)	(0.043)	(0.041)	(0.039)
Leisure and Hospitality	0.020	0.011	-0.004	-0.247***	-0.265***	-0.203***	-0.203***	-0.201***	-0.185***
	(0.014)	(0.014)	(0.016)	(0.073)	(0.062)	(0.052)	(0.050)	(0.048)	(0.045)
Other Services	0.024	0.019	0.014	-0.078	-0.054	0.001	0.014	0.018	0.016
	(0.017)	(0.017)	(0.018)	(0.085)	(0.072)	(0.061)	(0.059)	(0.056)	(0.053)
R-squared	0.318	0.300	0.305	0.443	0.489	0.473	0.441	0.445	0.444
Adjusted R-squared	0.238	0.219	0.224	0.378	0.429	0.412	0.376	0.380	0.380

Notes. Standard errors are shown in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1-, 5- and 10-percent levels.

Figure 1. Year-Over-Year U.S. Employment Change, January to September 2020

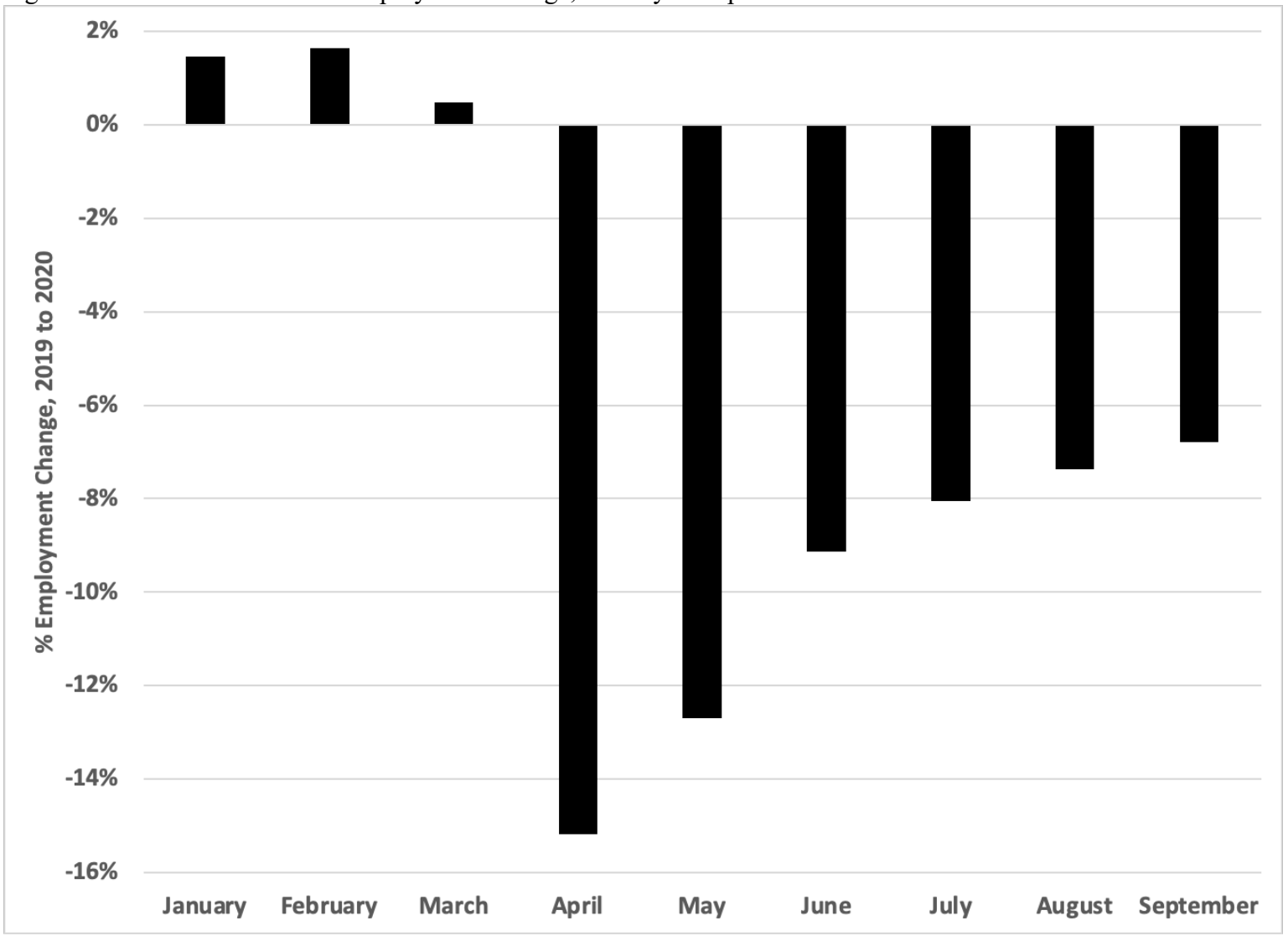

Figure 2. Effects of Close Physical Proximity and High Interaction with the Public on U.S. Industry Employment Change