STEM Employment Resiliency During Recessions: Evidence from the COVID-19 Pandemic

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James C. Davis,[1] **Holden A. Diethorn,**[2] **Gerald R. Marschke,**[2,3] **Andrew J. Wang**[4]; [1]USDA, [2]NBER, [3]University at Albany, SUNY, [4]Stanford University

Abstract

STEM occupational employment suffered smaller peak-to-trough percentage declines than non-STEM employment during both the Great Recession and COVID-19 recession, suggesting a relative resiliency of STEM employment during recessions in the digital age. We exploit the sudden peak-to-trough declines in STEM and non-STEM employment during the COVID-19 recession to measure STEM recession-resiliency during the pandemic, decomposing our difference-in-differences estimate into parts explained by various sources including differences in demographics, educational attainment, job tasks, remote work capability, industry, and STEM knowledge importance on the job. We find that STEM knowledge importance on the job explains the greatest share of STEM employment resiliency, and that workers in non-STEM occupations who nonetheless use STEM knowledge experienced higher employment rates during the pandemic. We show that R&D expenditures and employment also remained resilient, suggesting only a mild effect of the COVID-19 pandemic on innovative activity. Altogether, our findings suggest that increasing opportunities for STEM training—including outside the college-track—may help improve the employment resiliency of workers during future recessions.

Research Questions

1. *Descriptive: How did STEM worker employment, R&D employment, and R&D expenditures fare during the Great Recession and COVID-19 pandemic?*
2. *Analytical: What accounts for the greater recession-resiliency of STEM employment over non-STEM employment?*

Data

- QCEW data on monthly industry employment and OES data on occupational employment by industry.
- CES data on employment in R&D-intensive industries, BEA data on R&D expenditures.
- IPUMS-CPS data on person-level monthly employment, labor force participation, and work hours, along with background characteristics of each worker. Workers associated with occupation of longest-tenured job in 2019.
- O*NET data on occupational characteristics used to construct a remote work index (RWI), routine task intensity of work (as in [1]), and the importance of STEM fields of knowledge to one's occupation.
- Analytical sample: longitudinal sample of CPS respondents surveyed both before and during the pandemic. We validate that the employment patterns of STEM and non-STEM workers in this longitudinally-restricted CPS sample match those observed in QCEW-OES data.

Empirical Method

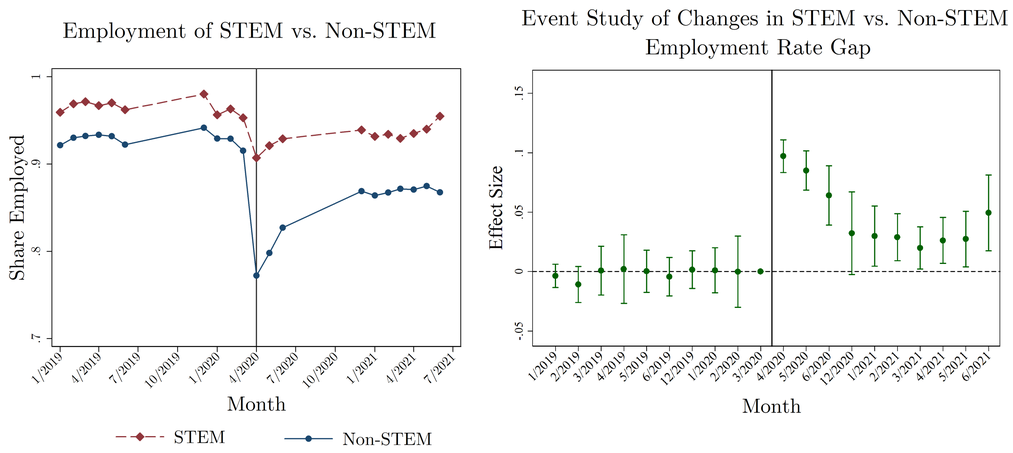

Figure 1: Employment Rate of STEM vs. Non-STEM Workers during the COVID-19 Pandemic (IPUMS-CPS)

- Use a difference-in-differences approach to estimate the differential impact of the COVID-19 pandemic on STEM and non-STEM worker employment.
- We estimate the change in the employment rate gap due to the pandemic and associated mitigation policies— identification assumption is that, in the absence of the pandemic, there would have been no change in the STEM vs. non-STEM employment rate gap.
- Figure 1 shows parallel pre-COVID trends in STEM and non-STEM employment rates, resulting in a constant gap between the two; the gap expands at onset of pandemic and remains at elevated levels throughout the pandemic.
- We find a 9 pp. increase in the STEM vs. non-STEM employment rate gap during the first full quarter of the pandemic (2020Q2) which represents our measure of STEM employment resiliency during the COVID-19 recession.
- We decompose this estimate to investigate the possible mechanisms driving STEM employment resiliency.

Results

- Figure 2 shows that STEM employment resilient relative to non-STEM employment during the Great Recession and COVID-19 pandemic.

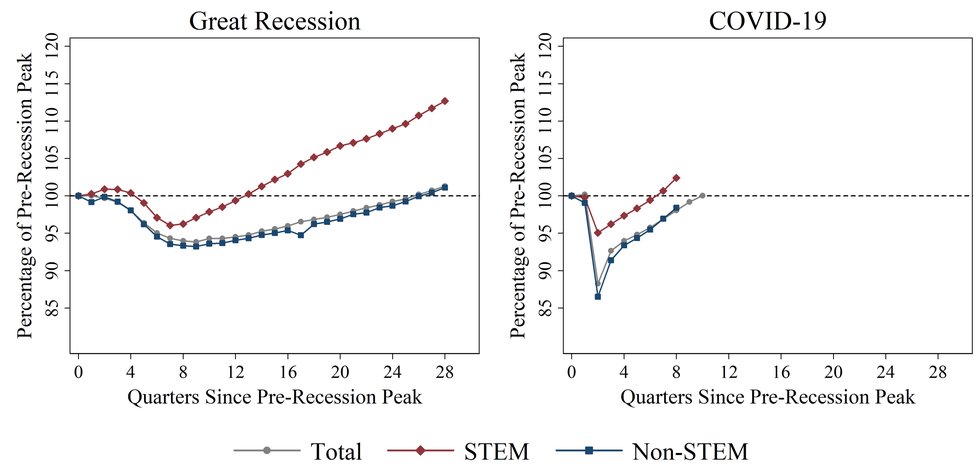

Figure 2: STEM and Non-STEM Employment in the Great Recession and COVID-19 Recession (QCEW-OES)

- Figure 3 shows that R&D employment and expenditures experienced a rapid recovery, with R&D spending continuing to increase despite two quarters of output declines in 2022.

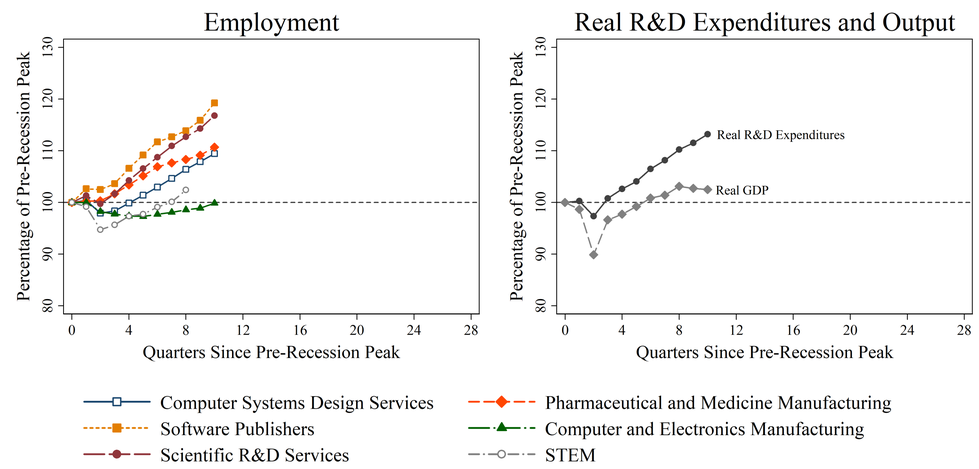

Figure 3: Employment in R&D-intensive Industries and Aggregate R&D Expenditures during COVID-19

- Figure 4 shows that the importance of STEM knowledge on the job is the greatest source of STEM employment resiliency; more important than job's remote work feasibility (RWI), educational attainment, and demographics.
- Whether job relies on routine/non-routine and cognitive/manual tasks is most important in explaining STEM resiliency among non-college-educated workers.

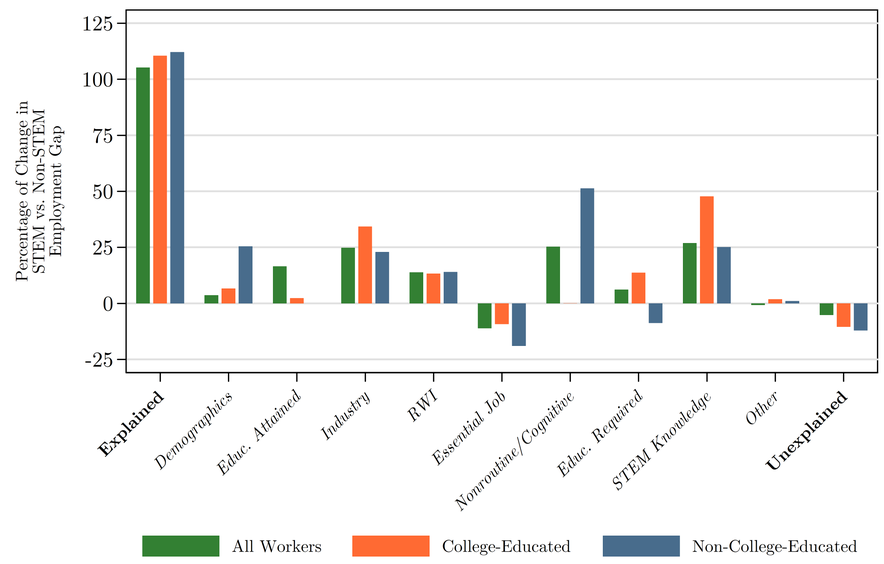

Figure 4: Decomposition of STEM Employment Resiliency

- Other results: STEM workers were also relatively resilient in terms of labor force participation and work hours during the pandemic. There are more workers in non-STEM occupations where STEM knowledge is important than there are workers formally classified as working in STEM occupations, and STEM knowledge conferred a degree of employment resiliency to these workers as well.

Conclusions

- STEM employment, R&D employment, and R&D expenditures relatively resilient during the COVID-19 pandemic.
- STEM knowledge an important source of employment resiliency for workers during the COVID-19 recession.

References

[1] **Acemoglu, Daron and David Autor.** 2011. "Skills, Tasks, and Technologies: Implications for Employment and Earnings." In *Handbook of Labor Economics*. Vol. 4, Part B, 1043–1171. Elsevier.

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