The Earnings Record and the AI Shock: Methodology

Data and methods behind "The Earnings Record Cannot See the AI Shock Yet" · opportunitydata.org/recent-grad-ai-disruption.html · October 2026

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1. The Census working paper

Orr, Cody, Lee C. Tucker, and Lawrence Warren, "Graduating into Disruption: Labor Market Outcomes for AI-Exposed College Majors," Center for Economic Studies Working Paper CES-WP-26-56, U.S. Census Bureau, September 2026. The paper links Post-Secondary Employment Outcomes graduate records to Longitudinal Employer-Household Dynamics earnings for 6.67 million bachelor's graduates, about 29 percent of bachelor's degrees conferred from 2016 to 2024, and estimates an event study around the November 2022 release of ChatGPT by decile of the Eloundou et al. (2024) GPT-4 Beta exposure score assigned to ACS field-of-degree codes. Headline estimates for the top decile: employment in the quarter after graduation down 5 percentage points, full-quarter initial earnings down 13 percent, earnings two years out down 3.3 log points. The paper's earnings series end in mid-2025 (employment through 2025Q2 in its decomposition), and its authors note the 2025 ACS was unavailable when written. The restricted microdata cannot be re-estimated publicly; this analysis uses the paper's Appendix Table A3, which reports for 142 fields with at least 1,000 graduates the three standardized exposure scores (Eloundou, Eisfeldt, Handa), each field's decile, and the paper's 2024 employment and log-earnings coefficients.

2. Exposure measure and crosswalk

The Opportunity Data AI Exposure Index, September 2026 data release, scores 911 occupations from nine O*NET work-characteristic variables (digital intensity as exposure driver; human contact and physical anchoring as protective structure) and aggregates to 1,806 academic programs through employment-weighted CIP 2020 to SOC 2018 crosswalks. Methodology: opportunitydata.org/ai-exposure-methodology.html.

The ACS records field of degree in 174 codes (FOD1P). A crosswalk from each code to 4-digit CIP 2020 codes was built by hand from the two code lists: 393 field-to-CIP pairs, 174 of 174 codes mapped, all 369 in-scope 4-digit CIPs claimed (CIP families 60, 61, and 99, residencies and fellowships, are out of scope). Twelve 4-digit CIPs are shared by more than one field code because the ACS splits them at six digits; those CIPs enter each claiming field. Match types: 168 exact, 74 manual, 27 family fallback, 46 general residual, 78 other residual. The score for each field is the completer-weighted mean of its 4-digit CIP scores, weighted by bachelor's completer counts from the College Scorecard field-of-study file. Deciles over fields are weighted by graduate counts so each decile holds

about a tenth of graduates.

Validation against the Census paper's measures across the 140 matched fields: Pearson 0.71 and Spearman 0.70 with the Eloundou score; Spearman 0.70 with Eisfeldt; 0.29 with Handa. Graduate-weighted R-squared predicting the paper's 2024 employment coefficient: 0.35 for the index alone, 0.65 for the Eloundou score alone; for the 2024 log-earnings coefficient, 0.16 and 0.47. Entered jointly, the index coefficient on employment is +0.002 per standard deviation and not distinguishable from zero. Eight of the index's seventeen top-decile fields are in the paper's top decile (every computing field, electrical and aerospace engineering); sociology, mechanical engineering, materials engineering, and international studies are in the index's top decile and the paper's deciles 5 to 8. The index measures digital and analytical work intensity, not language-model task exposure, and is the weaker predictor of realized 2022-2024 effects. All survey results are therefore reported under both groupings.

3. American Community Survey analysis

ACS one-year Public Use Microdata Samples for 2019, 2021, 2022, 2023, and 2024, downloaded from www2.census.gov (the 2020 one-year file was not released; the 2025 file was not posted as of October 28, 2026). Sample: SCHL equal to 21 (bachelor's degree, no higher), SCH equal to 1 (not enrolled), ages 22 to 24 for the headline series and 22 to 27 for the sensitivity series, with a non-missing field of degree. Employment status from ESR: employed (1, 2, 4, 5), unemployed (3), not in labor force (6). Unemployment rate is unemployed over labor force; employment rate is employed over all respondents in the group. Person weights (PWGTP) throughout. Wages are WAGP times ADJINC, deflated to 2024 dollars with CPI-U annual averages. Full-time full-year is usual hours (WKHP) of 35 or more, weeks worked (WKWN) of 50 or more, and positive wages.

Headline results, top decile of the Opportunity Data index against deciles 1 to 6, ages 22 to 24: unemployment 5.8/4.9 (2019), 7.9/7.2 (2021), 4.8/5.0 (2022), 6.0/4.7 (2023), 9.1/5.4 (2024) percent. Employment rate, top decile: 90.9, 86.1, 90.6, 90.5, 87.3 percent; deciles 1 to 6: 89.4, 86.2, 88.9, 89.5, 88.9. Difference-in-differences on the employment rate, 2024 against 2022: minus 3.3 points (index grouping), minus 1.8 points (Census grouping). Ages 22 to 27: minus 1.4 and minus 1.0 points. Cell sizes (unweighted respondents) range from 1,720 to 2,672 in the top decile and 9,187 to 11,035 in deciles 1 to 6.

4. PSEO cohort series

Census Bureau Post-Secondary Employment Outcomes, release R2026Q2, all-institution aggregates by 4-digit CIP (agg_level_pseo 36), bachelor's degree (degree_level 05), earnings one, five, and ten years after graduation, in real 2023 dollars as published. Three-year graduating cohorts (2001-03 through 2019-21); the 2011 single-year cohort cells are dropped. Each CIP cell carries its index score and decile; the series is the graduate-weighted median of cell medians within decile and cohort (weights are cell graduate counts). Cell counts per decile-cohort range from 185 to 832. Dispersion within the top decile uses the published 25th and 75th percentiles by cell, aggregated the same way: p75/p25 fell from 1.95 (2001 cohort) to 1.65 (2019 cohort); p25 rose 39 percent and p75 rose 17 percent.

4a. College Scorecard one-year earnings panel

College Scorecard field-of-study data, October 15, 2026 release, from the raw data archive (College_Scorecard_Raw_Data_10152026.zip), yearly files FieldOfStudyData1819_1920, 1920_2021, and 2122_2223, bachelor's programs (CREDLEV 3). The yearly files are labeled by pooled debt cohort; the earnings cohort each one carries is taken from the data dictionary's FieldOfStudy_Cohort_Map sheet: EARN_MDN_1YR in the 1819_1920 file is completers of AY2017-18 and AY2018-19 measured in CY2019 and CY2020 (2021 dollars); in the 1920_2021 file, completers of AY2018-19 and AY2019-20 measured in CY2020 and CY2021 (2022 dollars); in the 2122_2223 file, completers of AY2020-21 and AY2021-22 measured in CY2022 and CY2023 (2024 dollars). The 2021_2122 file carries no one-year earnings. The 2122_2223 values match the Most-Recent-Cohorts file in 99.9 percent of programs. Each cohort is re-deflated to 2024 dollars with CPI-U annual averages (2021: 270.970; 2022: 292.655; 2024: 313.689). Programs are assigned the index decile of their 4-digit CIP from the program-level decile cut used in Section 4 of the page.

Level series: graduate-weighted median of program medians by decile and cohort, weights EARN_COUNT_WNE_1YR. Decile 10: $71,992, $70,701, $69,726; decile 9: $66,531, $66,902, $68,526; decile 5: $47,272, $48,389, $52,995; decile 3: $35,520, $34,682, $38,384; decile 1: $74,495, $80,241, $81,303 (nursing dominates decile 1). Within-program change: programs matched on UNITID and 4-digit CIP with a median in both cohorts, weighted mean of the change in log real median, weights the average of the two cohorts' completers working. First to last cohort: decile 1 +4.1 percent, 2 +9.4, 3 +14.1, 4 +10.4, 5 +7.4, 6 +5.2, 7 +5.5, 8 +5.2, 9 -0.3, 10 -0.5 (1,166 to 3,597 programs per decile). Consecutive-cohort changes are in the published file.

Limitations: Title IV aided completers only; a full calendar year of earnings, so hours and part-year work enter the median; the 2020-22 cohort is measured half before and half after November 2022; the middle deciles' gains include recovery from the 2020-21 cohort's pandemic year, which is why the first-to-last comparison is shown alongside the consecutive one; program medians are differentially private and small cells are suppressed. Published files: scorecard_1yr_by_ai_exposure_decile_20261029.csv and scorecard_1yr_within_program_change_by_decile_20261029.csv.

5. Earnings-test mechanics and lag arithmetic

U.S. Department of Education, "Accountability in Higher Education and Access Through Demand-Driven Workforce Pell: Student Tuition and Transparency System (STATS) and Earnings Accountability; Final Rule," 91 FR 40136 (July 1, 2026), read from the govinfo.gov text. Median earnings of completers in the fourth tax year after completion, workers only: 34 CFR 668.403(b)(1). Cohort period and backward expansion below 30 completers: 668.2. Two failing years of any three consecutive: 668.603(a). Tipped-occupation carve-out for tax-year 2025 or earlier earnings: 668.402(c)(3). First calculation on award-year 2021 completers using tax-year 2025 earnings: Department of Education, "Timeline for Implementing the Earnings Test," January 7, 2026. Lag table: award-year cohort plus four tax years gives the measurement year; scoring follows about two years later on the Department's timeline; the earliest consequence assumes failing results in the first two years scored.

5a. Enrollment data

National Student Clearinghouse Research Center, Preliminary Fall 2026 Enrollment Trends, released October 29, 2026 (nscresearchcenter.org/prelim-fall-enrollment-trends). Per the report's methodological notes, it reflects approximately 7.92 million enrollments reported as of September 24, 2026 by 46.0 percent of participating institutions, and reports fields by aggregating six-digit CIP 2020 codes into two-digit CIP families. Figures used: Computer and Information Science enrollment -12.4 percent at 4-year institutions, -12.3 percent at 2-year, -10.4 percent graduate; Health +6.2, +4.3, +2.0; undergraduate enrollment +0.6 percent overall, +1.2 percent at community colleges, +0.3 percent at public 4-year, 0.0 at private nonprofit 4-year; graduate -1.6 percent. The two-year cumulative computer science declines (-18.4 percent 4-year undergraduate, -17.5 percent 2-year, -27.1 percent graduate; -5.9 percent at 2-year colleges in fall 2025) and the mechanic and repair technologies increase (+6.1 percent) are reported by Community College Daily (Dembicki, October 29, 2026) from the Clearinghouse dashboard and are attributed to that report on the page. All figures are preliminary and subject to revision; the final fall 2026 report is due in January 2027 and the page will be updated to it.

6. Sensitivity checks

Exposure grouping: under the Census paper's Eloundou deciles instead of the Opportunity Data deciles, top-decile unemployment runs 6.2, 7.6, 5.5, 6.3, 9.0 percent (2019 to 2024) against 4.7, 6.9, 5.1, 4.8, 5.4 for deciles 1 to 6. The direction, timing, and 2024 level are the same; the 2022-to-2024 employment difference-in-differences is smaller (1.8 against 3.3 points).

Age band: widening to 22 to 27 reduces the top-decile unemployment rise (3.5 to 6.1 percent, 2022 to 2024, index grouping) and the employment difference-in-differences (1.4 and 1.0 points), consistent with an entry-cohort effect diluted by earlier graduates.

Wage margin: among full-time full-year workers aged 22 to 27 in the top decile, the 10th, 25th, 50th, and 75th percentiles in 2024 are within three percent of 2019 in constant dollars ($38,600, $56,900, $81,200, $101,500 against $37,200, $53,300, $80,600, $99,200); the 90th rose from $133,900 to $147,200. The p90/p10 ratio moved from 3.60 to 3.82. No relative wage decline is detectable for the employed.

Comparison group: using deciles 7 to 9 instead of deciles 1 to 6 as the comparison gives 5.5 percent unemployment in 2024 (from 4.5 in 2022), so the top-decile divergence is not an artifact of the least exposed fields alone.

Crosswalk (computed October 29, 2026): dropping the twelve 4-digit CIPs shared by more than one field code leaves field scores rank-correlated 0.993 with the baseline and moves three fields from the top decile to decile 9 (Electrical Engineering, Industrial and Manufacturing Engineering, Miscellaneous Social Sciences), with none entering. Equal-weighting CIPs within a field instead of completer-weighting gives a rank correlation of 0.969 and moves four fields to decile 9 (Aerospace, Electrical, and Materials Engineering, Miscellaneous Social Sciences) while Civil Engineering enters. All eight computing fields remain in the top decile under both variants. Because deciles are graduate-weighted cuts, the margin between deciles 9 and 10 is where assignments move; the computing core that drives the result does not.

7. Limitations

The ACS cannot separate unemployment from labor-force exit, graduate enrollment deferred past the survey week, or employment outside the field of degree. The 22-to-24 sample includes graduates up to three years out, so entry effects are attenuated relative to the Census paper's quarter-after-graduation estimates. PSEO covers participating institutions only, and institutions joining in later releases shift cohort composition. The spring 2026 agentic frontier break is a dated design assumption of the Opportunity Data AI Exposure Index (Rowe 2026, documented with METR Time Horizon 1.1 and Stanford HAI 2026), not an estimated labor-market effect; no public data yet observes a cohort that graduated after it.

7a. Comparison with Fairlie and Wu (2026)

Fairlie, Robert, and Jane Wu, "The Early Impacts of AI on Employment Among Recent College Graduates," CESifo Working Paper 12994 (September 2026). Sample: CPS microdata, individuals aged 22 to 25 whose highest degree is a bachelor's and who are not enrolled, June through August 2026 against prior summers (2022 to 2025 average), older graduates aged 30 to 49, and young non-graduates. Reported estimates: summer 2026 coefficient -0.008 (s.e. 0.007) under the standard unemployment measure with a linear trend and 0.001 (0.008) in the event-study form; the expanded measure adding those who want a job gives 0.001 (0.009) and 0.008 (0.010); the young-graduate times summer-2026 interaction against middle-aged graduates is -0.007 (0.008). Interactions with theoretical and observed occupational AI-exposure measures are positive and not significant; teleworkability is positive and marginally significant. Reconciliation with this page: the CPS carries no field of degree, so the top-decile doubling reported here (4.8 to 9.1 percent, about a tenth of graduates) and the half-point move in the bottom 60 percent pool to roughly a point, within their standard error; their comparison baseline includes the 2023 and 2024 survey years in which the field-level divergence appears here; and their exposure interaction classifies by current or last occupation rather than by major, which the Census decomposition's industry-switching channel would attenuate. Their data are also two survey years later than the ACS used here, so the 2025 and 2026 ACS reruns are the direct test.

8. Versioning and next validation

Inputs: ACS one-year PUMS through 2024; PSEO R2026Q2; Clearinghouse preliminary fall 2026 enrollment (to be replaced by the January 2027 final report); College Scorecard field-of-study file released October 15, 2026; Opportunity Data AI Exposure Index September 2026 release. The analysis will be rerun when the 2025 ACS one-year file is posted and again when the 2026 file is released in late 2027. Next validation: the 2025 rerun under both groupings. Persistence or widening of the 2024 top-decile unemployment gap confirms the employment-margin finding; closure will be reported on the page.

9. Published data and provenance

Date-versioned files for recomputation: **recent_grad_outcomes_by_ai_exposure_20261028.csv** (survey year, grouping, exposure group, respondents, employment and unemployment rates, median wages); **pseo_bachelors_y1_by_ai_exposure_decile_20261028.csv** (decile, cohort, one-, five-, and ten-year medians, cell counts); **acs_fod_to_cip4_crosswalk_20261028.csv**; and **ai_exposure_index_by_acs_field_of_degree_20261028.csv**. Analysis page: **opportunitydata.org/recent-grad-ai-disruption.html**. Data files are date-versioned; every deploy of the site is timestamped (RFC 3161) with public Wayback snapshots. A working paper with the full tables is available from the author.

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