Preliminary Estimated Workforce Effects of Automation from AI

What are the expected employment effects (i.e., job loss) from AI-driven automation? Over what period of time should we expect these effects to play out?

Roughly 1.6–3.2 million workers could lose their jobs over the next 20+ years, around 1–2% of total US employment via May 2022 OEWS. These are <u>gross</u> job losses, we expect many of these people will find new employment. (Details of calculation and alternative estimates on next page).

This would be <u>less than half</u> the impact of the China Trade Shock on US manufacturing, with similar timing (a decade or longer). [Acemoglu et al. (2016)](#) estimate <u>net</u> job losses from rising Chinese import competition over 1999–2011 in the range of 2.0–2.4 million.

In addition, China Shock job losses were more regionally concentrated than what we expect from generative AI (more below). E.g., "Office and Administrative Support" [does not have a strong geographic](#) component. However, there will be still be variation, e.g., "Business and Financial Operations" [which does show patterns of regional concentration](#) (e.g., DMV, CO, WA, NY).

Likely: wage declines of ~33–47% for the demographic groups which are engaged in occupations <u>most-exposed</u> to generative AI, <u>relative</u> to others who are less exposed to this form of automation. This is based on the effects of other, similar employment shifts in US history.

Which jobs will be most-affected in this first phase of AI-driven replacement? Most expect these effects to threaten white collar jobs, but specifically which occupations?

The most at-risk workers include the following major occupational groups, which have many repetitive tasks which could be subject to automation:[1]
- Office and Administrative Support Occupations (e.g., clerks, human resources, proofreaders, interviewers, telephone operators, customer service representatives)
- Business and Financial Operations Occupations (e.g., loan officers, financial examiners, insurance underwriters, accountants, auditors, tax preparers)
- Sales and Related Occupations (e.g., telemarketers, insurance sales agents)
- Legal Occupations (e.g., title examiners, legal assistants)
- Arts, Design, Entertainment, and Media Occupations (e.g., interpreters, translators, editors)

Should companies be held responsible for job loss? If so, how? What are some alternatives?

We recommend focusing efforts on accelerating the creation of <u>new tasks</u> for people, primarily through redirecting technological change in that direction. Making this a priority for a new National Institutes for Computing, e.g., as part of the implementation of the Chips and Science Act, would be a powerful step in the right direction. Require the inclusion of workers and civil society in strategic decision-making at NIC, which would integrate federal efforts in this field.

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[1] We build on the work of [Felten, Raj, and Seamans (2023)](#) to identify some of the most at-risk occupational categories and estimate possible job losses. See the Additional Details below for more information.

Additional Details

We use Felten, Raj, and Seamans (2023) for job-exposure to generative AI as our baseline. Building from previous research which shows that "repetitive" job tasks are most likely to be automated, we then identify a subset of 43 occupational categories which have a high exposure to generative AI (AIOE > 1) and have a relatively low portion of "complex" (i.e., non-repetitive) tasks. Using BLS employment statistics, we estimate that roughly 12.8m workers, a little less than 10% (~8.7%) of the US labor force, are exposed to automation by Generative AI. Based on findings from manufacturing automation (Acemoglu and Restrepo, 2022), we conservatively estimate that 13-25% of these jobs could be lost over the next 20+ years. In short, **~1.6–3.2 million workers could lose their jobs, which corresponds to around 1–2% of total US employment** using May 2022 OEWS Survey numbers. These are gross estimates.

Research from other sources (e.g., Eloundou et al., 2023; McKinsey, 2023) suggest higher exposure to task-automation, which, if true, would result in higher job loss and worker displacement (respectively, approximately 23m workers, ~15.6% of workforce; 22–52m workers, 15–35% of workforce). We do not currently believe that these are realistic estimates for job loss, because generative AI is neither flexible enough to occupy all social (human-to-human) aspects of work, nor is it well-suited to the non-routine aspects of many "white collar" jobs. However, in the future, it is possible that additional job processes could be routinized, such that generative AI could cause greater displacement. This is not presently widespread.

Acemoglu et al. (2016) estimate **net job losses from rising Chinese import competition over 1999–2011 in the range of 2.0–2.4 million**. This means that the job losses from generative AI could be comparable to the impact of the China trade shock. This job loss was regionally concentrated. Places like Catawba County (Morgantown, NC) had steep manufacturing employment declines (to 38k in 2014 from 79k in 2000). We predict that the most-impacted occupations include categories like "Office and Administrative Support" — which do not appear to have a strong geographic component — but also categories like "Business and Financial Operations" — which do show patterns of regional concentration. It is possible that generative AI job loss has a geographical component, but the effects will likely be more geographically diffuse than the concentrated impacts of the China Trade Shock.

Another example from recent history is the increased use of industrial robots on US manufacturing. Various estimates from Acemoglu and Restrepo (2020), approximate an aggregate employment reduction by 420k–756k jobs on net over a 25-year period in the 1990s and early 2000s due to growth in the use of industrial robots. This suggests that early job losses from generative AI could be comparable to, or greater than, the impact of growth in the use of industrial robots.

A growing economic literature explores the impacts of task-automation and new task creation on the residual wage structure of partially automated occupations. Measuring the effect of task displacement (as the share of tasks that workers lose to automation) on the log difference in hourly wages from Acemoglu and Restrepo (2022), using the primary estimate range of -1.31 to -1.86 fall in the log difference of wages, and assuming 25% task-displacement in affected occupations, we could see (relative) wage declines of ~33–47% for the demographic groups which are engaged in occupations exposed to generative AI, relative to others that are less exposed to automation from generative AI.