When specialization becomes repetition: The urban division of labor and routinization of tasks

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1. Introduction and motivation

It is well-established in earlier research that work-related routine tasks, commonly defined as being performed repeatedly and with clear-cut steps, are susceptible to automation, be it by for instance robots or computers. If there is something that routine-biased job polarization has taught us is that routine jobs in the past have faced the brunt of automation-induced displacement (e.g., Autor, 2015; Fernández-Macías et al., 2016). With the advent of smarter machines in the wake of recent developments in artificial intelligence (AI), the question has been raised whether machines soon will be capable of displacing non-routine tasks too, tasks requiring creative and social skills, and hence jobs that historically have been shielded from earlier waves of technology-induced structural change.

Much like the number of manufacturing blue-collar jobs diminished as factories adopted a wide array of flexible production processes including industrial robots and computer numerically controlled machines, Ford (2015) argues that the next automation-induced waves, which are yet to occur, will affect white-collar jobs in services. This development, he argues, will be most evident among entry-level positions, leaving university graduates especially susceptible to automation-induced displacement. A majority of workers today are employed in the diverse services sector, and most of them work in cities. Cities have historically been remarkable engines of growth and contain the occupational and industrial structures that can enable them to create new jobs to replace

those displaced by machines. But as Frank et al. (2018) argue, cities are not automatically resistant to the adverse effects of automation since they enable a more specialized division of labor. Cities have in the past benefited from their plethora of jobs containing tasks that are difficult to automate. But what if the issue is not machines mastering social or analytical skills, where people hold a comparative advantage, but the issue rather being that jobs transform to contain a greater degree of tasks in which machines hold the comparative advantage. Similar to the factories of yesterday, cities today are intricate hubs encompassing agglomeration economies and featuring a higher degree of specialist labor (Massey, 1995; Wernberg, 2019). Does this division of labor, as brought about by the city, transform work in such a way that tasks become increasingly susceptible to displacement by machines?

This paper investigates the relationship between the urban division of labor on occupations' susceptibility to automation. I hypothesize that cities enable a routinization of tasks as a result of the finer division of labor entailed by an agglomeration of industries and occupations. If this is the case, occupations embedded in urban labor markets become increasingly susceptible to automation.

Earlier findings highlight the routinization of work. Fernández-Macías et al. (2016) and Fernández-Macías et al. (2023) find that workers, especially in white-collar managerial positions and jobs requiring higher education, have experienced an increased share of routine tasks, a so-called routinization of jobs. By examining whether cities contribute to this routinization of work, I contribute to the literature on agglomeration economies and automation impacts on labor markets. A major theme in earlier literature is the study of the extensive margin of occupations, and how the composition of occupations changes given automation-induced structural change. In this paper, I focus on the intensive margin of occupations and how task contents change as a result of the specialized division of labor entailed by an urban labor market.

2. Theoretical framework

This paper's theoretical foundation for analyzing the change in occupation task contents is the task-based framework (e.g., Autor, 2013; Acemoglu & Restrepo, 2019). This framework highlights job tasks as the fundamental unit of production, and how tasks are performed by either labor or capital given comparative advantage. Automation

technologies decrease the share of tasks performed by labor and hence substitute capital for labor, increasing the comparative advantage of machines in the labor displaced tasks. In addition to the direct displacement effect, automation also entails a productivity effect, potentially bolstering labor demand (Acemoglu & Restrepo, 2019). Labor market outcomes depend upon which effect outweighs the other. History offers an ample number of examples where the displacement of tasks has been compensated by the expansion of other tasks or creation of new tasks (Autor, 2015).

3. Data and method

I intend to use two data sets for this paper. The first data set consists of the 2011/2012 and 2022/2023 cycles of the Programme for International Assessment of Adult Competencies (PIAAC) Survey of Adult Skills, conducted in OECD countries. This survey-level data encompasses a wide range of information on individuals' demographics, education, income, occupation, industry, detailed accounts on work-related tasks and skills, as well as reading, calculating, and problem-solving competencies. The second data set consists of Swedish geocoded employer-employee matched administrative data, featuring individuals and firms. Both datasets are provided by Statistics Sweden. The aim is to use the PIAAC data to estimate within occupation changes in tasks contents and the administrative data to retrieve information on regional characteristics and the distribution of occupations and industries.

The overall research design will encompass quantitative methods, foremost descriptive and econometric analyses, to utilize the richness of the PIAAC data for the proposed research question and aims to include analyses where work-related tasks are linked to geography, which allows for the study of the spatial division of labor in cities.

4. Tentative conclusions

Workers in cities have a relatively smaller set of subtasks than their rural peers, indicating a greater degree of specialization. Moving forward, I aim to explore to what extent this specialization correlates with automation susceptibility (as measured by the share of routine tasks) and how the work organization of the establishment, embedded in the urban labor market, impacts this relationship.

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