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Business

The Future of Work in China and the World

To understand why the impact of technology on jobs can be different in China and other countries, Professor Albert PARK at the Department of Economics, HKUST Business School, is leading a research program to analyze data on occupations and job tasks in China. The program yields some interesting insights into the subject.

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With the rise of robotics and artificial intelligence, there is intense interest in how technology will shape the future of work as well as concern that new technologies will destroy jobs. It is instructive to remember that such concerns are not new but have been voiced repeatedly in the past, starting with the steam engine and more recently with the computer. Although research suggests that computers did lead to declines in employment in some occupations, for the most part these have been offset by increases in other occupations, in some cases created by the new technologies themselves (e.g. computer systems managers). Thus, despite rapid technological change, the world has yet to witness the emergence of widespread unemployment. On the other hand, technology has increased worker productivity and contributed to faster economic growth, while also delivering new products and conveniences enjoyed by consumers worldwide. And yet, some worry that new technologies, especially AI, may be qualitatively different from the technologies of the past.

Economists have generally resisted apocalyptic views of technological changes. Unlike engineers who focus on counting which jobs could be performed by machines, economists focus on whether it will be profitable to do so. They also recognize that technologies may substitute for some types of work, but also could be complementary to other types of work.

Changing nature of work

Analyzing detailed micro-data, researchers have shown that in the US and other advanced countries, the demand for non-routine cognitive tasks has increased steadily over time while the demand for routine tasks (cognitive and manual) has decreased due to technology and outsourcing. Because many middle-skill occupations feature routine tasks, this has led to wage polarization, with job growth occurring in difficult-to-replace high-skill jobs that require problem-solving as well as low-skill, service-oriented jobs (e.g. barbers, drivers). However, much less is known about how the nature of work is changing in China and other emerging

markets and developing countries. The World Bank's *2019 World Development Report* on the

Changing Nature of Work points out that the experiences of poorer countries are quite mixed, not necessarily mirroring the hollowing out of middle-skill, routine jobs found in the US. In fact, our research finds that in China, in contrast to the US, the share of jobs in middle-skill occupations actually increased between 2000 and 2015!

To understand why the impact of technology can be different in China and other countries, one must recognize that in addition to technological change, several other fundamental forces are also affecting the nature of work in many countries, specifically globalization, structural change, and the supply of skills. When countries specialize in global value chains, it is expected that routine-intensive tasks will be outsourced from high-wage countries and in-sourced to low-wage countries. Thus, by specializing in assembly operations, China may have increased its demand for routine tasks. As a developing country, China has experienced structural change that reduced jobs in agriculture and increased jobs in industry. But by far the most dramatic change has been the steady growth in service sector jobs, which increased from 28% of the nonagricultural labor force in 2000 to 43% in 2016. Changes in the demand for goods and services alters the demand for different types of job tasks. Finally, the labor force in poorer countries often is much less educated (or less skilled), which could influence the optimal assignment of routine and non-routine tasks.

Occupation and task data in China

To better understand the nature of work in China, I am leading a research program on job tasks in China. We have analyzed detailed occupation data from China's censuses and mini-censuses, and helped collect new survey data on the tasks actually being performed by workers in China. One survey is the China Employer-Employee Survey (CEES) conducted in 2018 of 2,000 manufacturing firms and 15,000 workers in five provinces (with Wuhan University, Stanford University, and the Chinese Academy of Social Sciences (CASS)). The other is the China Urban Labor Survey (CULS) conducted by CASS in 2016 of several thousand workers in six large cities in different parts of the country. A related project has used the CULS data and survey data from 41 other countries to better understand cross-country differences in the nature of work.

These projects are yielding some interesting insights into work in China. First, analyzing the CEES firm and worker data, we find that globalized firms (foreign-owned or exporting) have greater demand for routine tasks (and less educated workers) and less demand for non-routine cognitive tasks (and more educated workers), consistent with China specializing in routine-intensive parts of global value chains (Li et al, 2018). Our cross-country analysis using the CULS data also suggests that for China and other middle- and low-income countries, greater specialization in global value chains is associated with relatively greater demand for routine tasks, especially for low-skill workers (Lewandowski et al, 2019). The cross-country analysis also finds that managerial and professional jobs in China and other middle- and low-income countries are much more routine than in richer countries, and that technology measured by rates of computer use explains much of this difference.

Changes in China's occupational structure as measured by census and mini-census data features an increase in middle-skill, routine-intensive jobs over time, mainly because structural change has increased the size of the service sector, which has led to a substantial increase in retail jobs which are routine-intensive (Du and Park, 2017). However, this analysis cannot account for changes in tasks occurring within occupations over time. Notably, even among narrowly defined manufacturing and service sectors, China has not seen the skill-intensive sectors, such as professional services, grow faster than other sectors. Although the share of college graduates in the labor force has increased, many of the recent graduates are unable to find management and professional jobs, with an increasing share working in retail and even manufacturing operator jobs over time. Only in the last period studied, from 2010 to 2015, do we find that the increase in demand for high-skill occupations is outpacing the demand for middle-skill occupations and that the overall routine task intensity of work is declining.

Largest user of industrial robots

Thus, globalization and structural change both have contributed to making changes in the nature of work different in China than in the US. However, looking forward all signs point towards China following the pattern of richer countries, with technology and an increasingly skilled labor force leading to more jobs emphasizing non-routine cognitive tasks and declining demand for routine tasks. At least since 2010, structural change has consisted of jobs in skill-intensive sectors and occupations increasing faster than in other sectors. Over time, China has expanded its share of global value chains rather than specializing in the most routine-intensive parts. Responding to rapidly rising wages, firms are becoming larger, more productive, and more capital-intensive, all traits associated with greater demand for non-routine cognitive tasks. China has seen an explosion in robot use, passing Germany, South Korea, the US, and Japan to become the world's largest user of industrial robots since 2016.

In conclusion, the future of work in China and globally will increasingly value the ability of highly skilled workers to solve problems and supervise and interact with others. In addition to training students in such skills, it will be important for

researchers at HKUST and elsewhere to carefully monitor how the nature of work is changing, and consider how new technologies developed at HKUST and by others are influencing the jobs of the future. Last year, MIT established a blue-ribbon task force on the Work of the Future to assess this question (see <https://workofthefuture.mit.edu>). HKUST can bring a unique Eastern perspective to understanding the future of work.

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