

Is Job Polarization Path-Dependent? Evidence from Korea*

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Abstract

What is the source of job polarization in Korea? In this paper, we empirically examine if two competing hypotheses, a path-dependency hypothesis and an aging hypothesis, can explain patterns of job polarization in Korea. By exploiting regional variations, we find that between 2008 and 2019, job polarization was more evident in regions in which routine workers were historically more important than non-routine workers (path-dependency) while aging is not associated with the structural change in the labor market. We further show that job polarization is mainly driven by female workers.

Keywords: Job polarization, Routine worker, Aging, Korea

JEL Classification: J20, J23, R23

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I. INTRODUCTION

Job polarization, a phenomenon where jobs for middle-skilled workers have disappeared while those for high- and low-skilled workers have increased since the mid-1980s, has become one of the central research agendas in labor economics.¹ South Korea, a country that has joined the ranks of advanced countries since the late 1990s, is not an exception: Between 2008 and 2019, the share of middle-skilled workers among all employed workers has decreased from 69% to 62.4%.² Figure 1 plots the changes between 2008 and 2019 across regions, which confirms that job polarization is observed in Korea.³

[Figure 1]

In this paper, we investigate the main factors behind job polarization in Korea. In doing so, we consider two well-known hypotheses, a path-dependency hypothesis (Autor and Dorn, 2013) and an aging hypothesis (Acemoglu and Restrepo, 2022).⁴ The former hypothesis argues that job polarization is more evident in a region in which routine workers have been historically important in production so that the routine share was high. As the price of Information and Communications Technology (henceforth ICT) capital has fallen, jobs for routine workers have been replaced by ICT capital since such workers perform tasks that are easily codifiable, whereas cognitive and manual workers' tasks are not (Michaels et al., 2014). Autor and Dorn (2013) show that technological development in historically routine-intensive regions further replaced these workers and led to more severe job polarization in the U.S. The latter hypothesis is relatively new: Acemoglu and Restrepo (2022) hypothesize that aging would have increased demand for automation technology as older workers, whose share increases with aging, have a comparative disadvantage on routine jobs. They confirm that industries that heavily rely on old workers more actively adopt robots for automation.

¹ See Acemoglu and Autor (2011), Autor (2010), Jaimovich and Siu (2020), Mazzolari and Ragusa (2013), and Shim and Yang (2018) among others that study job polarization using the U.S. data. In this paper, we use the terms high-skilled/cognitive, middle-skilled/routine, and low-skilled/manual interchangeably. For detailed classification, refer to Table A.1.

² Authors' calculation using the Local Area Labor Force Survey. We closely follow Acemoglu and Autor (2011) to classify workers into three groups. Table A1 in Appendix shows how we classify workers.

³ According to Cheon (2007), job polarization in Korea started during the early 1990s. Given that job polarization emerged in the mid-1980s in the U.S. (Acemoglu and Autor (2011) and Shim and Yang (2018)), the emergence of job polarization in Korea seems to follow the trend of other advanced economies.

⁴ For more related discussions on path-dependency and structural changes in the Korean labor market, see Perez (2016) and Focacci (2021).

An empirical analysis is necessary to find out which hypothesis is more suitable to understand job polarization in Korea. Korea is a good testbed as it faces the challenge of rapidly ageing population, and there has been no systematic approach to consider both hypotheses in a unified empirical framework.⁵ By utilizing a regional variation in the degree of job polarization, the initial routine share (path-dependency hypothesis), and the changes in the share of old workers (aging hypothesis), we formally test which hypothesis can explain the heterogeneous aspect of job polarization across regions in Korea between 2008 and 2019.⁶

II. DATA AND EMPIRICAL ANALYSIS

For the empirical analysis, we use the Local Area Labor Force Survey (LALFS) from the Statistics Korea. LALFS is a survey conducted twice for each half-year of household members aged 15 or older living in sample households nationwide. Our sample covers the period between 2008 (the starting period of the data) and 2019.⁷ As Global Financial Crisis (2007-2009) might have affected the labor market, we further conduct a robustness check using the data between 2010 and 2019, which hardly changes the main findings.⁸

The variables mainly used in this study are (i) employment-related variables and (ii) residence area variables. We use regions that identify 162 cities and counties nationwide. For clustering, we additionally introduce the Living Zones (LZ) constructed by the Statistics Development Institute of the National Statistical Office. The LZ is a system of categories that consists of 55 regions targeting the actual living areas of residents. Table 1 presents the summary statistics, which clearly shows that job polarization proceeded during our sample period.

[Table 1]

To find out the main source of job polarization in Korea, we consider two potentially competing hypotheses, the path-dependency hypothesis suggested by Autor and Dorn (2013) and the aging hypothesis argued by Acemoglu and Restrepo (2022). In order to examine which channel

⁵ According to OECD, Korea is one of the world's fastest aging countries (<https://www.oecd.org/economy/ageing-inclusive-growth/>).

⁶ This paper is not the first to study job polarization in Korea: Cheon (2007) and Kim (2015) are a few examples that also analyze job polarization using Korean data. Our work is differentiated from them by utilizing a local labor market analysis to identify the role of initial conditions in job polarization.

⁷ This is because only the first half-year of 2020 is available, and the labor market in 2020 might be heavily affected by COVID-19.

⁸ Results are available upon request.

is more relevant in Korea, we estimate Equation (1), a version of the equation used in Autor and Dorn (2013):

$$\Delta Y_{jst} = \beta_0 \text{RoutineShare}_{jst_0} + \beta_1 \Delta \text{AgeRatio}_{jst} + \gamma_s + \varepsilon_{jst}. \quad (1)$$

ΔY_{jst} is the change in employment share for each type of workers (i.e., cognitive, routine, and manual) between the initial (t_0) and final (t) year. j is the region and s represents LZ to which the region belongs. $\text{RoutineShare}_{jst_0}$ is the share of routine workers at the initial year, and $\Delta \text{AgeRatio}_{jst}$ denotes the change in the ratio of workers aged 56 or older to those aged 21-55 years old between 2008 and 2019.⁹ γ_s is a fixed effect for each LZ and robust standard errors are clustered by LZ. If the path claimed by Autor and Dorn (2013) explains the differences in job polarization by region, we expect β_0 to be negative for the change in routine share. In a similar manner, if the aging hypothesis works in Korea, β_1 will be estimated to be negative.

III. EMPIRICAL FINDINGS

In Table 2, we present the main results by estimating Equation (1). Job polarization is defined as an increase in the share of employment in the two groups of workers (cognitive and manual workers), while a decline in the share of routine workers. Hence, to construct a variable that captures the job polarization, we calculate changes in the share for each type of workers between 2008 and 2019.

[Table 2]

Table 2 clearly shows that the path dependency channel exists in Korea. In comparison to the regions at the 20th percentile in terms of the routine worker share at the initial year, the regions at the 80th percentile had a decline in the share of routine workers by 4.5%p ($= -0.215 \times 0.208$) between 2008 and 2019. The result is consistent with Autor and Dorn (2013), in which the decrease in the share of routine workers leads to the increase in the share of manual workers.

On the other hand, $\Delta \text{AgeRatio}$ in Equation (1) hardly changes the result: The estimates (even columns) are very similar to those without considering aging (odd columns), which suggests

⁹ We follow Acemoglu and Restrepo (2022) for constructing this variable. Our findings do not alter if we instead use (1) the initial level of aging to be consistent with the other main regressor—the initial routine share—and (2) different definitions of middle-aged and older workers (e.g., middle-aged from 21-50, older from 51 onwards; middle-aged from 21-60, older from 61 onwards; middle-aged from 35-55, older from 56 onwards). Results are available upon request.

that $\Delta AgeRatio$ is not by itself related to regional differences in job polarization. Interestingly, the estimation presents the opposite pattern to the effect of aging found by Acemoglu and Restrepo (2022), which shows that the higher ratio of elderly workers leads to a relative decrease in the share of routine workers. In Korea, the relationship between aging and the change in the share of cognitive workers is significantly negative (column (2)), whereas there is no effect on the share of routine workers.

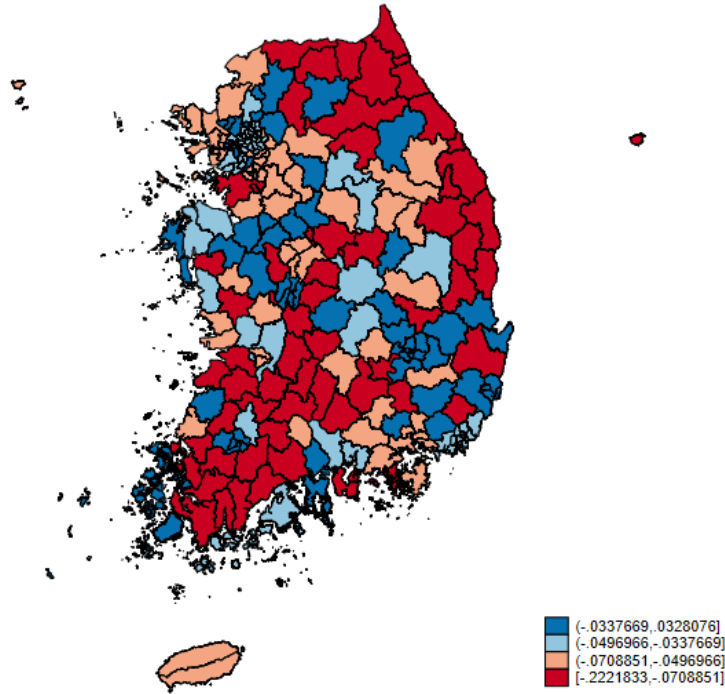
We additionally analyze whether the effect of the initial routine share (path-dependency hypothesis) appears differently between male and female workers. This is because, as shown in Cerina et al. (2021), job polarization can have a gendered effect, which affects our main analysis. Job polarization centers on women, according to Cerina et al. (2021), because of the growth in service sector employment. The skill premium for education has led highly-educated women to participate in the labor market, and women began converting home production into purchase of service goods. Consistent with Cerina et al. (2021) using U.S. data, Table 3 shows that job polarization in Korea is discriminatory between male and female workers. In particular, the results in Table 2 are mainly driven by female workers.

[Table 3]

IV. CONCLUDING REMARK

This study shows that the path-dependency hypothesis can explain the diverging patterns of job polarization across regions in Korea; the aging hypothesis, on the other hand, does not seem to work, implying that aging itself might not be a dominant factor behind job polarization in Korea. We further show that job polarization centers around female workers, the result that is consistent with Cerina et al. (2021). Our findings—structural changes have differential effects across regions and gender—raise a cautionary note on establishing optimal labor market policies: A careful examination of identifying winners and losers from the changes is necessary. One caveat of our paper is that our empirical analysis does not guarantee causality between the variables of interest; the limited (micro) data availability in Korea does not allow us to construct instrumental variables following Autor and Dorn (2013) and Acemoglu and Restrepo (2022).

Figure 1. Change in Routine Share (2008-2019)



Source: Local Area Labor Force Survey

Note: The legend is the value obtained by subtracting the share of routine workers in 2008 from that in 2019 for each region. The redder a region is, the more severe the job polarization is in the region.

Table 1. Summary Statistics

	2008		2019	
	Mean	S.D.	Mean	S.D.
Routine Share	0.690	0.106	0.624	0.097
Manual Share	0.197	0.058	0.255	0.064
Cognitive Share	0.114	0.066	0.121	0.070
Elderly Share	0.429	0.045	0.465	0.024
Female Share	0.444	0.049	0.465	0.044

Note: Observations are 162 cities and counties nationwide. The elderly share is the proportion of workers aged 56 or older compared to workers aged 21-55 years old.

Table 2. Main Results

Dependent Variable	$\Delta CognitiveShare$		$\Delta RoutineShare$		$\Delta ManualShare$	
	(I)	(II)	(III)	(IV)	(V)	(VI)
$RoutineShare_{t0}$	0.044* (0.024)	0.011 (0.029)	-0.215*** (0.038)	-0.200*** (0.048)	0.171*** (0.044)	0.188*** (0.058)
$\Delta AgeRatio$		-0.195** (0.084)		0.089 (0.114)		0.106 (0.132)
Constant	-0.023 (0.016)	0.006 (0.021)	0.083*** (0.026)	0.069* (0.036)	-0.060* (0.031)	-0.076* (0.043)
LZ FE	✓	✓	✓	✓	✓	✓
R-squared	0.437	0.464	0.6	0.601	0.626	0.628
Observations	162	162	162	162	162	162

Note: Clustered standard errors at the LZ level are reported in parentheses. ***p< 0.01, **p< 0.05, *p< 0.1

Table 3. Results by Gender

Dependent Variable	$\Delta CognitiveShare$		$\Delta RoutineShare$		$\Delta ManualShare$	
	Male (I)	Female (II)	Male (III)	Female (IV)	Male (V)	Female (VI)
$RoutineShare_{t0}$	0.054*** (0.017)	-0.010 (0.015)	-0.004 (0.034)	-0.211*** (0.029)	0.030 (0.021)	0.141*** (0.030)
R-squared	0.398	0.404	0.495	0.676	0.480	0.658

Note: Observations are 162 and LZ fixed effects are included. Clustered standard errors at the LZ level are reported in parentheses. ***p< 0.01, **p< 0.05, *p< 0.1

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Appendix

Table A.1 Korean Standard Classification of Occupations Codes

Code	Occupation	Type
1	Managers	Cognitive
2	Professionals and Related Workers	Cognitive
3	Clerks	Routine
4	Service Workers	Manual
5	Sales Workers	Routine
6	Skilled Agricultural, Forestry and Fishery Workers	Routine
7	Craft and Related Trades Workers	Routine
8	Equipment, Machine Operating and Assembling Workers	Routine
9	Elementary Workers	Manual