

Minki Hong

Working Paper

Structural changes in South Korea employment (2000-2021)

JRC Working Papers Series on Labour, Education and Technology, No. 2023/02

Provided in Cooperation with:

Joint Research Centre (JRC), European Commission

Suggested Citation: Minki Hong (2023) : Structural changes in South Korea employment (2000-2021), JRC Working Papers Series on Labour, Education and Technology, No. 2023/02, European Commission, Joint Research Centre (JRC), Seville

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JRC Technical Report

Structural Changes in South Korea Employment (2000–2021)

JRC Working Papers Series on
Labour, Education and Technology
2023/02

Minki Hong

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JRC132566

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How to cite this report: Hong, M, *Structural Changes in South Korea Employment (2000–2021)*, JRC Working Papers on Labour, Education and Technology 2023/02, European Commission, Seville, 2023, JRC132566.

Structural Changes in South Korea Employment (2000–2021)

Minki Hong (Korea Labor Institute)

Abstract

Using a job-based methodology, this paper studies structural shifts in employment in the South Korean labor market from 2000 to 2021. The methodology follows the approach suggested and applied in the reports published in the context of the European Jobs Monitor, such as Eurofound (2015, 2017). This study segments the analysis duration into three periods: 2000–2009, 2009–2019, and 2019–2021. The patterns of change in the employment structure between 2000–2009 and 2009–2019 varies greatly. Employment in higher-paid jobs increased between 2000 and 2009. Employment polarization, on the other hand, emerged between 2009 and 2019. Since 2000, changes in the employment structure have been influenced by a combination of increasing demand for highly skilled labor, deindustrialization, increased trade, and changes in the employment protection system. As the population ages rapidly in the 2010s, employment in health and social work services is increasing rapidly. The 2019–2021 period was set aside to investigate the impact of COVID-19 on the employment structure. Due to the spread of COVID-19, employment in face-to-face education and food services decreased in 2020 but quickly recovered in 2021.

Keywords: employment, occupational change, polarization, jobs approach, economic restructuring.

Joint Research Centre number: JRC132566

Related publications and reports:

Torrejón Pérez, S., Hurley, J., Fernández-Macías, E. and Staffa, E., *Employment shifts in Europe from 1997 to 2021: from job upgrading to polarisation*, JRC Working Papers on Labour, Education and Technology, European Commission, Seville, forthcoming.

Rodrigues-Silveira, R, *Structural Changes in Brazilian Employment (2002-2021)*, JRC Working Papers on Labour, Education and Technology 2023/01, European Commission, Seville, 2023, JRC132269.

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Executive summary

In the 2000–2009 period, employment increased primarily in the high-paid quintiles. In the higher-paid quintiles, employment in private professional services such as ICT, science and technology, and education increased. During this time, the employment of low-paid services in food and business support (cleaning, security) increased. As consumer product imports and outsourcing increased, employment in light manufacturing industry (such as shoes, clothing, textiles, furniture, and food and beverage manufacturing) declined.

In the 2009–2019 period, employment polarization emerged as employment in low-paid and high-paid quintiles increased. The employment polarization is caused by the polarization of salaried worker employment in the service sector. High-paid ICT and science and technology professionals' employment kept increasing. As the rate of population aging accelerated in the 2010s, social work (care service) service employment increased rapidly. Low-paid non-regular women have primarily provided social work services. Because the elderly provided the majority of medical and care service labor, the employment composition also aged. The decline in employment in the light manufacturing industry continued.

From 2019 through 2021, the decline in employment in Korea was smaller than in other countries because the shutdown was not conducted even when COVID-19 spread. Nonetheless, as the use of schools and public institutions was restricted, as were business hours for face-to-face service workplaces, self-employment and non-regular worker employment decreased. Employment rebounded quickly in 2021, as the impact of COVID-19 lessened.

The growth in medical and care service employment was impacted by deindustrialization, population aging, and the government's expansion of welfare spending. Korea's post-industrialization and aging population are predicted to continue in the future. Furthermore, the pattern of job polarization is predicted to continue.

Policy Implications

- The growing number of service employment is mostly conducted by non-regular workers. Non-regular workers' wages are low, employment stability is low, and many people do not have social insurance, such as employment insurance. Policies are required to increase social protection, such as increasing the employment stability of non-regular workers and increasing the social insurance subscription rate.
- Korea's population is aging rapidly. Insufficient old-age pension and social assistance magnify income inequality among the elderly. Pension systems and job policies for the elderly need to be enhanced.
- Technological change and the problem of overeducation are happening at the same time. There is a need for an education system that can cope with technological change while alleviating excessive competition in education.

1 Introduction

Using a job-based methodology, this report examines structural shifts in employment in South Korean (hereafter Korea) labor markets from 2000 to 2021. In this analysis, a job is defined as a specific occupation in a specific industry, and jobs are ranked using wage data. The job-wage is regarded as the primary predictor of job quality.

The terms occupation and sector refer to fundamental aspects of the division of labor within and across organizations. Sector classification defines the horizontal distribution of economic activity across organizations that produce different products and services. Job classification establishes an implicit hierarchy of organizational roles. The job-based approach identifies how net employment shifts at the national level have been distributed across jobs in different wage quintiles.

Labor market context

Korea's average annual growth real GDP growth rate was 12.8% in the 1990s, 7.1% in the 2000s, and 4.3% in the 2010s. On the other hand, job growth has remained relatively stable over the last 30 years. In the 1990s, the average annual growth rate of employment was 1.3%, 1.3% in the 2000s, and 1.4% in the 2010s.

In Korea, employment deindustrialization (an increase in employment in the service industry) has been gradual. In 2000, the agricultural, manufacturing, and service industries employed 10.7%, 20.4%, and 61.5% of the workforce, respectively. They changed to 5.3%, 16.1%, and 70.9% in 2021. The proportion of public service employment in service industries such as health and care, education, and public administration is steadily increasing. This reflects the trend of population aging and public sector expansion.

The analysis results show that employment in the service industry has generally increased since 2000, but the pattern of change in the employment structure varies depending on the period. Meanwhile, while high-wage employment increased from 2000 to 2009, employment polarization emerged from 2009 to 2019. Low-wage health and social service employment, in particular, has grown rapidly in recent years.

Structure of the paper

Section 2 provides basic employment statistics to help understand shifts in the employment structure. Section 3 describes the data and analysis methodology. Section 3 also depicts the largest employing, growing, and declining jobs in each quintile. Section 4 displays the analysis findings for each of the three periods (2000–2009, 2009–2019, and 2019–2021). Changes in the employment structure are caused by technological change, deindustrialization, population structure change, and institutional change. Section 5 summarizes previous findings and discusses the link with various hypotheses. The last section is the conclusion.

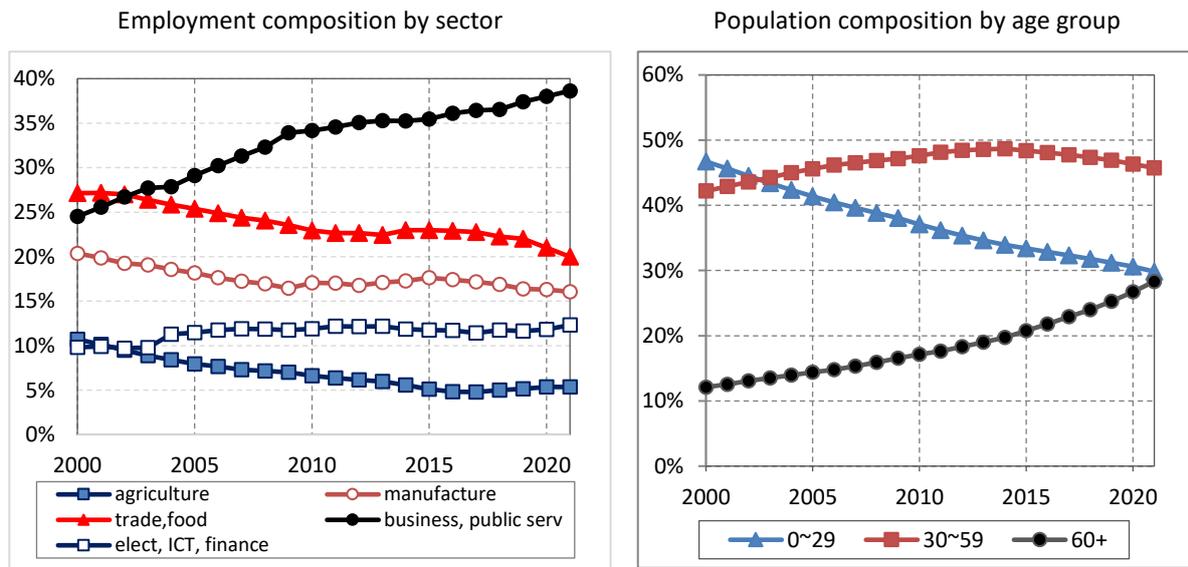
2 Background

As shown in the left panel of Figure 1, the employment proportion of the business and government service sectors (ISIC code M, N, O, P, Q, R, S, T, U) increased. The proportion of people employed in business and government sectors increased from 24.5% in 2000 to 38.6% in 2021. Electricity, Information and Communication Technologies (ICT), and financial services employment are also steadily increasing due to the advancement of information and communication technology. Agricultural employment, on the other hand, fell from 10.7% to 5.3% during this period. Manufacturing

employment also declined from 20.4% to 16.1%, but the percentage of manufacturing employment remains relatively high compared to other developed countries.

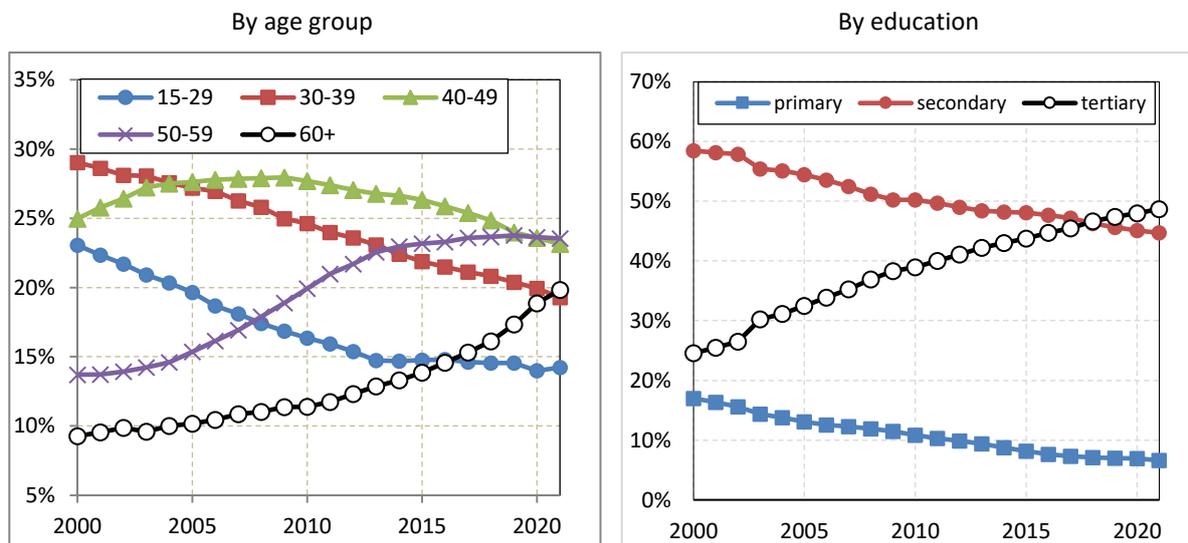
The right panel of Figure 1 depicts the population composition in Korea. Korea is aging rapidly. The proportion of people aged 60 and up increased from 12.1% in 2000 to 28.3% in 2021. On the other hand, due to the influence of the low birth rate, the proportion of the population under the age of 30 fell from 46.7% to 29.8% during the same period.

Figure 1: Employment composition by sector and population composition by age group (measured as a share of total employment and share of the total population, respectively)



(source) Economically Active Population Survey (Statistics Korea)

Figure 2: Employment composition by age and education group (measured as a share of total employment)



Economically Active Population Survey (Statistics Korea)

Figure 2 shows the employment composition by age group and education level. When looking at the composition of each age group, the employed are rapidly aging. The proportion of employed people in their 60s and older in total employment was 9.3% in 2000, but it increased rapidly to 19.8% in 2021. The percentage of employed people in their 50s increased from 13.7% to 23.5% during the same

timeframe. Conversely, the proportion of employed people in their teens, 20s, and 30s is rapidly declining.

The increase in elderly employment exemplifies the aging population. As the elderly population grew, so did the demand for medical and social welfare services. Jobs in social welfare services are typically low-paying. Low-wage jobs are on the rise as the number of elderly workers increases. This pattern is likely to continue in the future.

In Korea, the proportion of employed people with high education levels is steadily increasing. The proportion of employed tertiary (college graduate or higher) graduates increased from 24.6% in 2000 to 48.7% in 2021. During the same period, the proportion of secondary education fell from 58.4% to 44.7%, while the proportion of primary education fell from 17.0% to 6.6%. In Korea, nearly half of the employed are college graduates, which is very high in comparison to other countries. The proportion of employed people by educational background has been changing steadily. This pattern appears to reflect long-term population and education level changes.

3 Data and Methodology

3.1 Data

This study uses the Korean Labor and Income Panel Study (KLIPS). The KLIPS is the nation's sole labor-related panel survey. It began in 1998, and the 24th wave was completed in 2021. It is conducted annually in a sample of households, including all household members. KLIPS is a yearly dataset.

The preliminary sample size had been 5,000 households from 1998 based on metropolitan and urban area populations. To address panel household attrition and make the sample more nationally representative, 1,415 households were added in 2009 and 5,044 in 2018.

KLIPS dataset consists of two main types: Household Datasets derived from Household Questionnaires and Individual Datasets compiled from Individual Questionnaires. The latter is given to household members aged 15 and older. The Individual Dataset contains a wide range of categories such as a person's economic activity, earnings, employment characteristics, and work hours.

There are several reasons for applying KLIPS in this study. First, KLIPS provides a two-digit industry classification, whereas publicly available data from the Economically Active Population Survey (administered by the Office of Statistics; EAS hereafter) provides a one-digit classification. Second, KLIPS collects data on all employed people, including self-employed individuals, whereas EAS does not collect data on self-employment income. The Basic Wage Structure Survey (administered by the Ministry of Labor), samples workers in workplaces with five or more employees. KLIPS is the only data set with a two-digit industry classification that includes all employed individuals. Third, despite changes in industrial classification in 2008 and 2018, KLIPS data provides coherent classification information.

3.2 Methodology

The purpose of this study is to examine how the employment structure in Korea has changed recently. The methodology follows the approach suggested and applied in the reports published in the context of the European Jobs Monitor, such as Eurofound (2015, 2017). This method is based on the work of Stiglitz (CEA, 1996), Wright and Dwyer (2003), and others. The major steps of the job-based approach are the following:

1. Using the classification of sectors (Korean Standard Industrial Classification) and occupations (Korean Standard Classification Occupation), a matrix is created. Each job is an occupation in a specific industry. This paper uses 62 two-digit sectors and 10 one-digit occupations

considering the sample size of the data, which yields 416 job cells excluding cells with no observations.

2. The jobs are ranked by their median hourly wage from a starting period.
3. Jobs are allocated into quintiles by the job-wage level. The highest-paid jobs are assigned to quintile 5, while the lowest-paid jobs are assigned to quintile 1. Each quintile represents as close to 20% of employment as possible during the initial period.
4. Net employment changes between starting and concluding periods (in persons employed) for each quintile are summed to determine whether net job growth has been concentrated at the top, middle, or bottom of the employment structure.

This report segments the analysis period into three: 2000–2009, 2009–2019, and 2019–2021. As the results show, employment in the higher-paid job increased from 2000 to 2009, and employment in both the lower-paid and higher-paid jobs increased from 2009 to 2019. The 2019–2021 period was set aside to investigate the impact of COVID-19 on the employment structure.

This report also provides additional analysis by categorizing net employment change by sector, professional status, contract category (permanent or temporary), gender, or education level.

This report categorizes professional status as employee and self-employed. Employees are largely classified as permanent and temporary based on the contract period. A temporary worker is someone whose contract is for less than a year. When the contract period exceeds one year, the employee is considered permanent.

The industries are classified as manufacturing, construction, and service industries. The service industry is divided into public and private. Public service consists of public administration, education, and health and social work. Private service includes wholesale, retail, food service, transportation, telecommunications, finance, real estate, professional science and technology, broadcasting, entertainment, and personal services.

Non-regular workers and regular workers are the two types of employees. Non-regular workers include fixed-term (usually less than two years of the contract), non-typical (when an employment contract is different from the employer who actually uses workers, such as dispatched or outsourcing workers), daily workers, and domestic workers. Regular workers are those who do not belong to non-regular workers.

According to working hours, it is divided into full-time and part-time employees. Part-time workers are those who work less than 15 hours per week. Fixed-term and non-typical employees are full-time but non-regular employees.

Educational backgrounds are broadly classified into primary, secondary, and tertiary. The term primary refers to elementary school graduation. Secondary refers to high school graduation or lower. Tertiary refers to a college graduation or higher.

3.3 Main Employing, Growing, and Declining Jobs

Tables 1–3 show the top three employing, growing, and declining jobs in each quintile over time. Since 2000, agriculture self-employment, food service workers, and other service workers have been the most common jobs in the first bottom quintile. It is notable that in 2019, the social work service worker became a primary occupation in the first quintile.

Retail sales workers and land transport operators have been the main jobs in the second quintile. Since 2000, wholesale workers have been in the middle quintiles. Manufacturing (clothing, textile, and electronic components) craft, and operator were major jobs in the second quintile before 2019, but are no longer major jobs in that quintile. Since 2000, an educational professional has been the most common job in the highest paid quintile. In 2019, ICT and financial professionals are among the top three main jobs in the fifth quintile.

Food, other, business support, social work, and health services employment increased in the lower-paid quintiles during the 2000–2009 period (See Table 1). Agriculture farmers declined according to industrial changes. Employment of ICT, education, scientific and technical service professions enhanced in the higher-paid quintiles during this period. Notably, employment in light industries such as footwear, clothing, textiles, and furniture manufacturing fell across all quintiles.

From 2009 to 2019, social work and food services employment increased in the lowest-paid quintile, while domestic service employment decreased (See Table 2). Employment related to the social work service increased in the first, second, and third quintiles. There was a rise in health professionals in the fourth quintile. There was also an increase in social work and healthcare employment owing to the aging population. During this time, employment in light industries such as sewing continued to decline. In higher-paid quintiles, employment of ICT, scientific, and technical service professionals kept increasing. Further, employment in education declined during this period as the school-age population shrank.

During the period affected by COVID-19 (2019–2021), employment in face-to-face services, such as food service, decreased (See Table 3). Employment in social work kept increasing.

Table 1: Top three employing, growing, declining jobs in each quintile: 2000–2009 (thousand persons)

| Q | Largest-employing jobs | | Largest-growing jobs | | Largest-declining jobs | |
|---|--------------------------------------|-------|--|--------|-----------------------------------|--------|
| | Sector/Occupation | Emp. | Sector/Occupation | Growth | Sector/Occupation | Growth |
| 1 | agriculture | 1,016 | food service worker | 169 | agriculture | -189 |
| | food service worker | 988 | business support service elementary | 140 | public administration clerk | -81 |
| | other service worker | 327 | other service worker | 113 | shoes manufacture craft | -67 |
| 2 | retail trade sales worker | 1,535 | real estate assoc. prof. | 137 | retail trade sales worker | -179 |
| | clothing manufacture craft | 358 | social work assoc. prof. | 115 | clothing manufacture craft | -148 |
| | textile manufacture operator | 229 | health assoc. prof. | 70 | textile manufacture operator | -98 |
| 3 | land transport operator | 726 | education professional | 63 | furniture manufacture assembler | -93 |
| | construction by professional craft | 680 | business support service clerk | 60 | nonmetallic products clerk | -18 |
| | maintenance and repair service craft | 317 | land transport operator | 49 | nonmetallic products assembler | -17 |
| 4 | wholesale trade sales worker | 404 | ICT professional | 191 | insurance sales | -49 |
| | general construction craft | 366 | public administration clerk | 99 | food manufacture clerk | -47 |
| | Insurance sales | 327 | automobile manufacture operator | 85 | Other machinery manufacture clerk | -34 |
| 5 | education professional | 918 | education professional | 256 | general construction craft | -42 |
| | public administration clerk | 334 | scientific & technical services professional | 128 | education professional | -27 |
| | education assoc. prof. | 329 | education professional | 114 | textile manufacture assembler | -19 |

(source) Korean Labor and Income Panel Study.

(note) 'Q' refers to Quintile. 'assoc. prof.' refers to associate professional.

Table 2: Top three employing, growing, declining jobs in each quintile: 2009-2019 (thousand persons)

| Q | Largest-employing jobs | | Largest-growing jobs | | Largest-declining jobs | |
|---|---|------|--------------------------------------|--------|--|--------|
| | Sector/Occupation | Emp. | Sector/Occupation | Growth | Sector/Occupation | Growth |
| 1 | food service worker | 1151 | social work service | 340 | sewing products craft | -93 |
| | agriculture | 821 | food service worker | 187 | domestic service elementary | -53 |
| | other service worker | 438 | agriculture | 127 | food service elementary | -21 |
| 2 | retail trade sales worker | 1347 | social work assoc. Professional | 221 | retail trade sales worker | -109 |
| | land transport operator | 770 | health assoc. prof. | 154 | textile manufacture assembler | -73 |
| | electronic components manufacture assembler | 258 | retail trade sales worker | 77 | entertainment service | -68 |
| 3 | construction by professional craft | 718 | construction by professional craft | 111 | general construction craft | -56 |
| | education associate professional | 441 | plastic products assembler | 61 | wholesale trade sales worker | -33 |
| | wholesale trade sales worker | 425 | social work professional | 61 | education operator | -33 |
| 4 | motor vehicles manufacture assembler | 318 | health professional | 223 | telecommunications clerk | -80 |
| | health professional | 316 | wholesale trade sales worker | 63 | insurance sales | -63 |
| | insurance sales | 276 | scientific & technical service clerk | 60 | other transportation manufacture craft | -42 |
| 5 | education professional | 1169 | ICT professional | 167 | financial clerk | -74 |
| | public administration clerk | 402 | public administration clerk | 133 | general construction assoc. Prof. | -32 |
| | professional, scientific and technical services | 334 | scientific & technical service prof. | 93 | education professional | -26 |

(note) 'Q' refers to Quintile. 'assoc. prof.' refers to associate professional.

(source) Korean Labor and Income Panel Study.

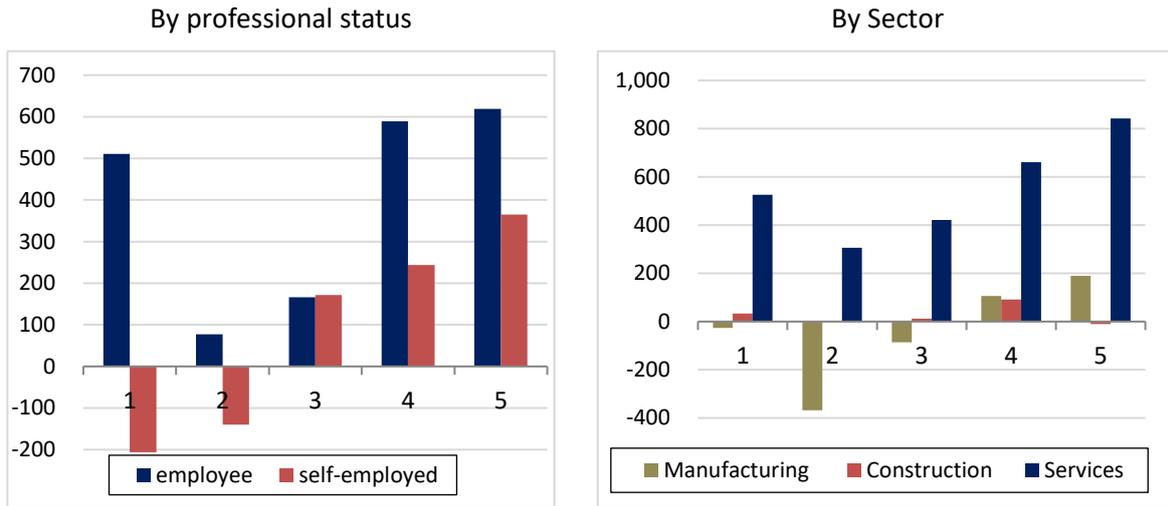
Table 3: Top three employing, growing, declining jobs in each quintile: 2019-2021 (thousand persons)

| Q | Largest-employing jobs | | Largest-growing jobs | | Largest-declining jobs | |
|---|-------------------------------------|-------|----------------------------------|--------|-------------------------------------|--------|
| | Sector/Occupation | Emp. | Sector/Occupation | Growth | Sector/Occupation | Growth |
| 1 | food service worker | 1,324 | social work service worker | 115 | food service worker | -110 |
| | agriculture | 897 | social work service elementary | 71 | business support service elementary | -31 |
| | social work service worker | 437 | public administration elementary | 50 | food service elementary | -24 |
| 2 | retail trade sales worker | 1,212 | telecommunication elementary | 36 | food service clerk | -70 |
| | land transport operator | 798 | food manufacture assembler | 32 | real estate assoc. prof. | -38 |
| | social work associated professional | 442 | entertainment service | 23 | land transport operator | -24 |

4.2 Employment Shifts in 2000-2009

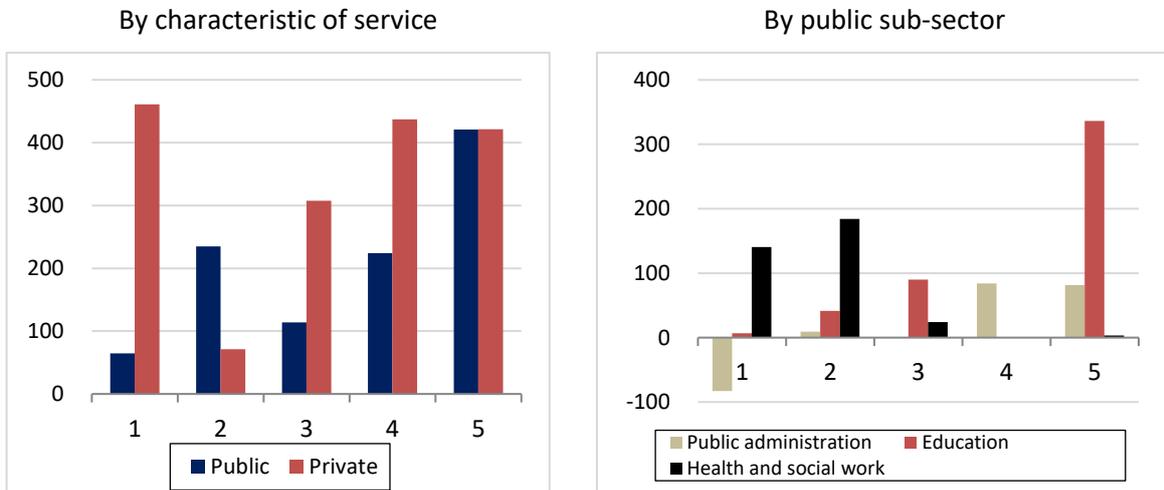
Between 2000 and 2009, the employment structures of salaried workers and the self-employed changed dramatically (See Figure 4, left panel). Salaried employment increased in a polarized way, while self-employment benefited from a process of job upgrading. Cheon and Jeong (2017)¹ study found job polarization in the 2000s using data on salaried workers (EAS). When the study's subject targeted salaried workers from 2000 to 2019, the results of their study and this study are consistent.

Figure 4: Employment shifts (in thousands) by job-wage quintile, professional status, and sector: 2000-2009.



(source) Korean Labor and Income Panel Study.

Figure 5: Employment shifts (in thousands) by job-wage quintile in service sector: 2000-2009.



(source) Korean Labor and Income Panel Study.

Figure 4's right panel depicts the employment change by sector. Service employment increased significantly in the top two quintiles, as well as in the first quintile. Low-wage manufacturing jobs (in the light manufacturing industry) had declined. This is due to increased imports of lower-cost consumer goods from China, and outsourcing of manufacturing production. In the fourth quintile,

¹ This is the only study that strictly applied the job-wage method by Eurofound (2008, 2015) to changes in the employment structure in Korea in the 2000s.

construction employment increased slightly. In summary, the increase in employment in the top two quintiles was driven by the service sector.

According to the characteristics of the services, the service sector is divided into public and private services. The private sector exhibits job polarization (see Figure 5, left panel). Employment in low-wage services like food and other services increased, as did employment in high-wage services like education, wholesale sales, and insurance sales. Public sector employment increased significantly in the higher-paid quintiles. High-paid educational services have grown significantly in both the private and public sectors (see Figure 5, right panel). As the aging progressed, health and social work employment increased during this period, primarily low-paid jobs.

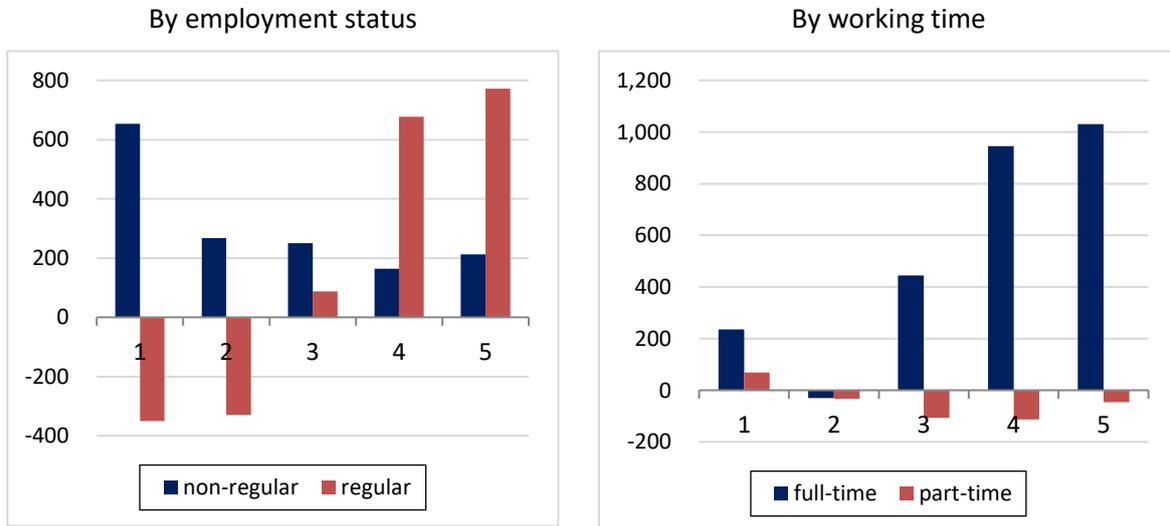
Following the 1997 financial crisis, the employment of non-regular workers increased dramatically in Korea. Figure 6 shows that employment of non-regular workers (primarily fixed-term and non-typical workers) increased in the low-paid quintiles while employment of regular workers increased in the higher-paid quintiles.

As shown in the right panel of Figure 6, part-time employment fell in all quintiles. Full-time employment increased during this period. In the 2000s, the proportion of part-time employees was extremely low in Korea. Full-time employment drove changes in the employment structure

Male employment increased considerably in the top two quintiles (See Figure 7, left panel). The female employment structure exhibits a polarization pattern. Women's employment in high-paid education services has increased substantially, while women's service employment (food, social work) has also increased in the bottom quintile.

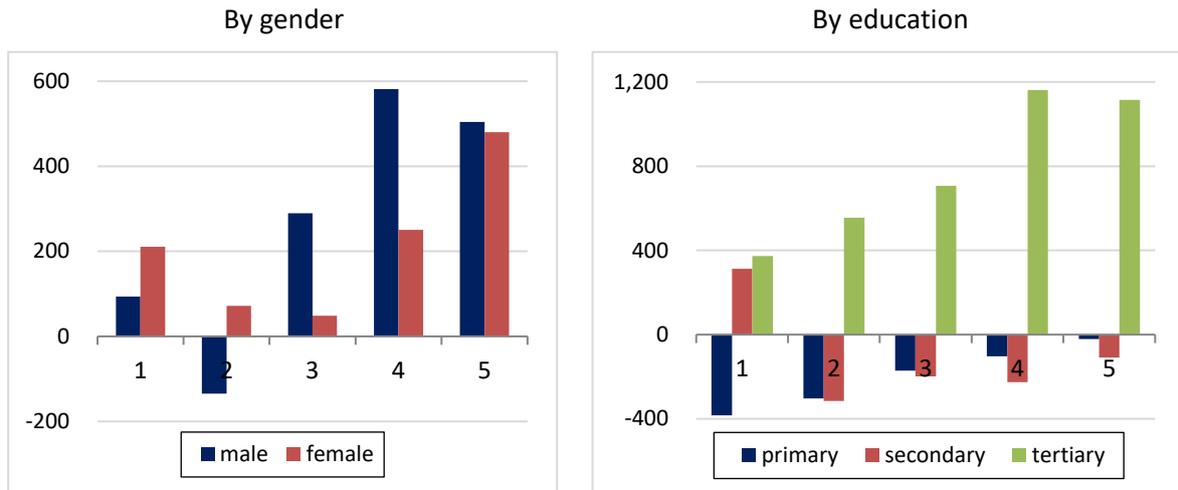
The right panel of Figure 7 depicts employment changes by education level. Primary education employment decreased overall, particularly in the lower-paid quintiles. Tertiary education employment has grown significantly, particularly in the high-paid quintiles. The level of education across all quintiles increased.

Figure 6: Employment shifts (in thousands) by job-wage quintile and employment status: 2000-2009.



(source) Korean Labor and Income Panel Study.

Figure 7: Employment shifts (in thousands) by job-wage quintile, gender, and education: 2000-2009.



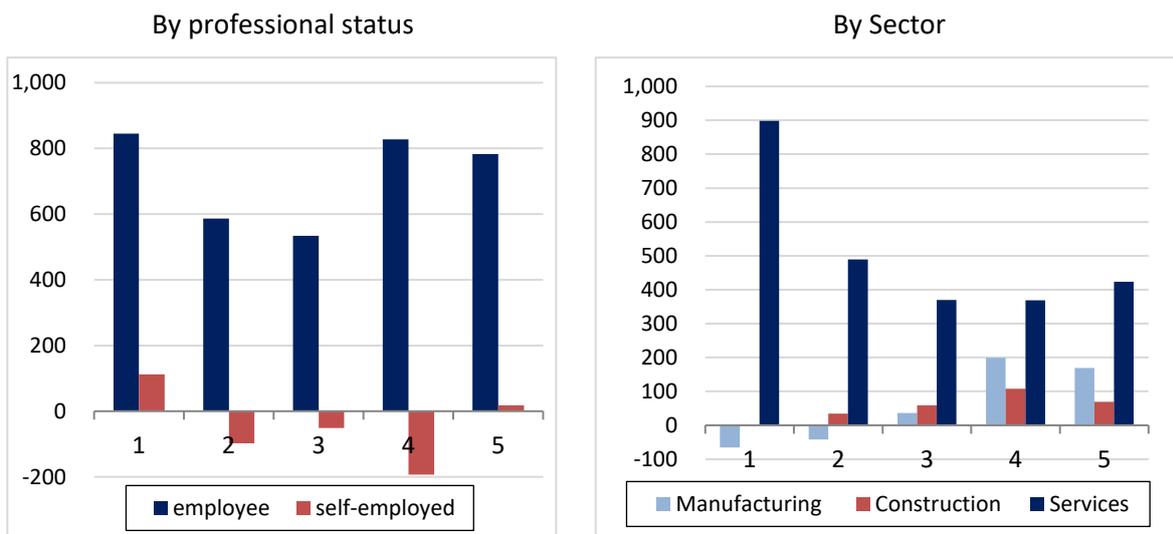
(source) Korean Labor and Income Panel Study.

4.3 Employment Shifts in 2009-2019

Figure 8 depicts the results of dividing net employment change by professional status from 2009 to 2019. The polarizing pattern is clearly visible in the change in salaried worker employment during this period. However, no discernible pattern is found in the change in employment of self-employed. Changes in the employment structure of salaried workers drove the employment polarization phenomenon from 2009 to 2019.

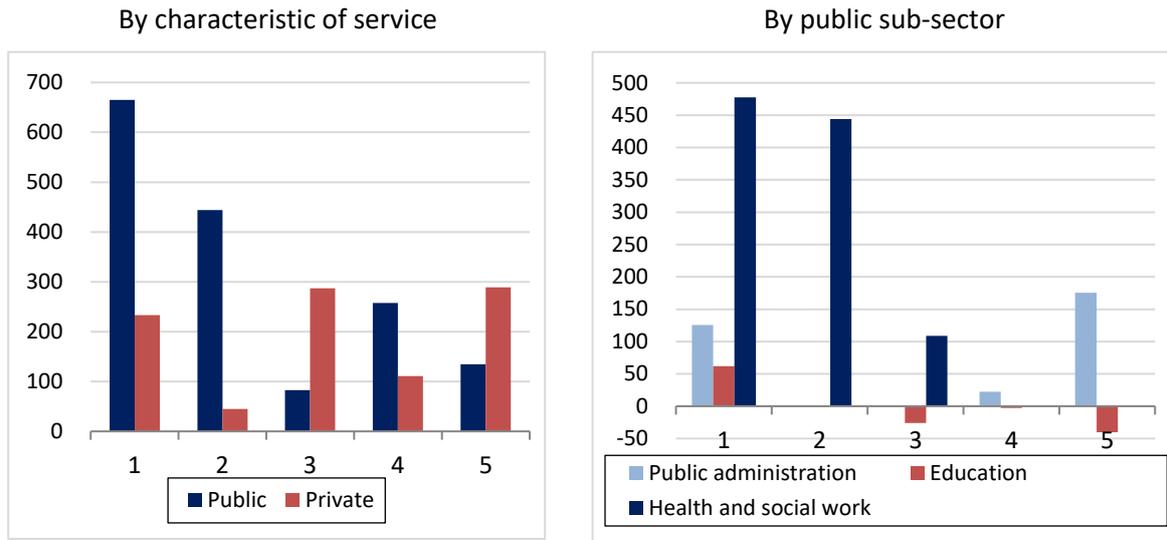
In the bottom quintile, employment in the service sector (food service, other service, health, and social work service) has increased considerably. Employment in the service, manufacturing, and construction in the highest paid quintile all increased. Manufacturing employment shows a fall in assembly employment and a rise in skilled high-wage employment.

Figure 8: Employment shifts (in thousands) by job-wage quintile, professional status, and sector: 2009-2019.



(source) Korean Labor and Income Panel Study.

Figure 9: Employment shifts (in thousands) by job-wage quintile in service sector: 2009–2019.



(source) Korean Labor and Income Panel Study.

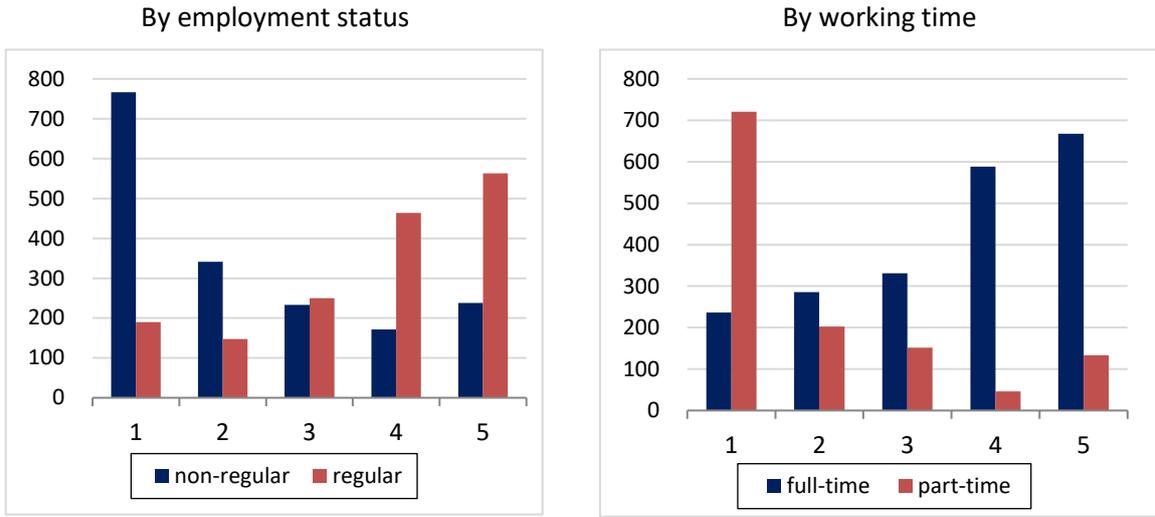
In the bottom two quintiles, public services have increased significantly (see Figure 9). Health and social work service employment drove the increase in lower-wage public sector employment. Employment of high-paid services, such as doctors, also increased. This reflects the growing demand for medical and care services as the aging population increases.

Polarization by employment status persisted in the 2010s. As shown in Figure 10 left panel, non-regular worker employment increased in lower-paid jobs, while regular worker employment increased in higher-paid jobs. It is noticeable that part-time low-paid jobs have increased considerably in the 2010s (see Figure 10 right panel). The majority of care services (in the health and social work sectors) are part-time jobs and performed by women (refer to Figure 11 left panel).

The right panel of Figure 11 shows the employment shifts by education level. Primary education employment fell across all quintiles. Secondary education employment increased considerably in the first quintile while decreasing in the rest. Tertiary employment increased significantly across all quintiles. Even in the low-paid quintiles, tertiary employment increased majorly compared to other educational levels. The considerable increase in tertiary employment, even in low-paid quintiles with low skill levels, can be interpreted as evidence of over-education.

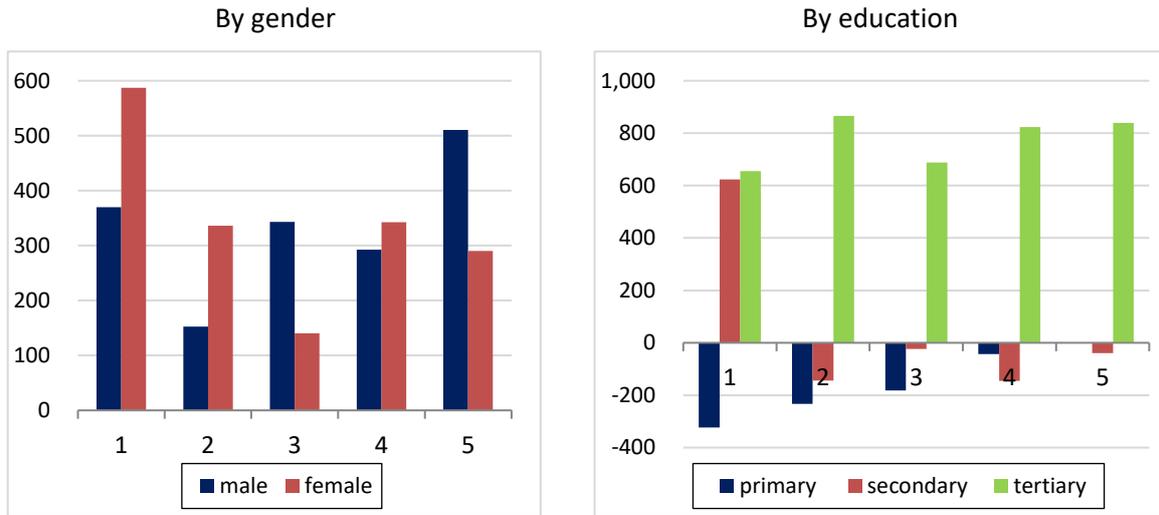
Finally, job polarization emerged in 2010–2019 as a result of increased employment in public services, particularly health and social work. The increase in female employment drove the increase in employment in this sector. The rise in health and social work employment reflects the population aging.

Figure 10: Employment shifts (in thousands) by job-wage quintile and employment status: 2009–2019.



(source) Korean Labor and Income Panel Study.

Figure 11: Employment shifts (in thousands) by job-wage quintile, gender, and education: 2009–2019.



(source) Korean Labor and Income Panel Study.

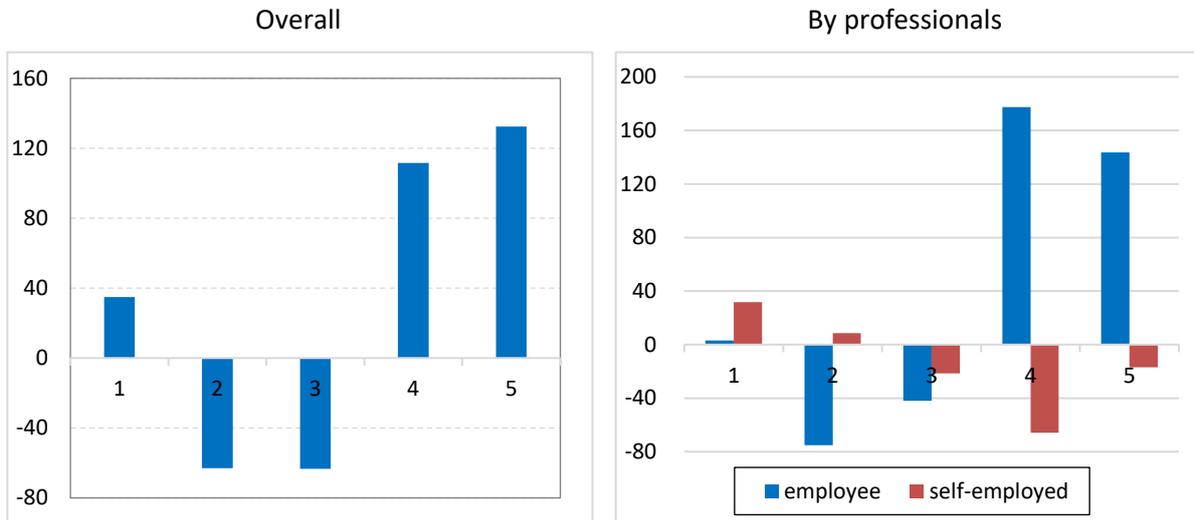
4.4 Effects of Covid-19 on Employment: 2019–2021

This subsection zooms into the 2019–2021 period to see the influence of COVID-19 on employment. Overall employment decreased in 2020 when Covid-19 spread, and increased in 2021 when the spread of Covid-19 weakened.

Employment decreased by 0.8% during the 2019–2020 period. The decrease in employment in Korea was smaller than in other countries because the shutdown was not done even after COVID-19 spread. Nonetheless, employment fell in 2020 as the use of schools and public institutions were restricted, and business hours for face-to-face service workplaces were reduced. Employment increased rapidly (+1.4%) in 2021 as the spread of COVID-19 decelerated.

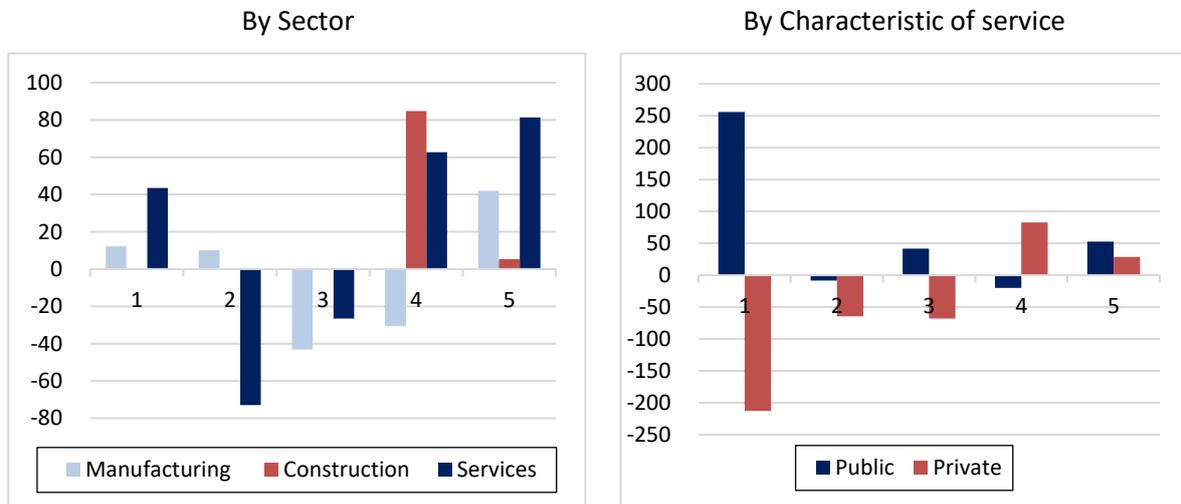
Overall pattern shows (Figure 12 left panel) that there has been an asymmetric employment polarization in which employment growth being towards higher paid jobs from 2019 to 2021. During this period, self-employed employment decreased while salaried employment increased in high-paid jobs (See Figure 12, right panel). In 2021, high-skilled manufacturing jobs increased as exports increased (See Figure 13). As the financial industry's profits increased, so did the employment of financial industry workers.

Figure 12: Employment shifts (in thousands) by job-wage quintile: 2019-2021



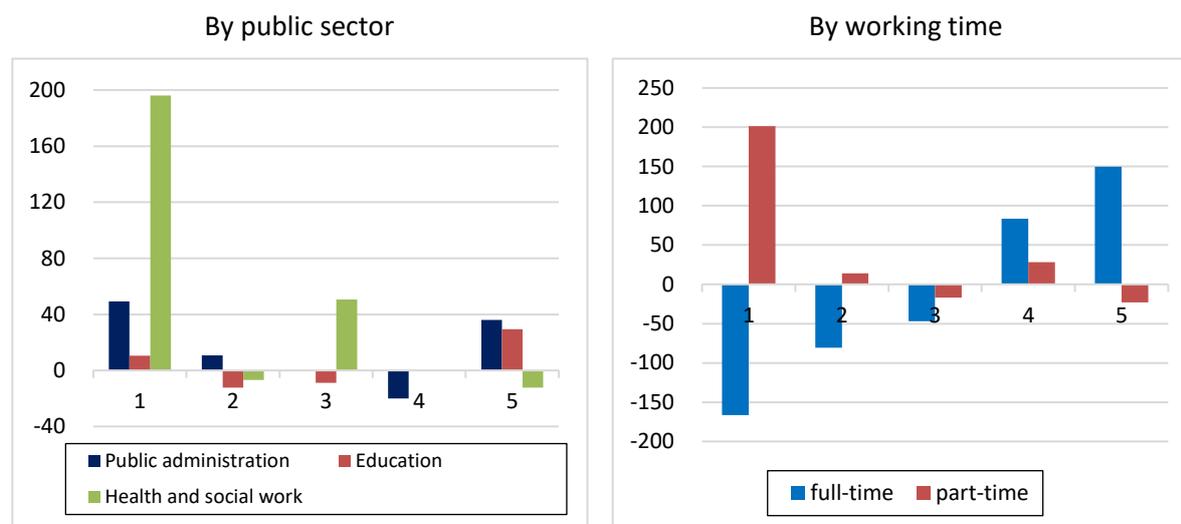
(source) Korean Labor and Income Panel Study.

Figure 13: Employment shifts (in thousands) by job-wage quintile and sector: 2019-2021



(source) Korean Labor and Income Panel Study.

Figure 14: Employment shifts (in thousands) by job-wage quintile, public service sector, and working time: 2019–2021



(source) Korean Labor and Income Panel Study.

Health and social work employment increased further as a result of the spread of COVID-19 and the population aging trend (See Figure 14, left panel). In Korea, the majority of health and social work sector employment (particularly care work) are still low-paid part-time jobs (See Figure 14, right panel).

Educational service employment in 2000 declined substantially in the bottom quintile as COVID-19 spread. This is because the provision of public education services was restricted along with school attendance. Educational service employment rose in 2021 as school attendance restrictions were relaxed.

Overall, as COVID-19 spread, the employment of temporary workers employed in schools fell as school attendance was restricted. Furthermore, because business restrictions were imposed on the face-to-face service business, related self-employed employment decreased. Employment recovered quickly in 2021 before being impacted by COVID-19.

5 Summary and Discussion

5.1 Summary of Employment Change During the Latest Two Decades

In the 2000–2009 period, employment increased primarily in the high-paid quintiles. In the higher-paid quintiles, employment in private professional services such as ICT, science and technology, and education increased. During this time, the employment of low-paid services in food and business support (cleaning, security) increased. As consumer product imports and outsourcing increased, employment in light industry manufacturing (such as shoes, clothing, textiles, furniture, and food and beverage manufacturing) declined.

In the 2009–2019 period, employment polarization emerged as employment in low-paid and high-paid quintiles increased. The employment polarization is caused by the polarization of salaried worker employment in the service sector. High-paid ICT and science and technology professionals' employment kept increasing. As the rate of population aging accelerated in the 2010s, social work (care service) service employment increased rapidly. Low-paid non-regular women have primarily provided social work services. Because the elderly provided the majority of medical and care service

labor, the employment composition also aged. The decline in employment in the light manufacturing industry continued.

From 2019 through 2021, the decline in employment in Korea was smaller than in other countries because the shutdown was not conducted even when COVID-19 spread. Nonetheless, as the use of schools and public institutions was restricted, as were business hours for face-to-face service workplaces, self-employment and non-regular worker employment decreased. Employment rebounded quickly in 2021, as the impact of COVID-19 lessened.

5.2 Discussion: Relevance to Hypotheses

The causes of changes in the employment structure include technological change, trade, deindustrialization, changes in the demographic structure, and institutional changes. These elements are not completely exclusive but are linked. The relationship between changes in the Korean employment structure observed since 2000 and major theories are briefly reviewed below.

The theories connecting technological change with changes in the employment structure include the Skill-Biased Technical Change Hypothesis (SBTC) and Routine Biased Technological Change Hypothesis (RBTC).

The Skill-Biased Technical Change Hypothesis (Bound and Johnson 1992, hereafter SBTC) argues that a surge in new technology increased the demand for highly skilled workers. ICT are commonly viewed as complementing skilled workers and thus increasing their relative labor demand. According to the SBTC theory, there is a positive monotonic relationship between skills and employment growth (Acemoglu, 2002).

The basic idea of the Routine Biased Technological Change hypothesis (Autor et al., 2003) is that technological developments (including ICT advancements) have enabled machines to replace workers performing routine tasks (manual or cognitive). Labor-capital substitution reduces labor's relative demand in middle-wage occupations. According to the theory, ICT advancements increase the number of jobs with cognitive non-routine components. This hypothesis predicts that computerization has a non-linear effect on labor demand.

Since 2000, higher-paid ICT professional employment has steadily increased. This phenomenon is consistent with the SBTC and the RBTC hypotheses' predictions. However, service employment kept increasing in both the lower-paid and the higher-paid quintiles. This can be viewed as a result of overall economic deindustrialization rather than as a direct result of technological changes.

On the other hand, it is necessary to investigate whether the jobs decreased from the middle paid were routine. The main middle-wage jobs that experienced a significant decrease in the 2000's were in the light manufacturing industry. Imports (particularly from China) and production outsourcing are the main reason for the decline in light manufacturing employment. Employment in general construction craft, wholesale or retail trade sellers, and education operators fell from the middle quintile in the 2010s. It is unclear whether these jobs have been replaced by machines.

According to Autor and Dorn (2013), job polarization occurs because automation does not replace the service industry but does replace manual labor. Autor and Dorn (2013) attribute the increase in low-wage service employment to an increase in consumer preferences for diversely differentiated services. However, the demand for services like health and care is particularly due to the population aging, the marketization of caring labor, and the expansion of welfare. Care service labor is not always considered low-skilled labor, but it is considered low-wage labor in Korea.

Since 2000, changes in the legal system and employment norms have had a considerable impact on the increase in non-regular workers in low-wage service jobs. The flexibility of employment was emphasized in the process of resolving the financial crisis after 1997, and the number of non-regular workers increased rapidly. Cleaning and security services, for instance, have been outsourced as a

result. The employment practice that service jobs are conducted by low-wage non-regular workers is also used in social work.

In short, the need for skilled labor due to technological advancement is visible in the high-paid quintile. However, there is no clear relationship between employment change and technological change in the lower or middle quintiles. Rather, deindustrialization, an increase in trade, and an aging population are thought to have had a significant impact on changes in the employment structure of the lower or middle quintiles. The form of service employment was impacted by government policies such as changes in employment protection systems on non-regular workers and expansion of welfare expenditures.

6 Conclusion

This study analyses changes in the Korean employment structure since 2000. According to the findings of this study, employment growth was higher in the high-paid quintiles from 2000 to 2009, and employment polarization emerged in the 2009–2019 period, with low and high-paid quintiles of employment increasing. Since 2000, employment in professional jobs, especially in ICT, finance, professional science and technology, and health, has increased in the high-paid quintile, while health and care service employment primarily managed by non-regular women workers has increased in the low-paid quintile.

The growth in medical and care service employment was impacted by deindustrialization, population aging, and the government's expansion of welfare spending. Korea's post-industrialization and aging population are predicted to continue in the future. Furthermore, the pattern of job polarization is predicted to continue.

The growing number of service employment is mostly conducted by non-regular workers. Non-regular workers' wages are low, employment stability is low, and many people do not have social insurance, such as employment insurance. Policies are required to increase social protection, such as increasing the employment stability of non-regular workers and increasing the social insurance subscription rate.

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