

INDUSTRIAL ACTIVITIES

Economic Index and Industrial Structure

The economic indices have been used to understand the economic power of a country and to predict the future of business cycles. They are often measured by using various statistically valid indicators. Each country adopts different sets of indices for its national atlas. For example, the National Atlas of the United States includes the economic indices, such as per capita income, unemployment rate, per capita number of jobs, median household income, and per capita average wage of employees. The National Atlas of Canada selects only income-related economic indicators, such as median household income, male median income, and female median income. In this National Atlas of Korea, total regional gross domestic product (GDP), income and expenditure, the total number of establishments and employees, the value added by industries, international trade and balance of payments, research and development activities, and other statistical indicators are presented as economic indicators.

Regional gross domestic product means the sum of the newly created final products and services rendered, i.e., the total value added during a specific time at a particular place. With other

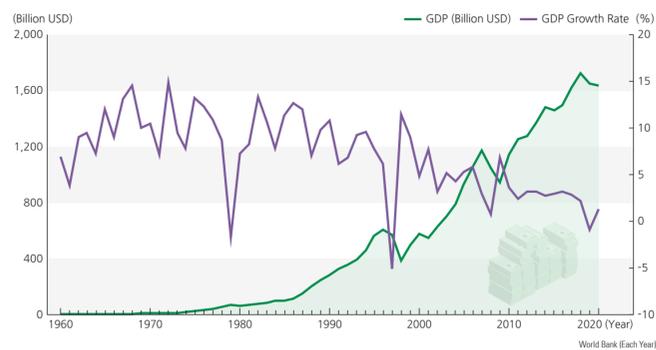
economic indices, the size of the regional economy, the level of production, and industrial structure can be deduced. Furthermore, these can be used as the basis for establishing regional economic policies and for conducting regional economic research. If this regional gross domestic product (RGDP) is expanded to the national level, it could be the national gross domestic product; however, the data used for the estimation and the methodologies may vary and may not necessarily be the same.

According to the World Bank, Korea's gross domestic product (nominal basis) was ranked 10th in the world in 2020 at 1,637 billion USD. In 1972, the gross domestic product was just over 10 billion USD. In 1985, 15 years later, it increased ten times, exceeding 100 billion USD. In 2006, 35 years after it first exceeded 10 billion USD, it broke through the 100-fold increase of 1 trillion USD. This growth pattern demonstrates that Korea has achieved accelerated economic growth in a compressed time frame. The change in the GDP growth rate in the pre-1960 period remained less than 5%. The change in the GDP growth rate reached 9.5% in the 1960s (1961-1970), 9.3% in the 1970s (1971-1980), and 10%

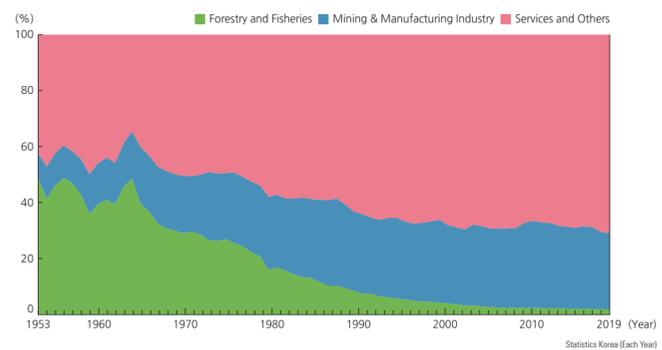
in the 1980s (1981-1990), with the highest growth rate of almost 10% for some time during this period.

But in the 1990s, the growth rate declined to 7.2%. In the 2000s, it dropped to 4.6%, and in the 2010s, it decreased significantly to 2.5%. This declining growth rate indicates the slowing growth of the Korean economy. Since 2010, growth has further slowed, with a growth rate of less than 4%. The proportion of the gross domestic product accounted for by the agriculture, forestry, and fishing industries declined sharply from 48.2% in 1953 to 28.9% in 1970, 8.4% in 1990, 2.4% in 2010, and only 2.0% in 2020. Meanwhile, mining and manufacturing had the proportion of 8.9% in 1953, 20.4% in 1970, 28.0% in 1990, and 30.3% in 2010, demonstrating a continuous increase. However, its trend turned into a decrease to 27.2% in 2020. Services and other tertiary sectors were at 42.4% in 1953, 50.7% in 1970, 63.6% in 1990, 67.3% in 2010, and 70.8% in 2020, showing a proportional increase. This change shows that the industrial structure of Korea was quickly reorganized after 1970, with industry's proportion of the gross domestic product moving from primary industry to secondary and tertiary industries.

Trends in the Real Growth Rate of GDP

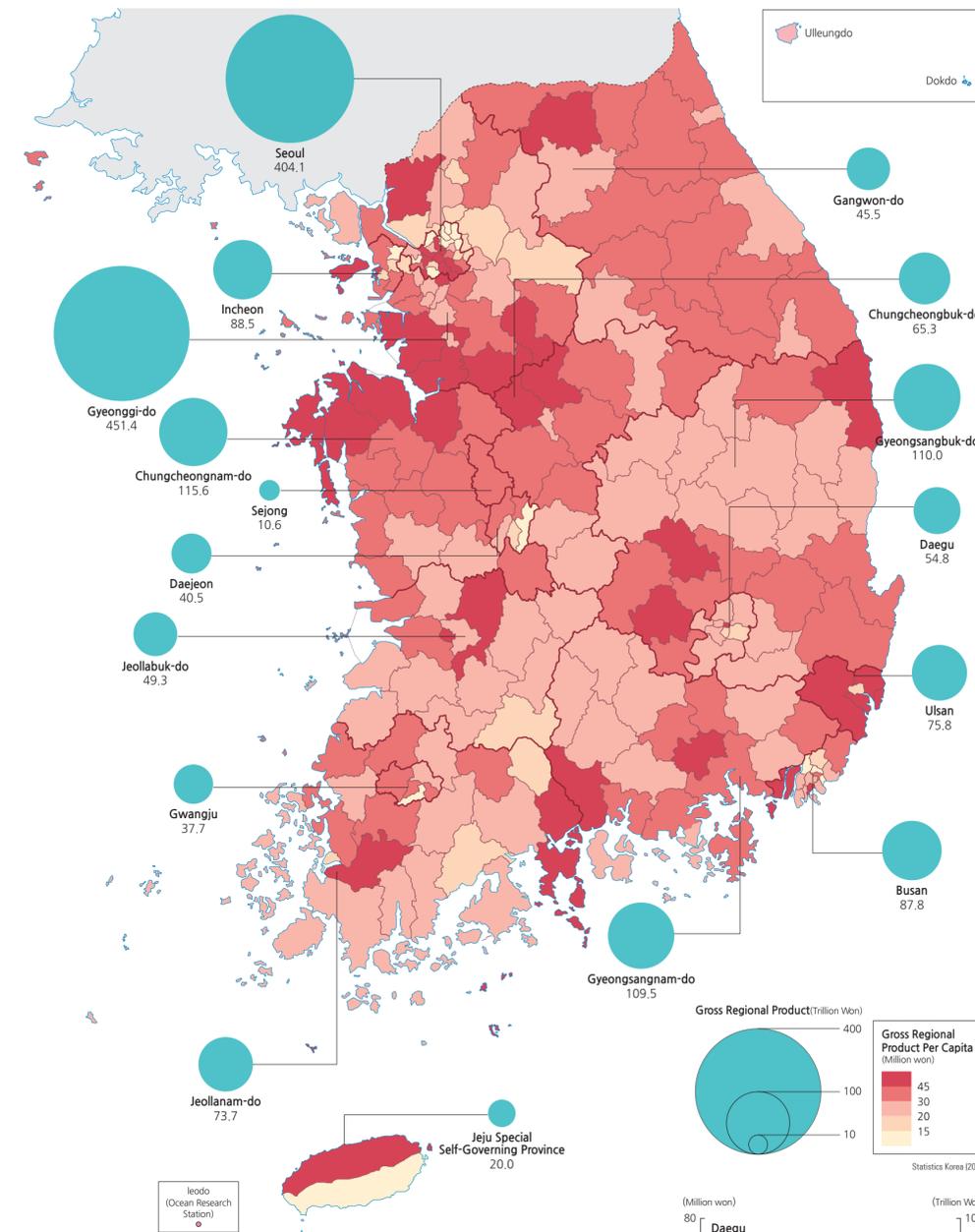


Changes in GDP by Industry

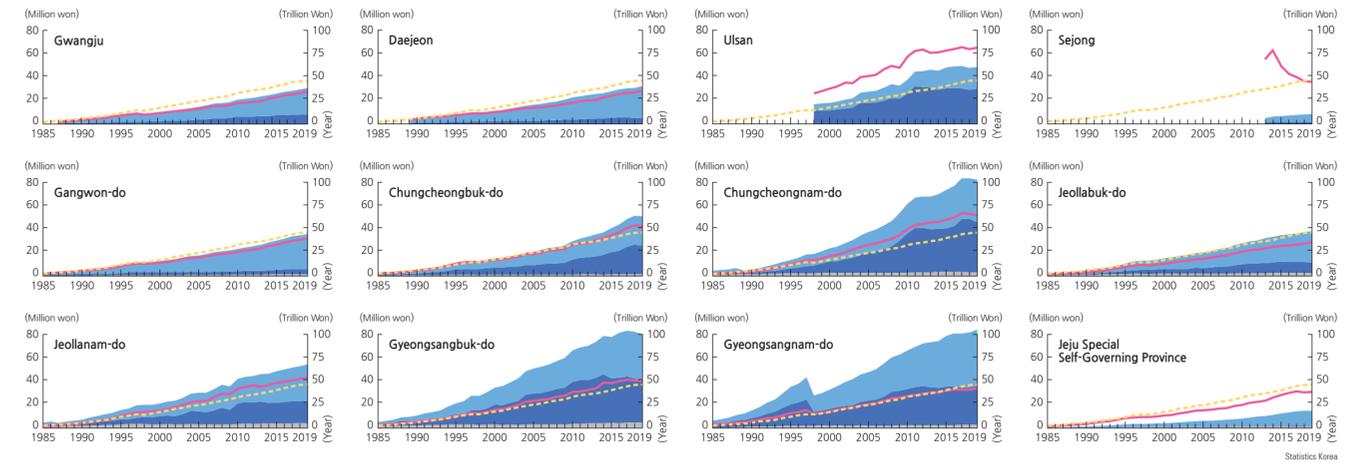
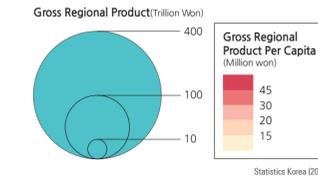
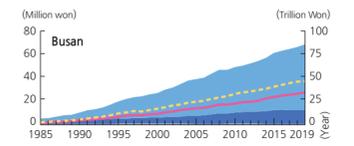
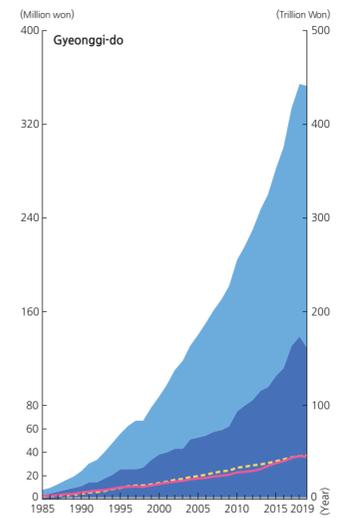
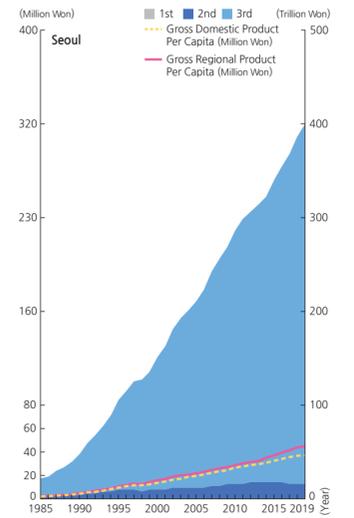


Economic Growth

RGDP and RGDP per Capita (2017)

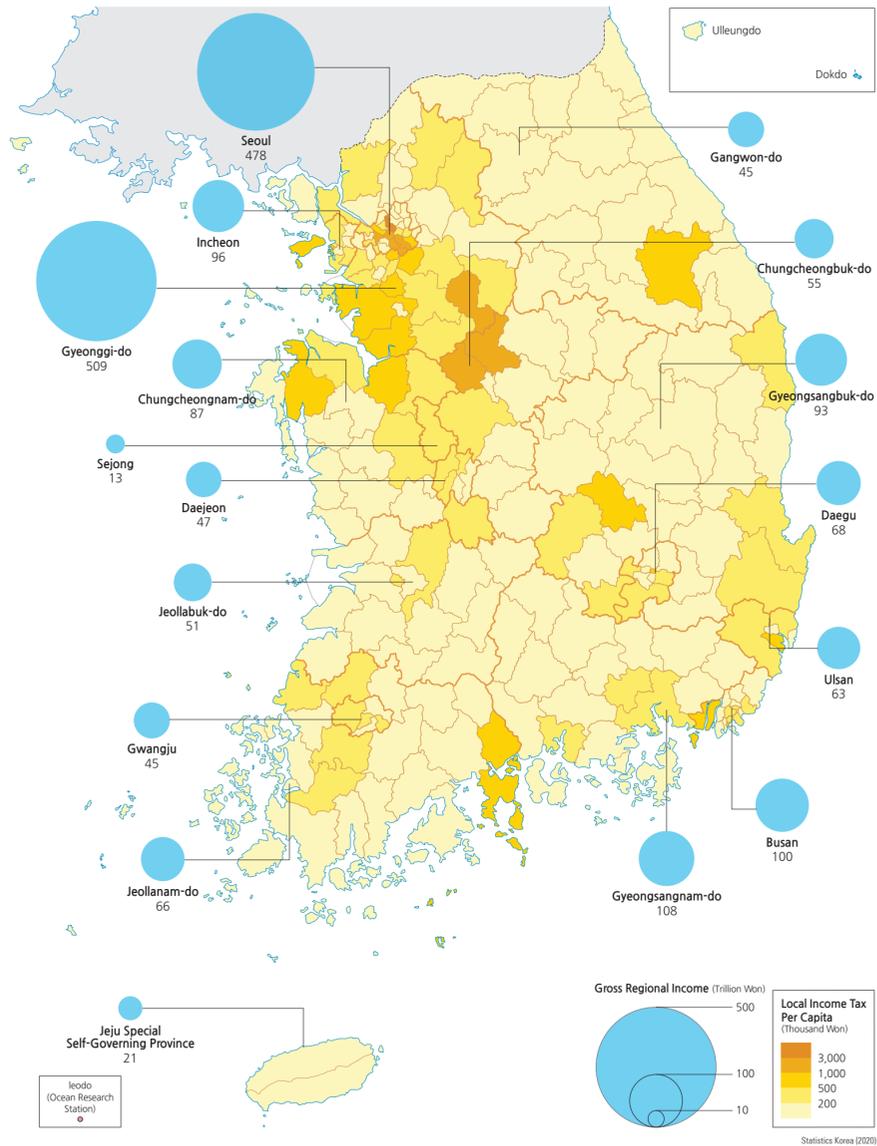


Growth Rate in RGDP (2000-2019)



Income and Expenditure

Regional GNI and Regional Income Taxes per Capita

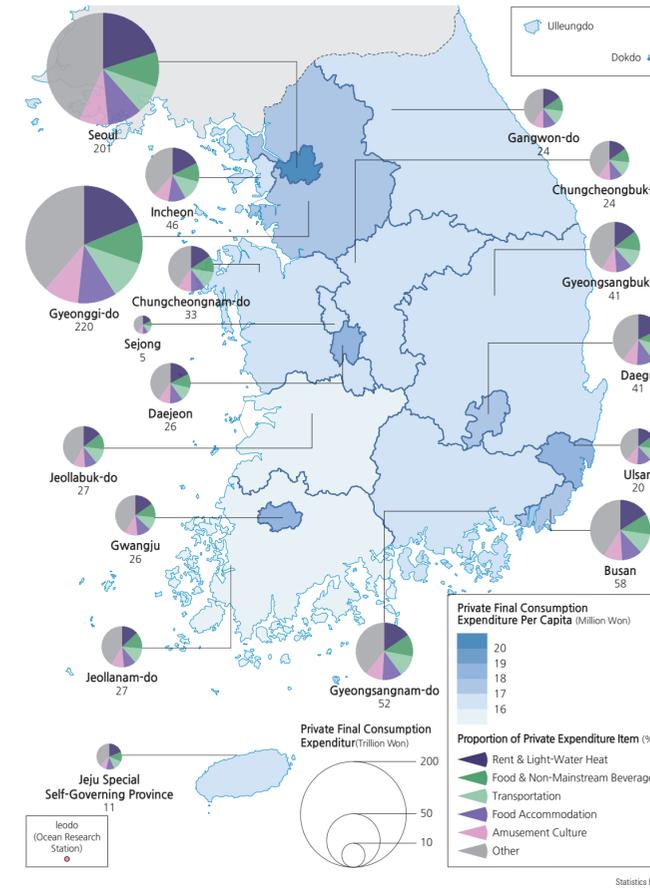


Regional gross domestic product (RGDP) has been regarded as an index that evaluates regional wealth to explain regional inequality and economic differences at the national level. However, it might not include all of the regional incomes. For example, the output produced by a branch factory would be included in the RGDP in the administrative region in which the branch is located, while the surplus yielded by the branch is going to be integrated into the regional income in the administrative region in which the headquarter is located. Therefore, the index of regional income levels should use total regional income rather than RGDP. Nevertheless, it is hard to use regional income at the -si-gun-gu area levels because regional income data is only available at the level of metropolitan cities and provinces (-do) in Korea. Instead, regional income tax would be used as a substitute index of regional income at the level of sub-metropolitan cities and provinces.

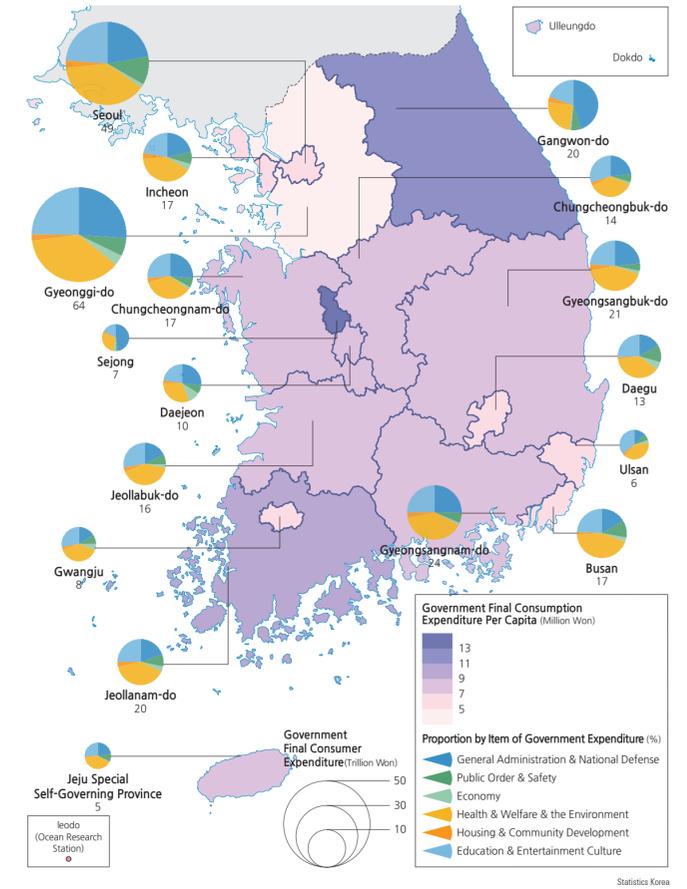
Total regional income has increased from 661 trillion won in 2000 to 1,949 trillion won in 2019, accounting for a 194.7% increase for 19 years. In terms of regional income by the level of metropolitan cities and provinces, higher regions than the national average were as follows: Gyeonggi-do (274.2%), Incheon (259.1%), Chungcheongnam-do (243.9%), Jeju-do (240.6%), Chungcheongbuk-do (216.8%), Gwangju (207.4). In particular, regional income in Gyeonggi-do has overtaken Seoul since 2016 and accounted for 26.4% of national income in 2019. In this same year, the regional income per capita by the level of metropolitan cities and provinces was as follows: Ulsan (54.19 million won), Seoul (48.69 million won), Gyeonggi-do (41.09 million won), Gyeongsangnam-do (39.29 million won), Sejong (38.18 million won). The level of regional income tax per capita by the -si-gun areas in 2019 was as follows: Seoul Jung-gu (6.59 million won), Seoul Jongno-gu (3.13 million won), Gangnam-gu (2.24 million won) in Seoul, Icheon-si (2.07 million won) in Gyeonggi-do, Seocho-gu (1.67 million won) in Seoul, Yeongdeungpo-gu (1.62 million won) in Seoul, Jincheon-si (1.14 million won) in Chungcheongbuk-do, Eumseong-gun (1.06 million won) in Chungcheongbuk-do. On the other hand, the lowest region was Seogwipo-si in Jeju-do, accounting for only 0.02 million won.

In terms of total regional consumption expenditure in 2019, the proportion of expenditure by metropolitan cities and provinces was as follows: Gyeonggi-do (23.4%), Seoul (20.7%), Gyeongsangnam-do (6.3%), Busan (6.2%), Incheon (5.2%). Regions higher than the national average of consumption expenditure (24.4 million won) were Sejong (35.6 million won), Gangwon-do (29.5 million won), Seoul (26.9 million won), Jeollanam-do (26.7 million won), and so on whereas regions lower than the national average were Incheon (22.2 million won) and Busan (23.5 million won). Consumption expenditure by item was as follows: food and non-alcoholic beverages (15.9%), restaurants and hotels (13.3%), transportation (12.0%), and housing, bills, gas, and other fuels (11.9%)

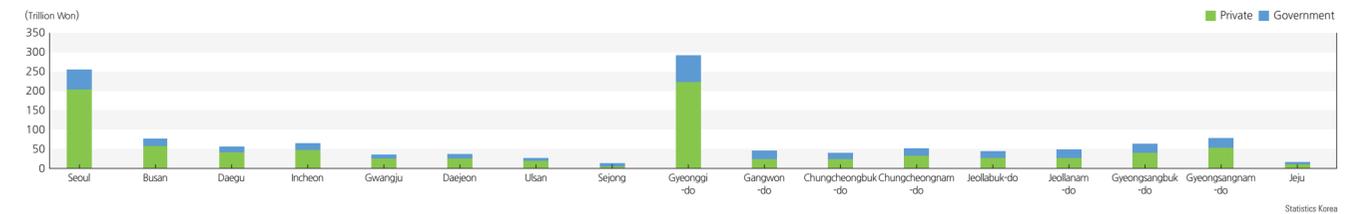
Private Final Consumption Expenditure Per Capita



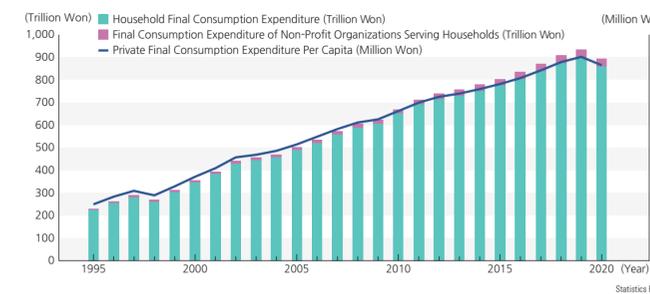
Government Final Consumption Expenditure Per Capita



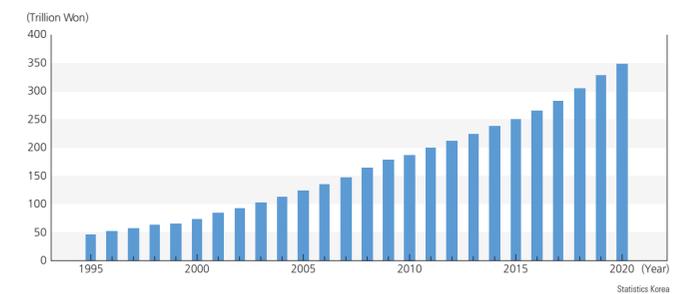
Final Consumption Expenditure (2020)



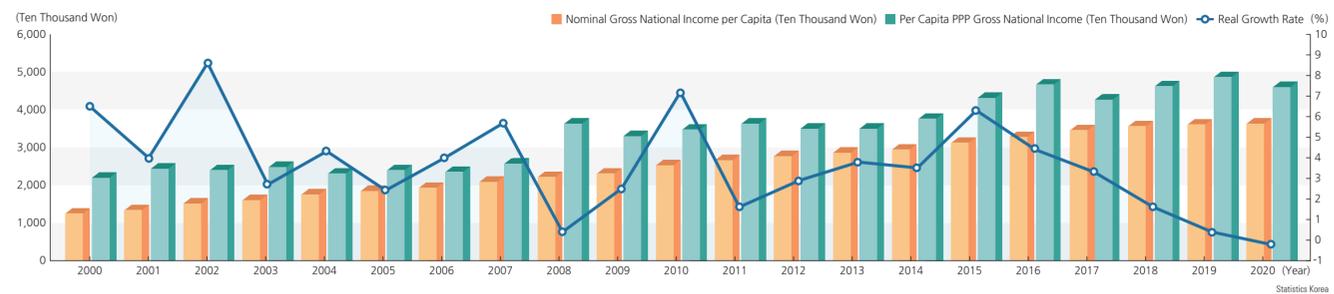
Changes in Private Consumption Expenditure (1995-2020)



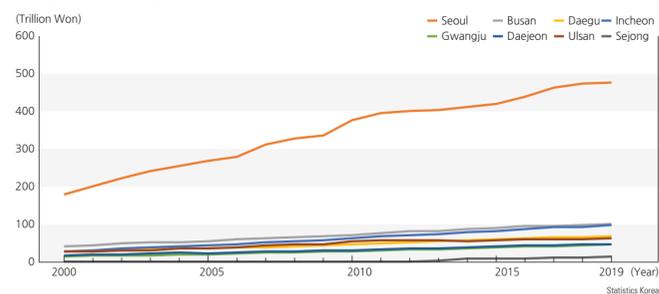
Change in Government Consumption Expenditure (1995-2020)



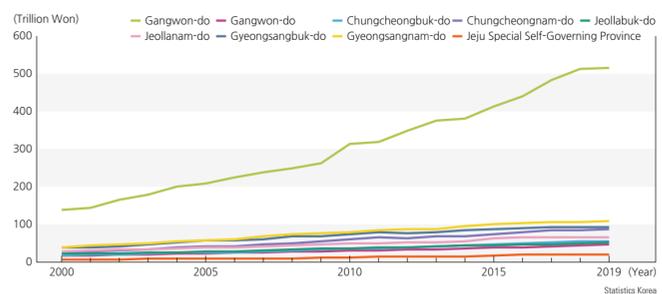
Changes in GNI per Capita



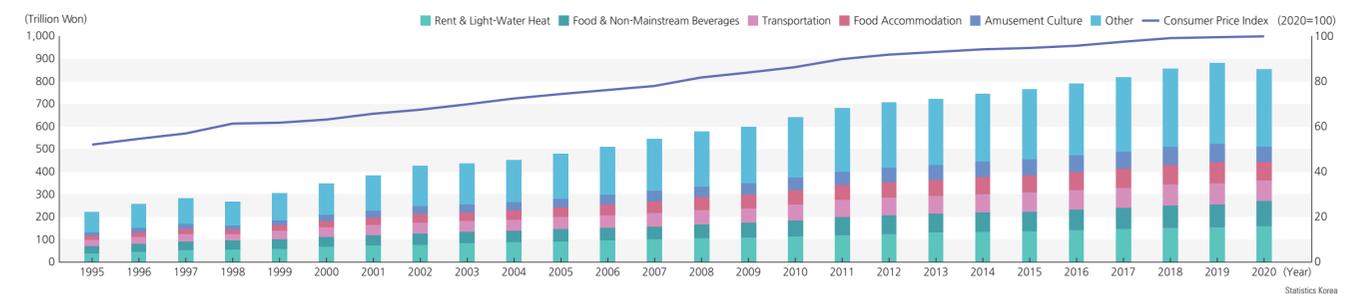
Changes in Gross Regional Income (-Si)



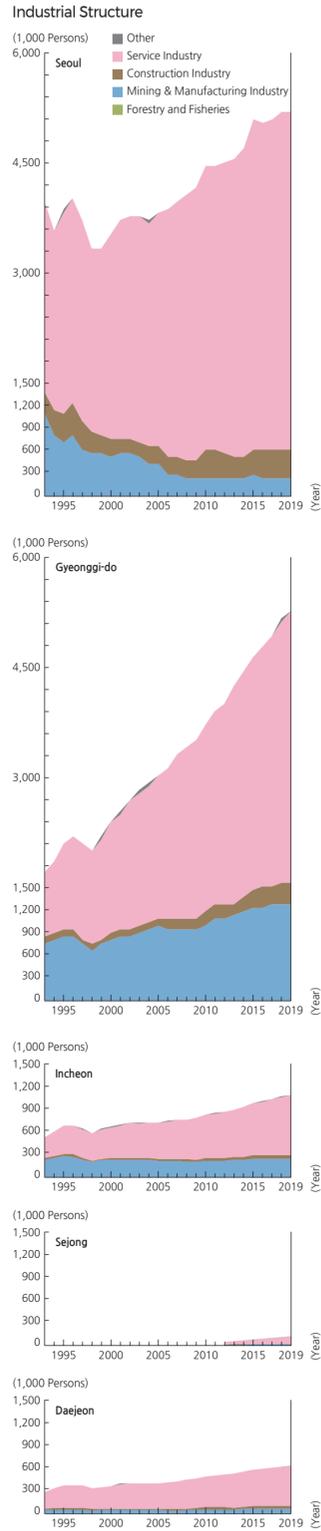
Changes in Gross Regional Income by Province (-Do)



Changes in Consumer Price Index (1995-2020)

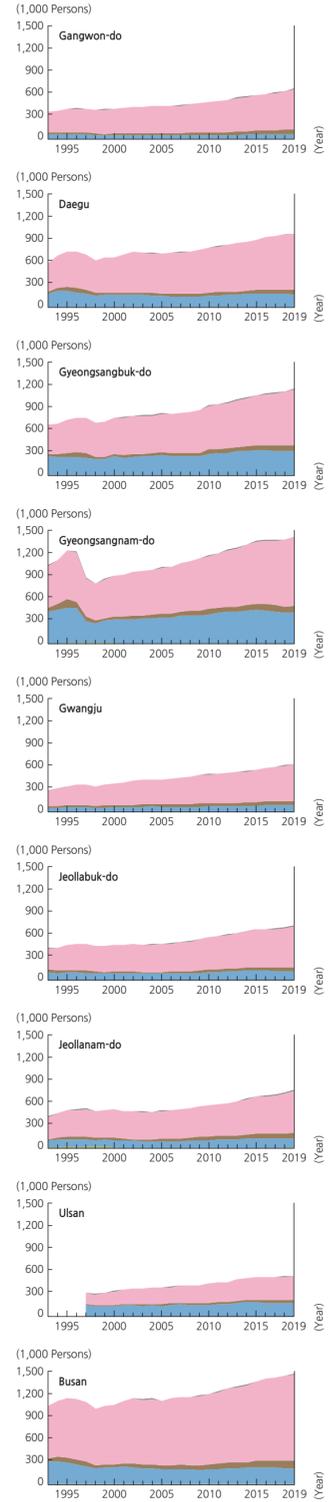
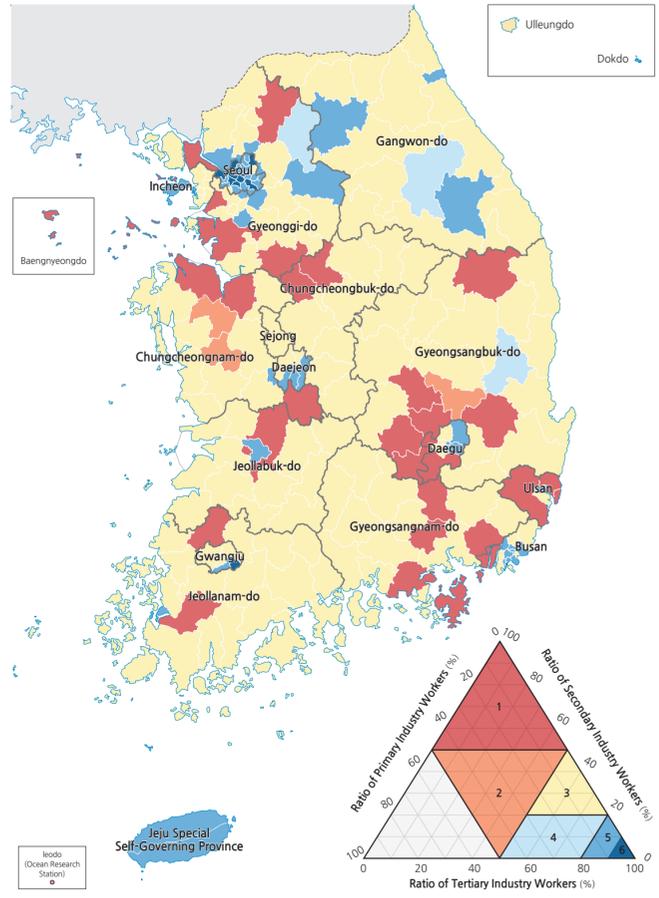


Industrial Structure

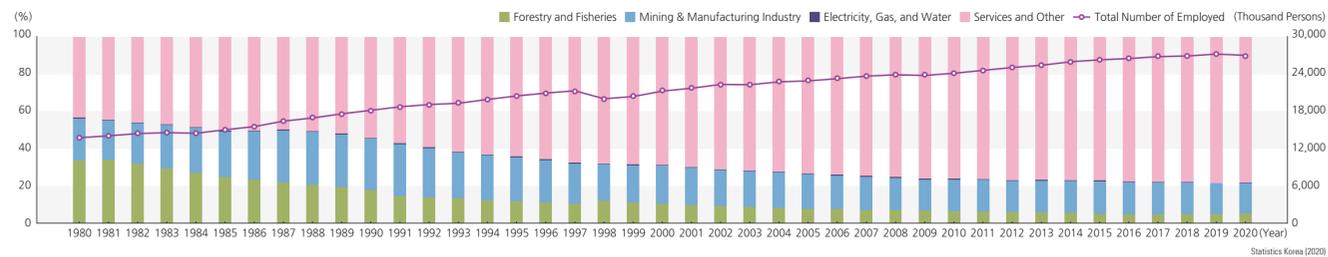


An analysis of the changes in the proportion of employees and establishments by industries reveals that the economic sectors of agriculture, forestry, fishing, mining, and manufacturing have declined continuously, while service sectors have increased. For example, the proportion of mining and manufacturing employees declined from 20.4% in 2000 to 16.4% in 2019. On the other hand, the proportion of service industrial sector employees and their establishments grew from 68.9% in 2000 to 78.5% in 2019. In particular, since 2000, the greatest increases in the number of service sector employees per thousands of persons have mostly occurred in the large metropolitan areas where the service sector grew the fastest, such as Jung-gu in Seoul (2,441 to 3,111), Geumcheon-gu in Seoul (388 to 1,042), Gangseo-gu in Busan (449 to 1,004), Jongno-gu in Seoul (1,182 to 1,721), and Jung-gu in Busan (1,122 to 1,593).

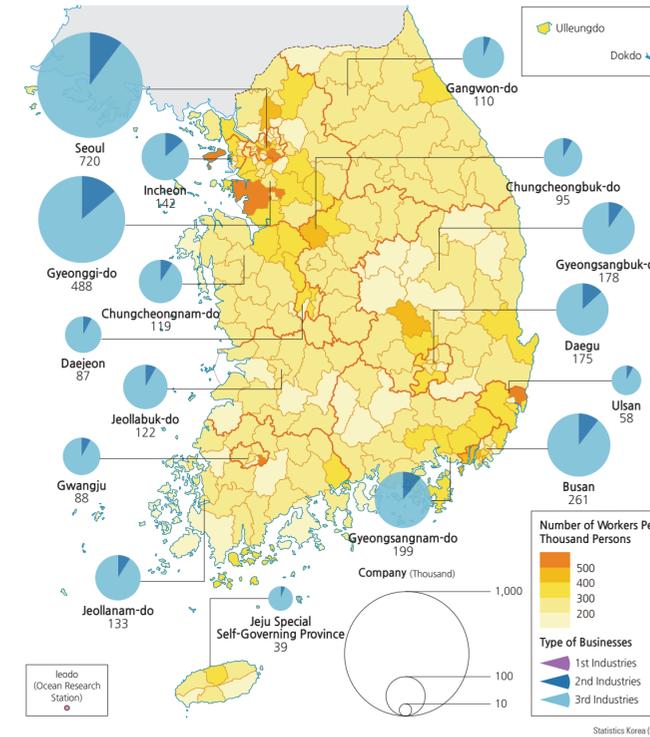
Ratio of Employees by Industry (2019)



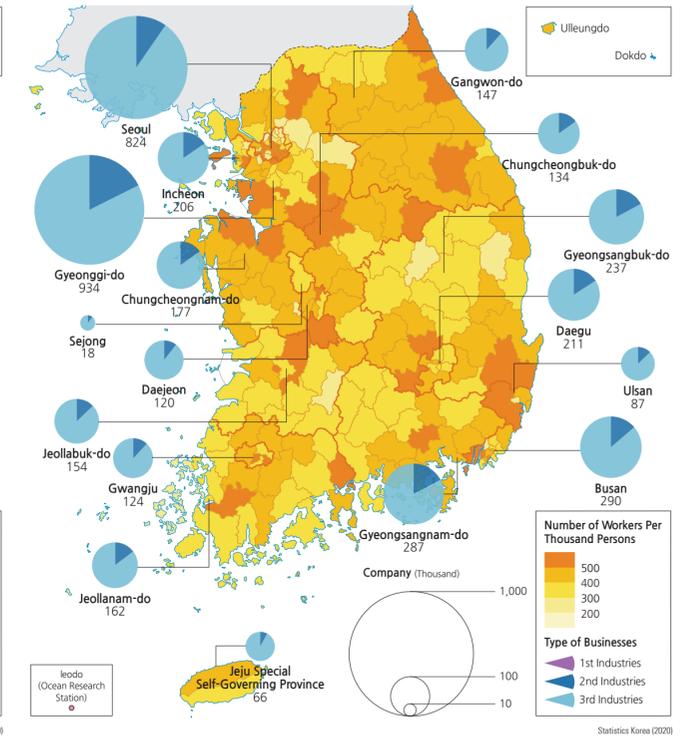
Changes in the Percentage of Employees by Industry



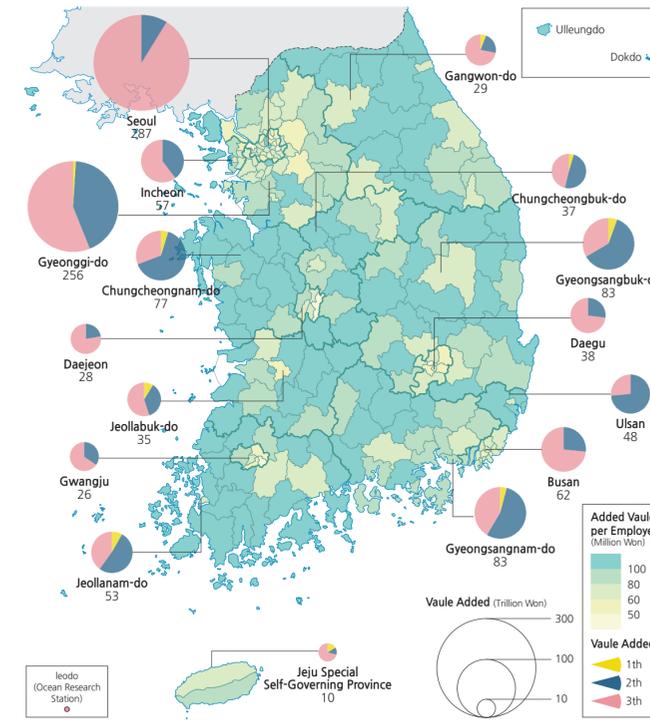
Businesses and Workers (2000)



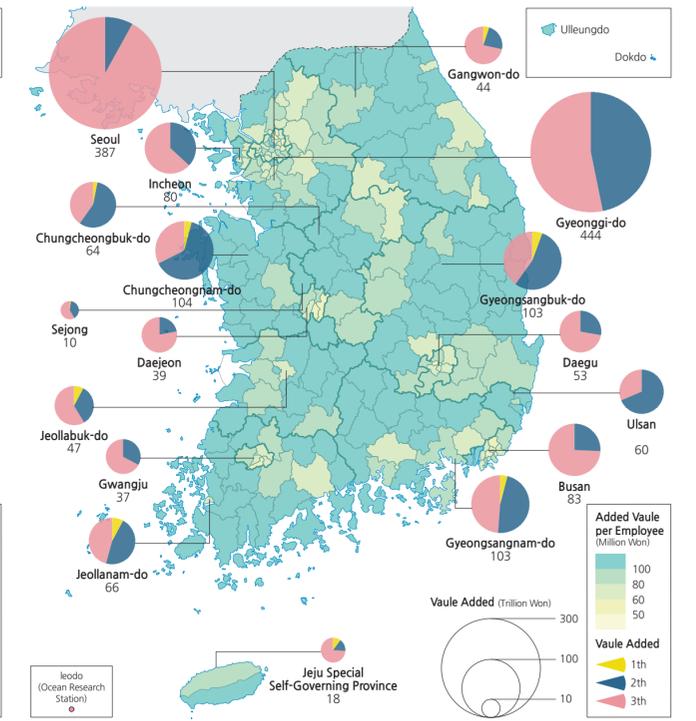
Businesses and Workers (2019)



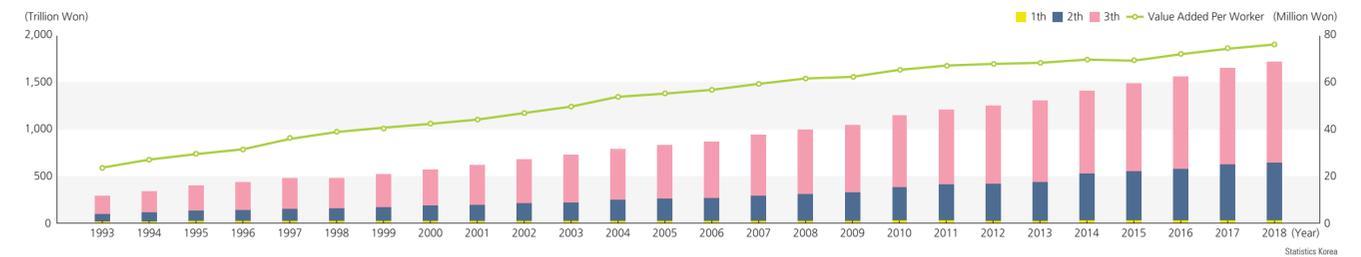
Total Value Added (2010)



Total Value Added (2018)

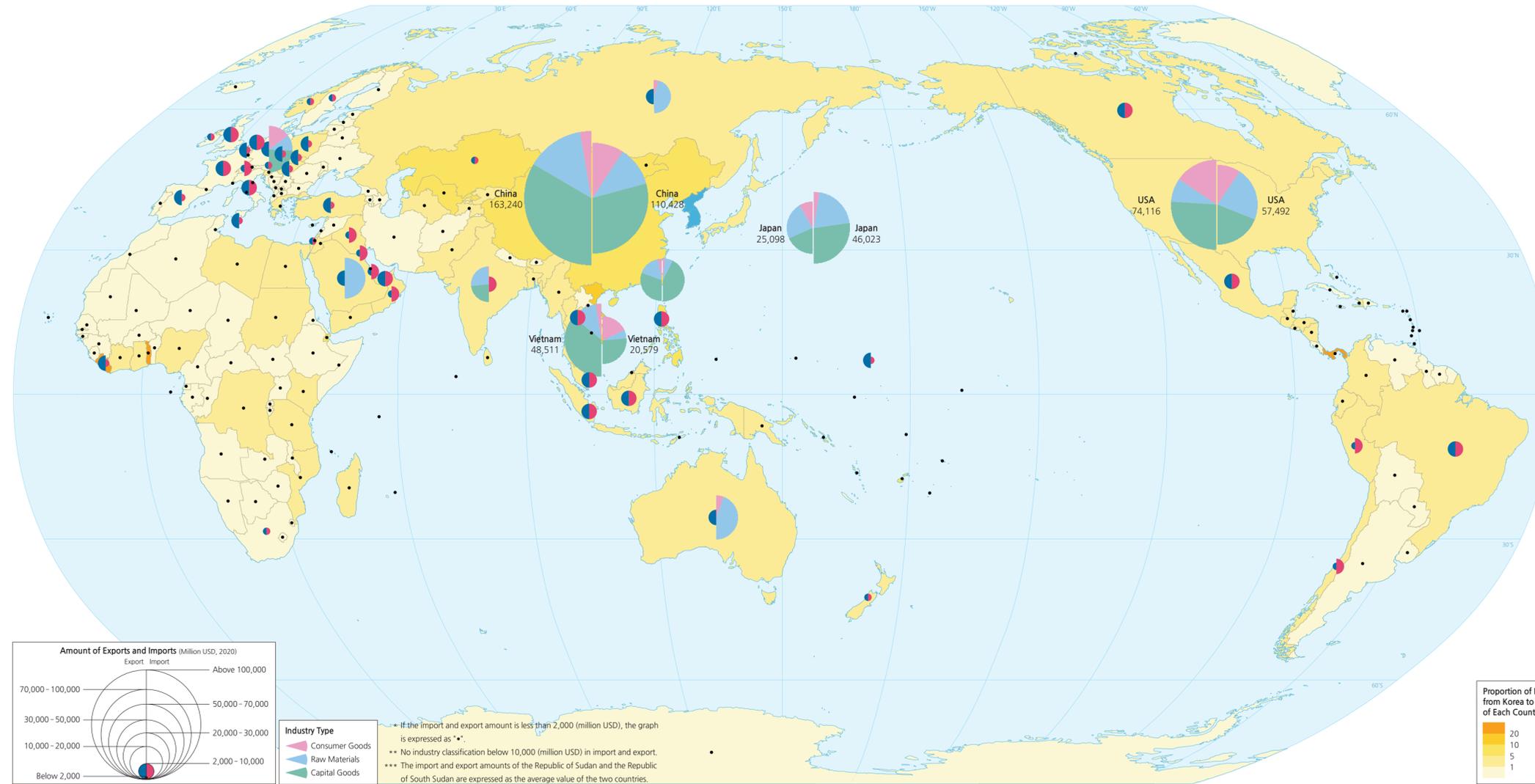


Value Added by Industry

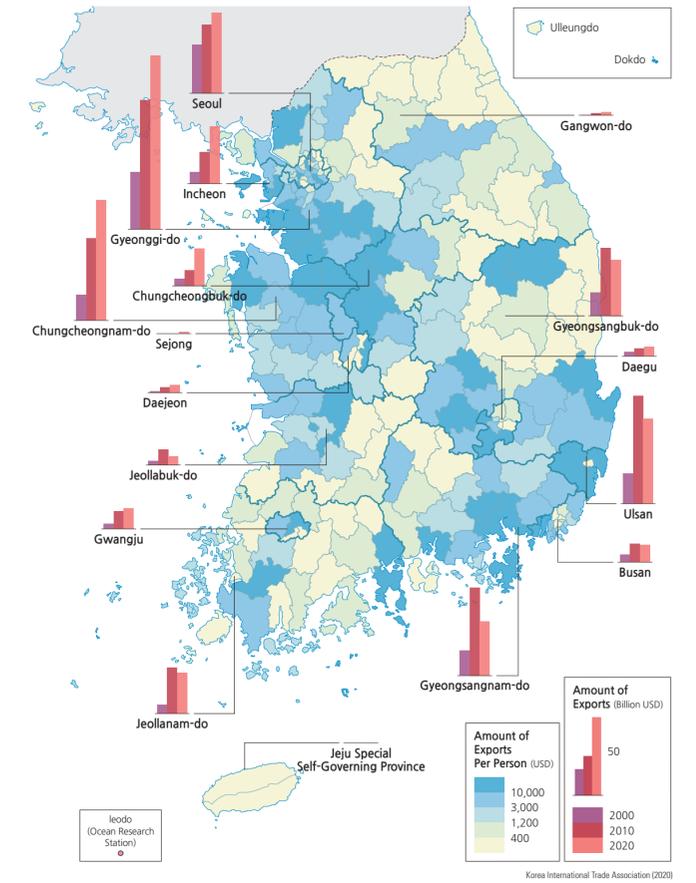


Trade and International Balance

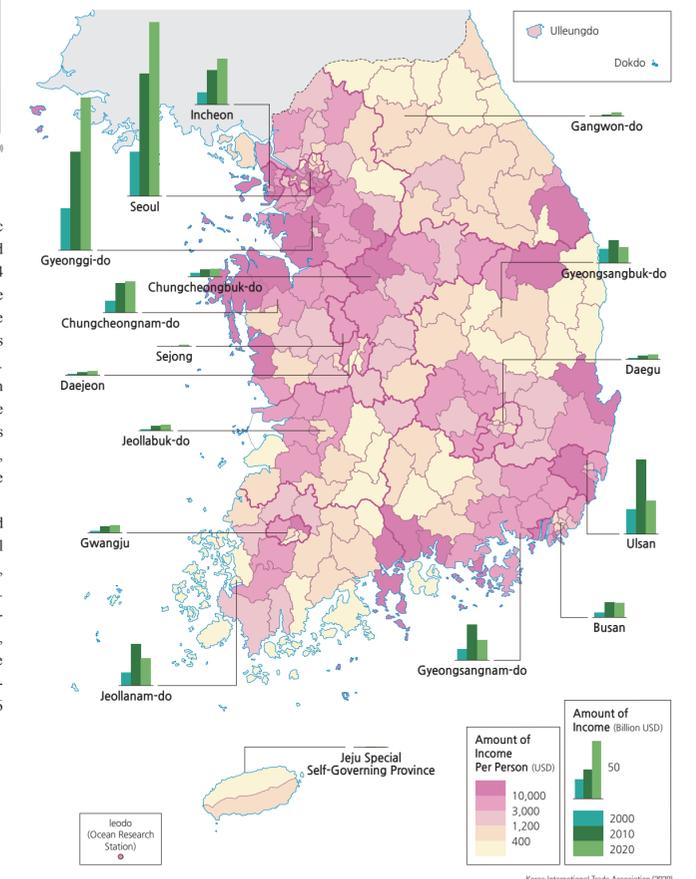
Exports and Imports of Korea



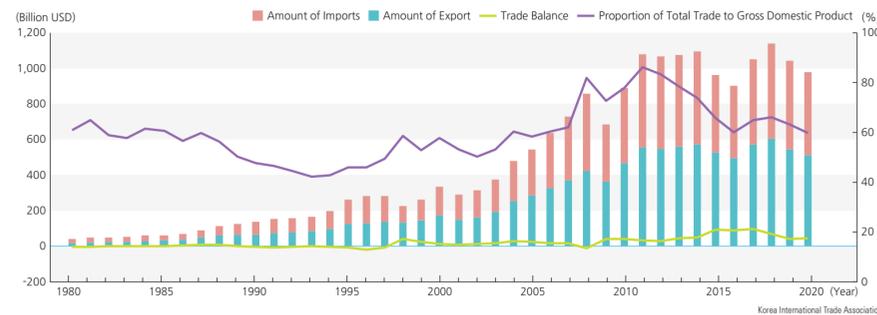
Exports (2000, 2010, and 2020)



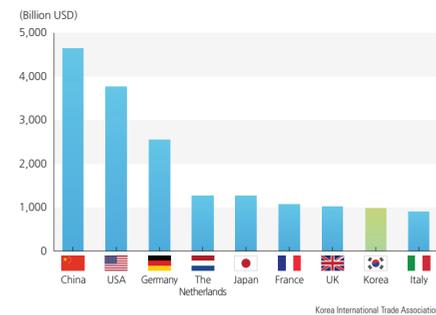
Imports (2000, 2010, and 2020)



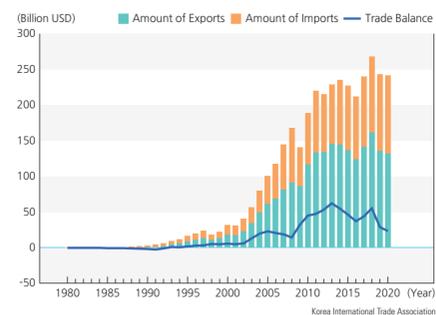
Exports, Imports, Trade Balance, and Degree of Dependence on Foreign Trade of Korea



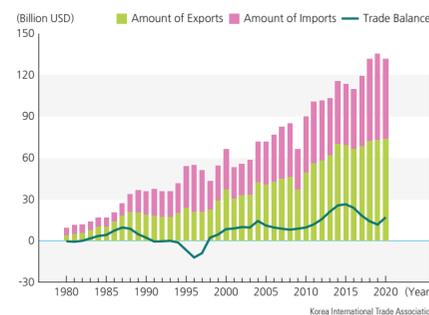
Leading Countries in World Trade



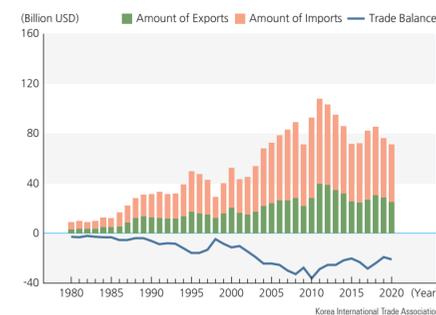
Exports, Imports, and Trade Balance with China



Exports, Imports, and Trade Balance with the USA



Exports, Imports, and Trade Balance with Japan

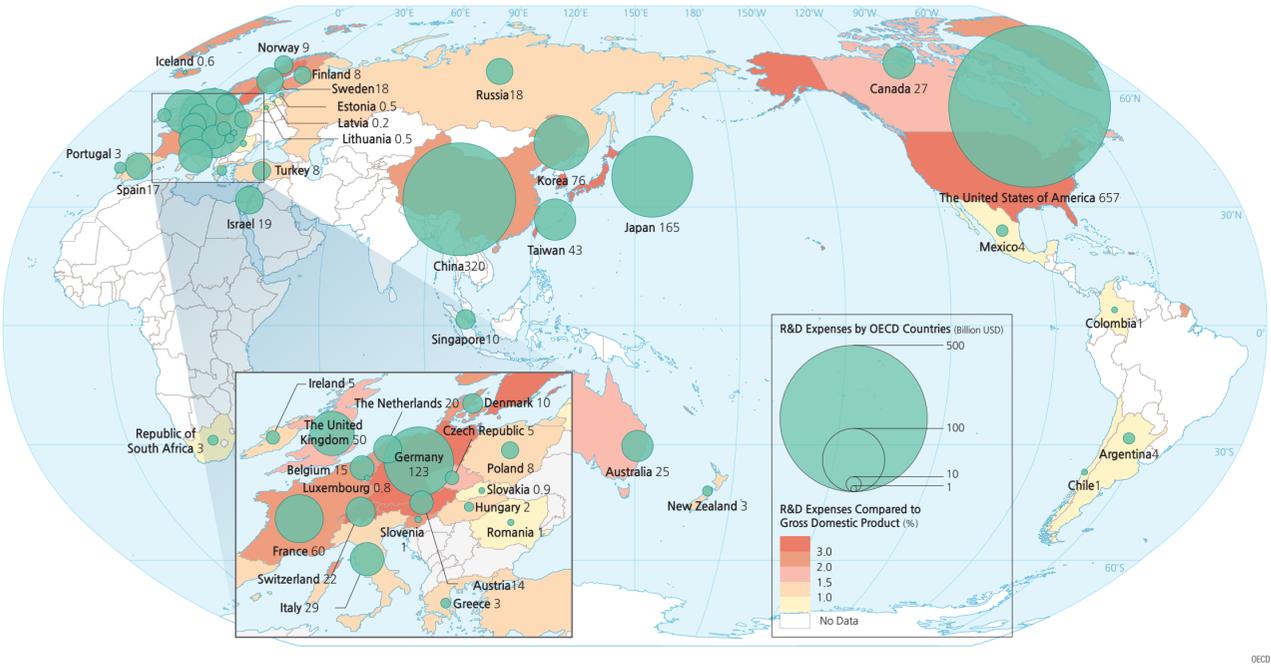


Since the 1960s, the rapid growth of international trade has played a crucial role in the economic growth of Korea. By 2011, the country's international trade volume had exceeded 1 trillion USD, and in 2018, it reached 1.1401 trillion USD. However, it declined to 980.1 billion USD (export: 512.4 billion USD, import: 467.6 billion USD) in 2020 due to Covid-19. In particular, the foreign trade dependency initiated by the export-led growth strategy of the 1960s maintained a steady increase (to 40%) through the mid to late 1990s and continued to increase to 86.1% by 2011. But it has significantly decreased thanks to the growth in the domestic market, accounting for 59.8% in 2020. What is noticeable here is that the decrease in the foreign trade dependency after 2019 comes from the deterioration of exports due to Covid-19. In terms of international trading, the highest volume of exports was to China, followed by the United States, Japan, and Vietnam. Meanwhile, China was also the country from which Korea received the most imports, followed by the United States, Japan, Germany, and Vietnam. In particular, China has been Korea's most important trading partner since 2007.

The analyses of international trading activities by region reveal that Gyeonggi-do (22.5%) had the most export volume in 2020, followed by Chungcheongnam-do (15.5%), Ulsan (10.9%), Seoul (10.4%), and Incheon (7.4%). On the other hand, Seoul (31.6%) had the most import volume in 2020, followed by Gyeonggi-do (27.7%), Incheon (8.3%), Ulsan (6.0%), and Chungcheongnam-do (5.7%). The highest per capita export volume in US dollars was from Asan (186,636 USD), followed by Buk-gu in Ulsan (88,724 USD), Jung-gu in Incheon (86,031 USD), Namdong-gu in Incheon (80,845 USD), Icheon in Gyeonggi-do (74,732 USD), and Ulju-gun in Ulsan (74,216 USD). On the other hand, the highest per capita import in US dollars was to Jung-gu in Seoul (140,990 USD), followed by Jongno-gu in Seoul (138,475 USD), Ulju-gun in Ulsan (100,212 USD), Namdong-gu in Incheon (80,386 USD), and Seosan in Chungcheongnam-do (77,266 USD).

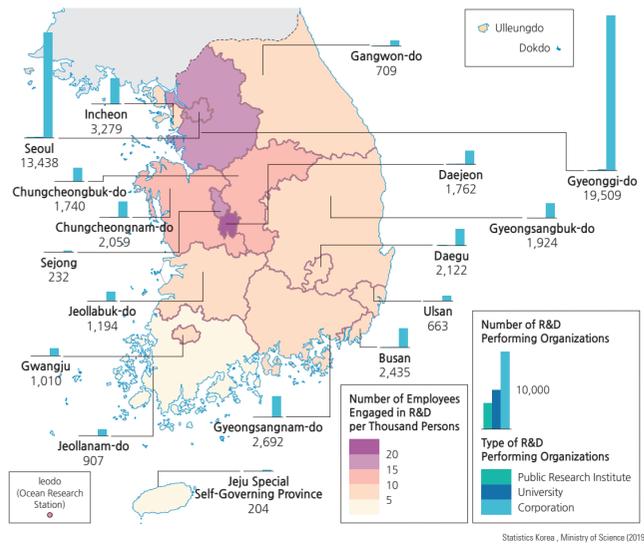
Research and Development

R&D by Country in OECD

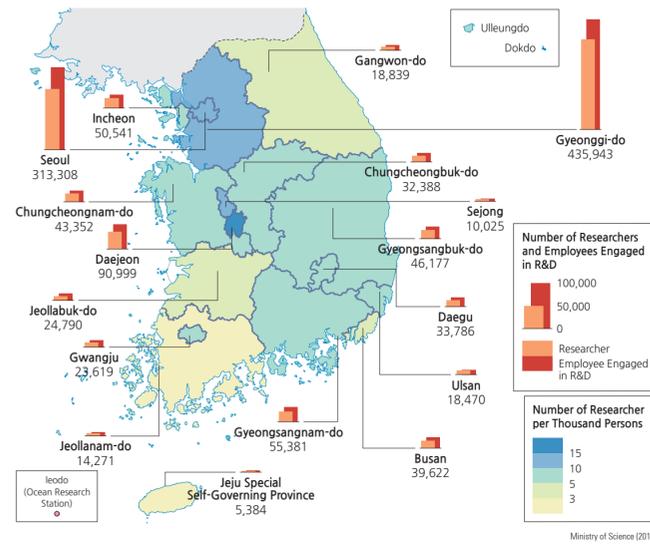


OECD (2019)

Employees and Organizations of R&D (2019)

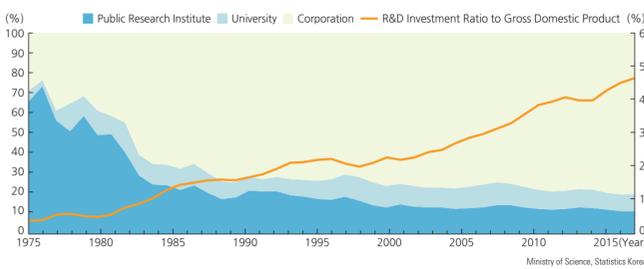


Number of Researchers (2019)



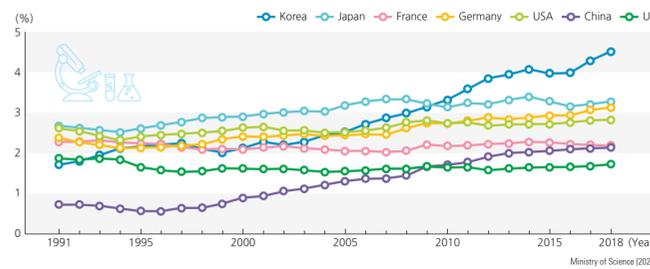
Ministry of Science (2019)

Proportion of R&D Performing Organizations



Ministry of Science, Statistics Korea

Proportion of R&D Expenditure to GDP by Leading Countries



Ministry of Science (2020)

Since the 1980s, Korea's industry has been transformed into an innovation-led industrial structure through technology investments and advanced technology, as well as human resource development. In 2019 the R&D ratios to GDP among OECD countries reveal that Israel is currently in first place at 4.2%, with South Korea in second place at 4.6%, followed by Taiwan (3.5%), Sweden (3.5%), Japan (3.2%), Austria (3.2%), Switzerland (3.2%), Germany (3.2%), and the United States (3.1%).

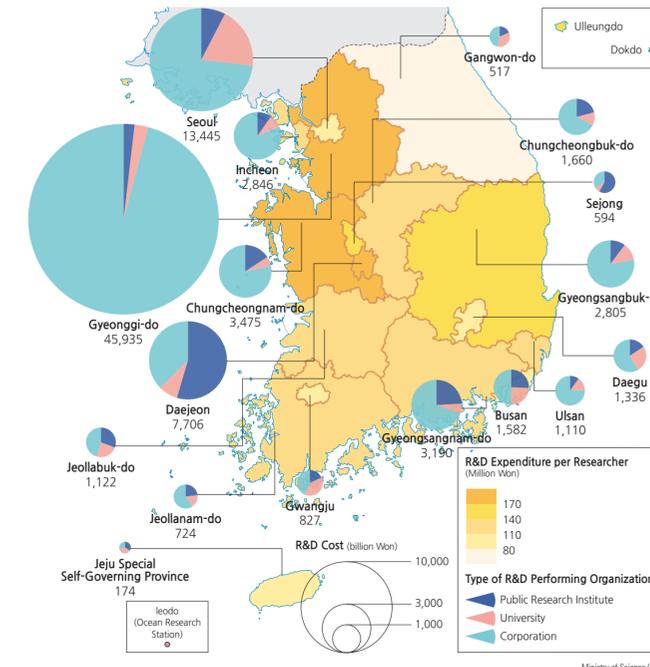
A review of the R&D performing organizations shows that in the 1970s, over half of them were public research institutions.

However, starting in 1980, the proportion of private enterprises increased rapidly, and after 1989, they accounted for more than 70%. In 2019 the proportion of public research organizations accounted for 11.4%, private enterprises accounted for 80.3%, and universities accounted for 8.3%. An examination of R&D performing organizations by region shows that most R&D organizations are located in the Seoul Metropolitan Area of Gyeonggi-do (34.9%) and Seoul (24.0%), followed by Incheon (5.9%), Gyeongsangnam-do (4.8%), and Busan (4.4%). The locations with the greatest number of researchers per thousand

Persons are Daejeon (25.0 persons), Gyeonggi-do (14.4 persons), Seoul (13.3 persons), Sejong (12.7 persons), and Chungcheongnam-do (8.4 persons). The numbers for local research and development personnel also appear similar to the numbers for researchers by region. Daejeon had the most R&D personnel per thousand persons at 35.9 persons, followed by Seoul (18.0 persons), Gyeonggi-do (17.6 persons), Sejong (16.8 persons), Chungcheongbuk-do (11.6 persons), and Chungcheongnam-do (11.4 persons).

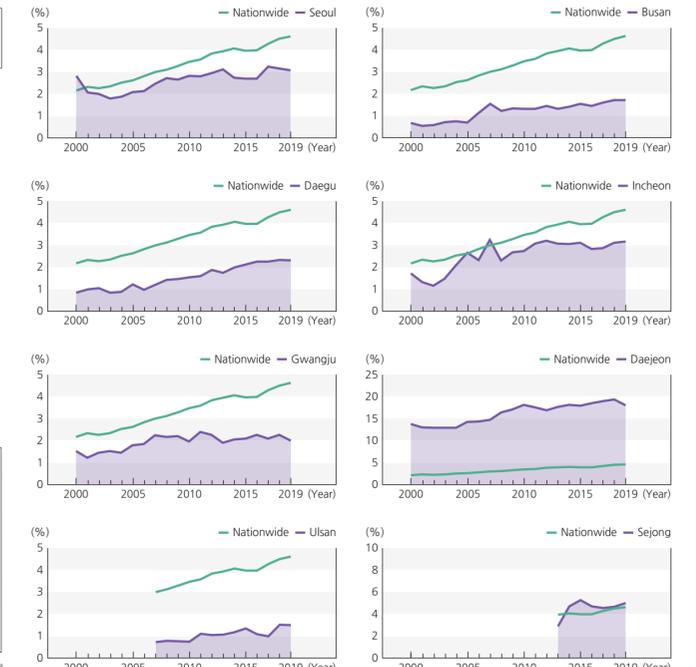
In the R&D investment trends, the share of R&D to GDP

R&D Expenditure (2019)

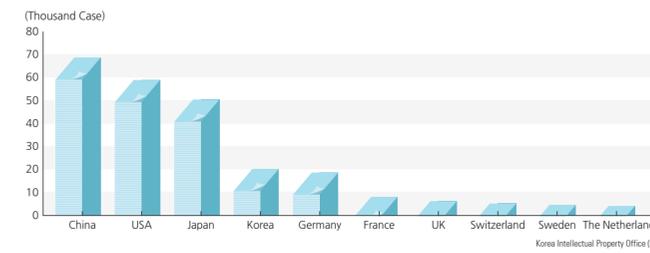


Ministry of Science (2019)

Proportion of R&D Expenditure to RGDP

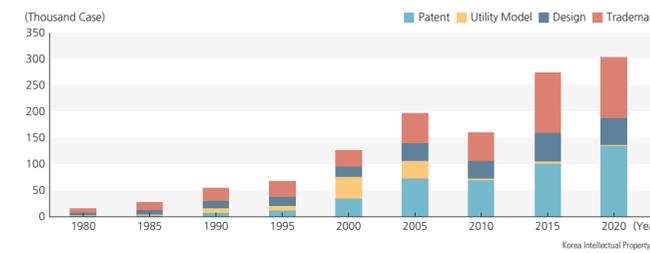


International Patent Applications of World Leading Countries



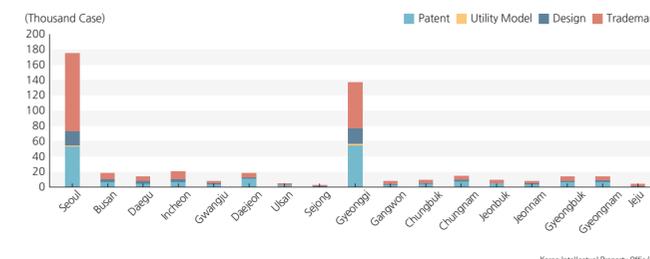
Korea Intellectual Property Office (2020)

Registrations of Domestic Intellectual Properties (1980-2020)



Korea Intellectual Property Office (2020)

Application of Domestic Intellectual Properties



Korea Intellectual Property Office (2020)

increased from less than 1% in the early 1980s to 2% in the 1990s and continued to rise, accounting for 4.6% in 2019. According to the proportion of R&D to regional GDP, all metropolitan areas and provinces, except Daejeon and Gyeonggi-do, did not reach the national average. Since 1973 the Ministry of Science and Technology has invested 30 trillion won in Yuseong-gu in Daejeon and established Korea's first intensive scientific technology and research park in the Daedeok Research Complex. As a result, R&D expenses in the Daejeon area accounted for 13.8% of the regional GDP in 2000 and continued to increase to 18.0%

in 2019. Meanwhile, through vigilant attention to technology-intensive enterprises after the 1997 financial crisis, Gyeonggi-do significantly increased R&D investment throughout the 2000s. Statistically, the R&D ratio to GDP was 2.8% in 2000, but by 2019 it had increased significantly to 9.6%. In particular, in terms of per capita R&D expenditure by metropolitan area and province, the highest region was from Gyeonggi-do (234.4 million won), followed by Daejeon (206.3 million won), Chungcheongnam-do (189.0 million won), Gyeongsangnam-do (143.6 million won), and Sejong (141.5 million won).

Korea is the world's fourth-largest country in terms of the number of international patent applications in 2020 at 20,059 cases, following China (68,707 cases), the United States (56,881 cases), and Japan (50,527 cases). Also, the number of patents granted has increased dramatically from 1,632 cases in 1980 to 134,766 cases in 2020. In terms of the number of patent applications by metropolitan and province, Gyeonggi-do (30.3%) had the most patent applications volume in 2020, followed by Seoul (29.4%), Daejeon (6.0%), and Chungcheongnam-do (4.0%).