Mizuho Economic Outlook & Analysis

May 22, 2020

The potential for home-based work in Japan

Around 30% of workers can work from home

< Summary >

◆ This paper estimates that around 30% of Japanese workers can work from home. Although the number of commuters has dropped significantly in May, companies seem to be making huge sacrifices of productivity to realize this reduction.

◆ My analysis suggests that the actual ratio of regular employees working from home could improve by another around 10 percentage points. Companies are expected to create telecommuter-friendly working environments by taking measures such as reexamining their working operations and promoting more effective use of information technologies.

◆ Relatively lower-skilled and lower-income workers tend to engage in jobs that cannot be performed remotely and face a higher risk of reducing incomes. The COVID-19 shock could exacerbate the inequality between regular and non-regular employees.

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1. Introduction

An increasing number of companies have now introduced the system of telecommuting or working from home, for their workers to prevent the spread of COVID-19 infection. Even in the aftermath of the current crisis, teleworking will be likely to become more common in the Japanese labor market. However, this home-based work style is not feasible for all types of occupations. Hence, it would be useful to investigate the potential of working from home for individual occupations, to examine the extent to which telecommuting has been implemented during this crisis and to forecast potential structural changes in the future labor market.

This report estimates the ratio of Japanese workers who, in theory, can work from home by applying the related study in the United States (US) that estimates the share of jobs that can be performed at home (Dingel and Neiman, 2020). Although conducting work from home requires some IT equipment or system, the estimate in this study does not regard this issue and determines whether a given job can be done at home based solely on the nature of the tasks at each occupation. I also examine the differences in the potential of telecommuting by region (prefecture) and the industry as well as the characteristics of workers.

2. Estimation method

My estimation method draws on research by Dingel and Neiman (2020). Establishing a set of 15 criteria based on the data about work contents and activities from the US Occupational Information Network (O*NET), they classified 968 occupations, assigning a value of 1 to jobs that can be performed at home and 0 to jobs that cannot be done remotely. For example, occupations are categorized as unable to be performed at home when the use of e-mails is extremely infrequent, when workers are required to work outdoors, or when operating a machine is very important for the job. On the other hand, occupations such as computer and mathematical, legal, and business and financial operations, are classified as jobs that can be performed at home. Their analysis finds that 37% of employees can work from home in the US. Their calculation gives the value of 0 to an occupation that can rule out the possibility of home-based work; therefore, their estimate is interpreted as an upper bound on the share of employees that can work from home.

To determine whether teleworking is feasible for a given job, a database containing detailed records of work contents and activities of each job is necessary, as described above. In March 2020, the website of the “Japanese version of O-NET,” which is

expected to contribute to such research, was released. However, since the data available from this site is limited compared with the O*NET in the US at the time of writing, I attempt to calculate the estimate based on the results of Dingel and Neiman (2020) and use the data from Japan's O-NET[1] to adjust their estimation to Japanese cases.

To apply the analytical results of Dingel and Neiman (2020) to Japan, it is necessary to map Japanese occupational classifications to the US equivalents. For this purpose, this report refers to the work by Hamaguchi and Kondo (2018). They calculated the possible share of workers being substituted by the artificial intelligence (AI) for each prefecture in Japan, by applying the findings of Frey and Osborne (2017) who used O*NET data to determine the probability of such substitutions in the US. In the course of this calculation, Hamaguchi and Kondo (2018) connected between Japan's occupational classifications at the unit group (3-digits) used in the Population Census and the Employment Status Survey (both were conducted by the Ministry of Internal Affairs and Communication (MIC)) and the US classifications (SOC codes), and created the concordance table. This report uses this table to apply the estimates on the feasibility of teleworking in the US to Japan.

More specifically, first, I merge the scores calculated by Dingel and Neiman (2020) that show the feasibility of teleworking for each job with the corresponding US occupational classifications (SOC codes, 2010). Then, following the concordance table of Hamaguchi and Kondo (2018), I map the values for the US occupational classifications to the Japanese equivalents (occupational classifications at the unit group) used in the Population Census.[2] When more than one classification falls into a single classification, a simple mean value is used.[3] In this way, I calculate the scores demonstrating the probability of teleworking for 231 occupational classifications (except workers not classifiable by occupation) at the unit group level used in the Population Census (hereinafter this score is called "DN value"). **Chart 1** depicts the image of this calculation process.

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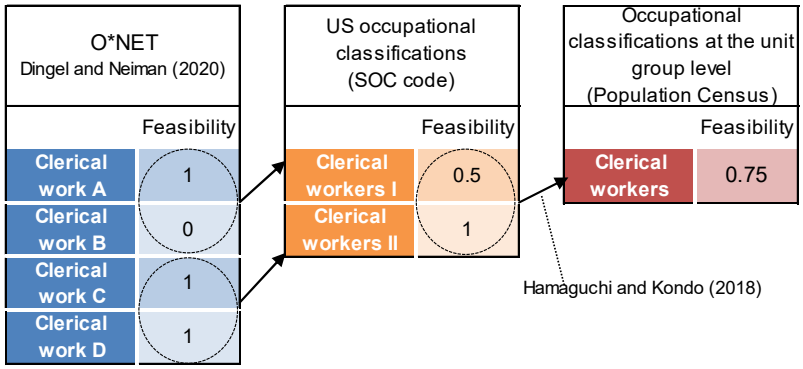
[1] The data from the Japanese version of O-NET used in this paper is "the abridged numerical downloadable data (ver. 1.8) in the occupational information database created by the Japan Institute for Labor Policy and Training." On May 13, 2020, I downloaded the data from the website of Japan's O-NET operated by the Ministry of Health, Labour, and Welfare for providing occupational information (https://shigoto.mhlw.go.jp/User/download).

[2] It should be noted that Hamaguchi and Kondo (2018) excluded classifications of "other" occupations and "not classifiable by occupation" from 232 classifications of the unit group. This report uses the average of the values for the other unit group classifications in the same minor group, as a substitute for the value for "other" occupations. I substitute the value for "other carrying, cleaning, packaging, and related workers" at the unit group with the averaged value for occupations in the same major group.

[3] Dingel and Neiman (2020) mapped each job of O*NET' to the SOC classification by using the number of respondents at the O*NET survey as the weight. However, I use the simple mean values, as the purpose of this report is to apply the analytical findings in the US to Japan, and using the weighted average based on the US survey data will not necessarily increase the accuracy of the analysis.

Chart 1: Image of the Calculation Method



Source: Made by MHRI

However, connecting the occupational classifications between the US and Japan in this manner is arguable to some extent, as some classifications in Japan are hard to make concordance with those in the US. On top of this, an occupation that can be performed at home in one country may not be performed at home in the other country, because tasks even with the same occupation title could be different. To mitigate these problems, I use the data from Japan's O-NET as mentioned above. The database contains the outcomes of the survey toward the employed worker, and numerical data for 439 jobs are currently available. I use five questions about the work content from this numerical data (**Chart 2**). The respondents were asked to choose from 1 through 5 to show the degree of importance or the frequency of each characteristic. The database includes the average values of these questions for each job.

For the adjustment process, I first map the occupational codes at the Japanese O-NET to the corresponding occupational classifications at the unit group in the Population Census.[4] When multiple jobs fall into a single classification, a simple mean calculation is used. Next, I select the occupational classifications of the unit group that meet any of the following five criteria (teleworking is expected to be less feasible if an occupation meets the criteria): over 4 value for the frequency of face-to-face discussions; over 4 value for the importance of working in accordance with equipment speed; over 4 value for the frequency of working outside; under 2 value for the length of sedentary work; and over 4 value for the length of standing work.[5] As the maximum number of the criteria that one occupational classification has is three, I adjust the DN value by multiplying it

[4] The occupational code in the Japanese O-NET is created by the Ministry of Health, Labour and Welfare, and the code is different from the one in the Population Census that is created by the Ministry of Internal Affairs and Communication

[5] Many of the occupational classifications that meet any of the five criteria are already categorized as not able to be performed at home at the DN values. Consequently, only 26 classifications are subjected to adjustment. Although there are no data in Japan's O-NET for "administrative and managerial workers not classified elsewhere", "university professors", "money collectors" and "investigators", I make the same adjustment for them as the other unit group in the same minor group.

with (1-N÷3), where N is the number of the criteria each classification meets (hereinafter this score is called "Adjusted Value 1").[6] Moreover, to make stricter adjustments, I create another set of adjusted values by classifying the occupations that meet at least one of the five criteria as unable to be work from home (hereinafter this score is called "Adjusted Value 2").

Chart 2: Criteria used in Japan's O-NET

choice	1	2	3	4	5
Face-to-face discussions	Less than once a year	Once or more a year	Once or more a month	Once or more a week	Almost everyday
Work in accordance with equipment speed	Not important at all	Slightly important	Important	Very important	Extremely important
Work outside	Less than once a year	Once or more a year	Once or more a month	Once or more a week	Almost everyday
Sedentary work	Not at all	Less than half of working hours	Almost half of working hours	More than half of working hours	Almost always
Standing work	Not at all	Less than half of working hours	Almost half of working hours	More than half of working hours	Almost always

Source: Made by MHRI based upon Japan's O-NET.

3. Analytical findings

(1) Overall results

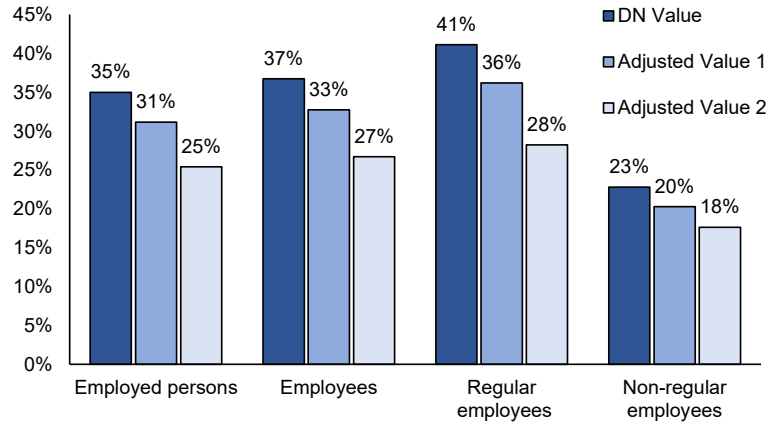
I estimate the share of workers who can work from home by weighting the three scores explained above with the number of labor population. **Chart 3** depicts the figures resulting from weighting the scores by the number of employed persons, employees, regular employees, and non-regular employees based on the 2015 Population Census by MIC. The share of employed persons who can work from home is generally around 30%, with the DN value at 35%, Adjusted Value 1 at 31%, and Adjusted Value 2 at 25%. The percentage for the employees is two percentage points higher than that for employed persons, with the DN value at 37%, Adjusted Value 1 at 33%, and Adjusted Value 2 at 27%. Compared with the estimate for employees in the US, which is 37%, the ratio of employees who can work from home in Japan seems to be slightly lower. It may be fair to say, however, that the occupational classification-based analysis shows no distinct difference in the probability of telecommuting between the US and Japan.

Although regular and non-regular employees in the same occupational classification may have different work contents, I assign the same score to the same classification and

[6] I use the adjustment method of assigning a value of 0 (which means that teleworking is not feasible) only when the occupational classification meets three (maximum) of the five criteria. For other cases, I reduce the DN value by one-third per criterion. This is because I take into account that the data from Japan's O-NET is limited compared with the US version and that occupations listed in the Japanese version may simply be one example of each occupational classifications. Please refer to the Appendix for the DN value and Adjusted Value 1 for each occupational classification at the unit group level.

obtain the estimates. The results show that the ratio of employees being able to work from home is 28% to 41% for regular employees and 18% to 23% for non-regular employees. There is a significant disparity in the feasibility of working at home between regular and non-regular employees, with the feasibility 1.6 to 1.8 times higher for the former. Non-regular employees tend to be unable to work from home due to the nature of their tasks, which suggests that they could face a higher risk of losing their earnings compared with regular employees under the circumstances of the self-restraint.

Chart 3: Estimation Results



Note: Employees include board members.
Source: Made by MHRI based upon the Ministry of Internal Affairs and Communications, *Population Census*, and others.

Based on the nationwide survey of regular employees aged between 20 and 59, Persol Research and Consulting (2020) reported that the actual share of regular employees who were telecommuting after a state of emergency declared for seven prefectures was approximately 28%. This figure is about the same as Adjusted Value 2, although they cannot compare simply, as the age group is different. In light of the results of a survey by the Recruit Works Institute that only 9% of regular employees were teleworking in December 2017,[7] there appears to be a drastic change in the Japanese working style, which reflects employers' efforts to encourage telecommuting. If the upper bound of the feasibility of home-based work is the DN value or Adjusted Value 1, companies still have room to expand this share by another around 10 percentage points by changing the way of working operations (e.g. reducing paperwork and seal uses) and updating their IT facilities and equipment for telecommuting. Companies need to continue their active efforts to establish work systems and environments that would make teleworking more feasible.

[7] The number is based on "JPSED.stat" by Recruit Works Institute. This is the ratio of regular employees aged between 20 to 59 who answered one hour or more to the question of "How many hours were you telecommuting per week?"

The Japanese government requested a 70% reduction in the number of commuters to prevent the further spread of COVID-19 infections upon the declaration of a state of emergency. The data on the "number of passengers passing through the automatic ticket gates in train stations" on the Cabinet Secretariat's website indicates reductions of passengers by -63% to -75% on May 11 and 12 compared with the previous year.[8] The data could include the number of travelers other than commuters, but it would be fair to say that the number of workers commuting to the office had dropped significantly. Based on the results of the above Persol survey and this paper's estimates, it is considered that companies have been taking all sorts of measures, including suspending business, cutting business hours, and working alternatively, to meet the 70% reduction target. Unlike telecommuting, however, these measures could directly lead to lower productivity, which means that many firms are most likely facing waning productivity and subsequent shrinking of profitability. This decline in corporate profits could raise the risk of losing jobs for non-regular employees for whom telecommuting tends to be less feasible.

Making full use of telecommuting is imperative for companies, but my estimate suggests that around 70% of workers still need to commute to sustain business operations (or to maintain productivity at the pre-crisis level). In fact, according to the survey by Persol Research and Consulting (2020), the largest share of workers who did not work remotely answered that they were unable to do so because "their jobs could not be performed at home". As companies attempt to restore their productivity, there will be greater congestions in city areas, such as commuter rush, even though they are making maximum use of teleworking. This could raise the risk of a second wave of COVID-19 infections.

(2) Findings by prefecture and industry

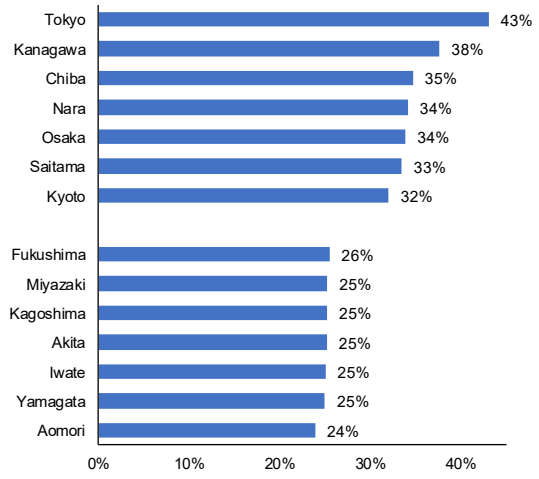
Next, the estimations by prefecture and industry are examined, setting Adjusted Value 1 as the baseline result (**Charts 4 (1) and (2)**). Among all prefectures, the highest is 43% for Tokyo, followed by Kanagawa, Chiba, Nara, and Osaka. The lower-ranking prefectures, many of which are in the Tohoku region, have almost the same rate. Overall, the rate tends to be higher in metropolitan areas. Since Persol Research and Consulting (2020) also reported the actual ratio of workers who were telecommuting by prefectures, I can compare the estimated and actual ratio. The correlation coefficient between them is about 0.9, which indicates a strong positive correlation. This implies that teleworking has been implemented widely in prefectures where telecommuting is feasible for a larger

[8] "COVID-19 Information and Resources," Cabinet Secretariat's website (visited on May 20, 2020). The figures are the averages of the largest and smallest numbers of passengers on May 11 and 12 who passed through the automatic ticket gates in the train stations for which such data are published.

share of workers.

By industry, the share of the employed persons who can work remotely is as large as around 80% for the finance/insurance and information/communications sectors, followed by education/learning support, scientific research, etc., real estate/goods rental and leasing, and electricity, gas, etc. The ratio of these industries is considered to be higher, as they employ many office workers. On the other hand, the feasibility of accommodations/eating and drinking services is only 7%, which is remarkably low. The ratio of workers who can work from home is also low for other sectors such as manufacturing, amusement/living-related services, medical and health care/welfare, and transport/postal services.

Chart 4 (1): Findings by prefecture



Note: The feasibility estimates are based on Adjusted Value 1. The top seven and bottom seven prefectures are listed.
Source: Made by MHRI based upon the Ministry of Internal Affairs and Communications, *Population Census*, and others.

Chart 4 (2): Findings by industry

Note: The feasibility estimates are based on Adjusted Value 1. "Other" is the total of agriculture and forestry, fisheries, mining, etc. and industries unable to classify.
Source: Made by MHRI based upon the Ministry of Internal Affairs and Communications, *Population Census*, and others.

According to the "JCB Consumption NOW" (the consumption index co-developed and powered by JCB and Nowcast), the consumption index by the industry showed a large drop in April 2020 compared with the previous year. In descending order, the index was -93% for travel agencies, -72% for accommodations, -61% for food services, -49% for amusement, -40% for the railway, bus, taxicab, and air transport, and -29% for retail trade (fabric, apparel, apparel accessories, and notions). One can find that the industries experiencing a significant decline in consumption (sales) are generally those which have a low ratio of workers who can work from home. These sectors are likely to face a

difficult situation with sales sharply declining due to the exercises of self-restraint and, at the same time, the nature of their business prohibiting their workers from telecommuting.

(3) Correlations with skills and earnings

Kikuchi et al. (2020) analyzed how the COVID-19 crisis could affect heterogeneous workers in Japan, and they pointed out that especially low-income workers would be hit harshly, which could significantly exacerbate inequality. I can draw a similar implication from the perspective of the home-based work potential discussed in this report. **Chart 5 (1)** plots the ratio of the employed persons with an undergraduate degree or higher (high-skilled workers) against the feasibility of teleworking by occupational classifications at the minor group level. There is a positive correlation between the two variables, and the correlation coefficient is about 0.7. A very small (or zero) share of workers can telecommute for occupations in which only a small fraction of high-skilled workers engages. **Chart 5 (1)** plots a logistic curve estimated using the ratio of high-skilled workers as an explanatory variable, and the estimated coefficient of the ratio is statistically significant at the 1% level.[9] In other words, workers who can telecommute and continue to work during this crisis are mainly those with higher skills, and low-skilled workers could face a higher risk of falling income because they cannot continue to work if they stay at home.

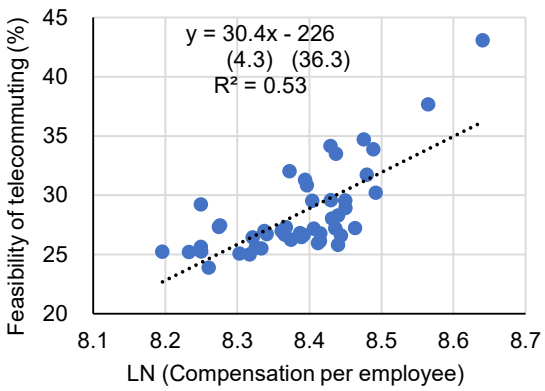
I can also point out a similar correlation between the feasibility of telecommuting and earnings. **Chart 5 (2)** plots compensation per employee against the share of workers who can telecommute by prefecture. Here again, a positive correlation between the two variables is observed (the correlation coefficient is about 0.7). The chart, which depicts the outcomes of a simple linear regression, also indicates that the coefficient of compensation per employee is statistically significant. The share of the employed who can work from home is larger in prefectures with higher compensation per employee, which suggests that high-income workers could work from home and continue to earn their living, while low-income workers could be confronted with the higher risk of losing income because teleworking tends to be not feasible for them.

[9] The logistic function is estimated with the feasibility of telecommuting as a dependent variable and the ratio of workers with an undergraduate degree or higher as an independent variable. The estimated coefficients are the constant: -3.32 (-4.2) and the coefficient of the ratio: 7.08 (3.67) (the figures in the parentheses are z values).

Chart 5 (1): Correlation with skills (educational backgrounds)

Note: The feasibility estimates are based on Adjusted Value 1. The score is weighted by the data from the Employment Structure Survey, 2017.
Source: Made by MHRI based upon the Ministry of Internal Affairs and Communications, *Employment Structure Survey*, and others.

Chart 5 (2): Correlation with earnings



Note: The feasibility estimates are based on Adjusted Value 1. The score is weighted by the data from the Population Census, 2015. Compensation per employee is for 2016. The number in the parentheses in the estimation formula is a t-value.
Source: Made by MHRI based upon the Cabinet Office, *Annual Report on Prefectural Accounts*, and others.

4. Conclusion

This report estimates the ratio of Japanese workers who can work from home, referring to a study in the US and taking into account the Japanese occupational characteristics. I conclude that the potential for home-based work is around 30% for employed persons, with 30% to 40% for regular employees and about 20% for non-regular employees. Comparing the estimates with the actual ratio of regular employees who worked from home in April 2020, firms will be able to enhance the ratio by another around 10 percentage points. As the risk of COVID-19 infection spread continues, companies are required to continue their efforts for establishing a working environment that would allow their employees to telecommute.

A significant drop in the number of commuters was observed in May, but this seems attributable not only to teleworking but also companies' responses, including suspending business and encouraging their employees to work alternatively, at considerable expense to their business activities. These measures could result, however, in waning labor productivity, which could in turn reduce corporate revenues and eventually raise the risk of losing a job, particularly for non-regular employees. My estimate also suggests that a minimum of around 70% of employees would have to commute to maintain labor productivity at the pre-crisis level (with no change in the way of working operations). As companies attempt to restore productivity to its former level, the majority of employees will need to commute, even though they are making full use of teleworking. This will in turn increase the risk of a second wave of COVID-19 infections.

Concerning workers with different skills and earnings, lower-skilled or lower-income workers tend to engage in jobs that cannot be performed at home due to their nature of the tasks. Based on the finding that those who are difficult to work from home tend to be in the industries that have experienced a sharp decline in sales due to the COVID-19 crisis, the current crisis could exacerbate the inequality. Workers who can telecommute can continue to earn their living, while those who cannot face a higher risk of losing their earnings. The government is required to provide sufficient livelihood supports targeting relatively lower-skilled and lower-income workers, and when the COVID-19 crisis comes to end, the government needs to expand its job-seeking support and vocational training for affected individuals.

Although this report's analysis focuses on whether a given job can be done at home or not, it is also important to examine the relationship between teleworking and productivity. With working styles dramatically changing over a short period, some people may be having a hard time to keep up with this transformation, and as a result, there are high chances that recent labor productivity has declined. The analysis of improving productivity with home-based work is left for future study.

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Appendix Teleworking feasibility scores by occupational classification at the unit group level

Occupational classification (unit group level)	DN Value	Adjusted Value 1
01a Management government officials	1.00	1.00
021 Company officers	1.00	1.00
02a Officers of other corporations, organizations	1.00	1.00
03a Administrative and managerial workers of corporations and organizations	1.00	0.67
049 Administrative and managerial workers not classified elsewhere	1.00	0.67
051 Natural science researchers	0.71	0.71
052 Humanities, social science, and other researchers	0.83	0.83
06a Agriculture, forestry, fishery and food engineers	0.00	0.00
07a Electrical, electronic, telecommunications engineers	0.75	0.75
07c Machinery engineers	0.21	0.21
07d Transportation equipment engineers	0.37	0.24
07e Metal engineers	0.00	0.00
07f Chemical engineers	0.00	0.00
091 Architectural engineers	1.00	0.67
09a Civil engineers and surveyors	0.83	0.83
10a System consultants and designers	1.00	0.67
104 Software creators	1.00	1.00
10c Other data processing and communication engineers	1.00	1.00
11a Other engineers	0.34	0.34
121 Doctors	0.11	0.11
122 Dental surgeons	0.00	0.00
123 Veterinary surgeons	0.00	0.00
124 Pharmacists	0.00	0.00
131 Public health nurses	0.00	0.00
132 Midwives	0.00	0.00
133 Nurses (including assistant nurses)	0.00	0.00
141 Diagnostic radiographers	0.00	0.00
143 Clinical laboratory technicians	0.00	0.00
144 Physiotherapists, occupational therapists	0.00	0.00
145 Certified orthoptists, speech therapists	0.50	0.50
146 Dental hygienists	0.00	0.00
147 Dental technicians	0.00	0.00
151 Nutritionists	0.00	0.00
152 Masseurs, chiropractors, acupuncturists, etc.	0.00	0.00
15a Other health care workers	0.25	0.25
163 Childcare workers	1.00	0.67
16a Other social welfare specialist professionals	0.50	0.50
17a Judges, public prosecutors and attorneys	0.33	0.22
17c Patent attorneys and judicial scriveners	1.00	1.00
179 Other legal workers	0.60	0.40
181 Certified public accountants	1.00	0.67
182 Licensed tax accountants	0.00	0.00
183 Certified social insurance and labor consultant	1.00	1.00
18a Other management, finance, and insurance professionals	0.90	0.90
191 Kindergarten teachers	1.00	0.33
192 Elementary school teachers	1.00	0.33
193 Junior high school teachers	1.00	0.67
19a Senior high school teachers	1.00	0.67
196 Special needs education school teachers	1.00	0.67
19c University professors	0.97	0.65
199 Other teachers	1.00	0.67
201 Workers in religion	1.00	1.00
211 Authors	1.00	1.00
212 Journalists, editors	1.00	1.00
22a Sculptors, painters and industrial artists	0.67	0.67
224 Designers	0.86	0.86
225 Photographers, film operators	0.50	0.50
231 Musicians	0.25	0.25

Occupational classification (unit group level)	DN value	Adjusted Value 1
23a Dancers, actors, directors and performers	0.08	0.08
24a Librarians and curators	0.80	0.80
24n Private tutors (for music)	1.00	1.00
24p Private tutors (for dance, actor, direction, performance)	1.00	1.00
24r Private tutors (for sports)	1.00	1.00
24s Private tutors (for study)	1.00	1.00
24t Private tutors (not classified elsewhere)	1.00	1.00
245 Sports professionals	0.67	0.67
246 Communication equipment operators	1.00	1.00
24c Specialist professionals not classified elsewhere	0.94	0.94
25a General affairs and human affairs workers	1.00	1.00
254 Reception and guidance clerical workers	0.00	0.00
256 Telephone receptionists	0.00	0.00
257 Comprehensive clerical workers	1.00	1.00
25c Other general clerical workers	0.67	0.67
26a Accountancy clerks	0.50	0.50
27a Production-related clerical workers	0.00	0.00
28a Sales clerks	1.00	1.00
291 Money collectors	1.00	0.00
292 Investigators	1.00	0.00
299 Other outdoor service workers	1.00	0.00
30a Transport clerical workers	0.67	0.67
303 Post clerical workers	0.00	0.00
311 Personal computer operators	1.00	1.00
312 Data entry device operators	1.00	1.00
31a Other office appliance operators	1.00	1.00
321 Retailers, retail manager	0.00	0.00
322 Wholesalers, wholesale manager	1.00	1.00
323 Shop assistants	0.00	0.00
324 Home visit and mobile sales workers	0.00	0.00
325 Recycled resources collection and wholesale workers	0.00	0.00
326 Goods purchase canvassers	1.00	1.00
331 Real estate agents and dealers	1.00	1.00
332 Insurance agents and brokers	1.00	1.00
33a Other quasi-sales workers	1.00	1.00
343 Medicine sales workers	1.00	0.67
34a Machinery, communication and system sales workers	1.00	1.00
346 Finance and insurance sales workers	1.00	1.00
347 Real estate sales workers	0.00	0.00
34c Other sales workers	0.94	0.63
351 Housekeepers, home helpers	0.00	0.00
359 Other domestic support service workers	0.00	0.00
361 Care workers (medical and welfare facilities, etc.)	0.00	0.00
362 Home visiting care workers	0.00	0.00
371 Care assistants	0.50	0.17
37a Other healthcare service workers	0.00	0.00
381 Hairdressers	0.00	0.00
382 Beauticians	0.00	0.00
383 Cosmetic service workers (except beauticians)	0.25	0.25
384 Bath workers	0.00	0.00
38a Launderers and fullers	0.00	0.00
391 Cooks	0.13	0.04
392 Bartenders	0.00	0.00
401 Restaurateurs, restaurant managers	0.00	0.00
402 Japanese inn owners and managers	0.00	0.00
40a Food and drink service and personal assistance workers	0.00	0.00
40c Customer entertainment workers	0.00	0.00
407 Service workers in places of entertainment, etc.	0.00	0.00

Occupational classification (unit group level)	DN Value	Adjusted Value 1
41a Condominiums, apartment buildings, lodging houses, hostel and dormitorymanagement personnel	0.00	0.00
413 Office building management personnel	1.00	1.00
414 Car park management personnel	0.00	0.00
421 Travel and tourist guides	0.00	0.00
422 Left luggage handlers	0.00	0.00
423 Commodity hire workers	0.00	0.00
424 Advertisers	0.00	0.00
425 Undertakers, crematorium workers	0.00	0.00
429 Service workers not classified elsewhere	0.50	0.50
43a Self-defense officials	0.00	0.00
44a Police officers and maritime safety officials	0.04	0.04
44c Prison guards and other judicial police staff	0.00	0.00
452 Firefighters	0.00	0.00
453 Security staff	0.00	0.00
459 Other public security workers not classified elsewhere	0.00	0.00
461 Crop farming workers	0.08	0.06
462 Livestock farm workers	0.13	0.00
463 Landscape gardeners, nursery workers	0.00	0.00
469 Other agricultural workers	0.00	0.00
471 Forest nursery workers	0.00	0.00
472 Tree-felling, logging, and collecting workers	0.00	0.00
479 Other forestry workers	0.00	0.00
481 Fishery workers	0.00	0.00
482 Ships' captains, navigation officers, chief engineers, engineers (fishing boats)	0.00	0.00
483 Seaweed and shellfish harvesting workers	0.00	0.00
484 Aquaculture workers	0.00	0.00
489 Other fishery workers	0.00	0.00
49a Pig-iron forging, steelmaking, non-ferrous metal smelting workers	0.00	0.00
49c Cast metal manufacturing and forging workers	0.00	0.00
49d Metal machine tools workers	0.00	0.00
49e Metal press workers	0.00	0.00
49f Ironworkers, boilermakers	0.00	0.00
49g Sheet metal workers	0.00	0.00
49h Metal sculpture and plating workers	0.00	0.00
49i Metal welding and fusion cutting workers	0.00	0.00
49j Other product manufacturing and processing workers (metal products)	0.00	0.00
50a Chemical product manufacturing workers	0.00	0.00
50c Ceramic, earth, and stone product manufacturing workers	0.00	0.00
50d Food manufacturing workers	0.00	0.00
50e Beverage and cigarette manufacturing workers	0.00	0.00
50f Spinning, weaving, apparel, and fiber product manufacturing workers	0.13	0.08
50g Wooden and paper product manufacturing workers	0.00	0.00
50h Printing and bookbinding workers	0.25	0.25
50i Rubber, plastic product manufacturing workers	0.00	0.00
50j Other product manufacturing and processing workers	0.00	0.00
51a General-purpose, manufacturing, and business-use mechanical apparatus assembly workers	0.00	0.00
51c Electro-mechanical apparatus assembly workers	0.00	0.00
51d Automobile assembly workers	0.00	0.00
51e Transportation machinery assembly workers (except automobiles)	0.00	0.00
51f Weighing and measuring appliance, photo-optic mechanical apparatus assembly workers	0.00	0.00
551 General-purpose, manufacturing, and business-use mechanical apparatus maintenance and repair workers	0.00	0.00
552 Electro-mechanical apparatus maintenance and repair workers	0.00	0.00
553 Automobile maintenance and repair workers	0.00	0.00
554 Transportation machinery maintenance and repair workers	0.00	0.00
555 Weighing and measuring appliance, photo-optic mechanical apparatusmaintenance and repair workers	0.00	0.00
56a Metal product inspection workers	0.00	0.00
571 Chemical product inspection workers	0.00	0.00
572 Ceramic, earth, and stone product inspection workers	0.00	0.00

Occupational classification (unit group level)	DN Value	Adjusted Value 1
573 Food inspection workers	0.00	0.00
574 Beverage and cigarette inspection workers	0.00	0.00
575 Spinning, weaving, apparel, and fiber product inspection workers	0.00	0.00
576 Wooden and paper product inspection workers	0.00	0.00
577 Printing and bookbinding inspection workers	0.00	0.00
578 Rubber, plastic product inspection workers	0.00	0.00
579 Other product inspection workers	0.00	0.00
581 General-purpose, manufacturing, and business-use mechanical apparatus inspection workers	0.00	0.00
582 Electro-mechanical apparatus inspection workers	0.00	0.00
583 Automobile inspection workers	0.00	0.00
584 Transportation machinery inspection workers (except automobiles)	0.00	0.00
585 Weighing and measuring appliance, photo-optic mechanical apparatus inspection workers	0.00	0.00
59n Painters, paint and signboard production workers	1.00	1.00
59p Manufacturing-related workers	0.00	0.00
592 Quasi-manufacturing workers	0.00	0.00
60a Railway drivers	0.00	0.00
61a Motor vehicle drivers	0.00	0.00
62a Ship captains, navigation officers, navigators and pilots	0.00	0.00
623 Ships' chief engineers, engineers	0.00	0.00
624 Aircraft pilots	0.00	0.00
631 Conductors	0.00	0.00
63a Deckhands, dual purpose crew and ships stokers	0.00	0.00
63c Transport workers not classified elsewhere	0.00	0.00
641 Power plant and substation workers	0.00	0.00
642 Boiler operators	0.00	0.00
643 Crane, winch operators	0.00	0.00
645 Construction, well-drilling machinery operators	0.00	0.00
64a Other stationary and construction machinery operators	0.00	0.00
651 Molding box carpenters	0.00	0.00
652 Scaffolding workers (*Tobishoku*)	0.00	0.00
653 Steel reinforcement workers	0.00	0.00
661 Carpenters	0.00	0.00
662 Block and tile laying workers	0.00	0.00
663 Roofing workers	0.00	0.00
664 Plasterers	0.00	0.00
665 *Tatami* workers	0.00	0.00
666 Pipe laying workers	0.00	0.00
681 Civil engineering workers	0.00	0.00
682 Railway line construction workers	0.00	0.00
68a Other construction and civil engineering workers	0.25	0.25
67a Line hanging and laying workers	0.00	0.00
674 Telecommunication equipment construction workers	0.00	0.00
679 Other electric construction workers	0.00	0.00
693 Gravel, sand and clay quarrying workers	0.00	0.00
69a Other mine workers	0.00	0.00
701 Mail and telegram collection and delivery workers	0.00	0.00
702 Onboard and quayside cargo handlers	0.00	0.00
703 Land-based cargo handling and carrying workers	0.00	0.00
704 Warehouse workers	0.00	0.00
705 Delivery workers	0.00	0.00
706 Packing workers	0.00	0.00
711 Building cleaning workers	0.00	0.00
71a Waste treatment workers	0.00	0.00
712 House cleaning workers	0.00	0.00
71c Other cleaning workers	0.00	0.00
721 Packaging workers	0.00	0.00
739 Other carrying, cleaning, packaging, and related workers	0.00	0.00

Note: Based on the occupational classifications at the unit group level used in the *Population Census* by the Ministry of Internal Affairs and Communications. The score of 1 is assigned when teleworking is feasible for a given occupation and a score of 0 when teleworking is not feasible. A score sometimes falls somewhere between 0 and 1 as jobs that can be done at home and those which cannot be can both be categorized into the same classification.

Source: Made by MHRI based upon Dingel and Neiman (2020) and Japan's O-NET, and others.