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Labor income inequality in Japanese corporations and employee health: evidence from Japanese Health Insurance Society data

Abstract

This study investigates the relationship between labor income inequality and employee health in Japanese corporations based on a nationwide survey – that is, the monthly reports of health insurance societies, which cover the majority of Japanese employees working in major Japanese companies and industries. The authors calculate the mortality rate and the rate of sickness and injury leave using the public medical insurance benefit data. Labor income inequality is calculated using the labor income distribution data, which is also used for calculating insurance premiums. The paper finds a significant association between intra-company labor income inequality and the mortality rate after controlling for certain confounding factors, such as the average age, average labor income, and ratio of women. These data show that intra-company labor income inequality is associated with the health of employees in major Japanese companies and industries.

Keywords: inequality, employee health, Health Insurance Society, social capital.
JEL Classification: D31, I12, J59.

Introduction

In recent years, many researchers have shown an interest in studying economic inequality (Kawachi & Kennedy, 2002; Ohtake & Saito, 1998; Tachibanaki, 2006). This interest is not only because economic inequality in itself reflects an injustice or denial of equal opportunity, but also because such inequality leads to various externalities. Some researchers have argued that economic inequality is associated with the worsening health of employees and investigated the relationship between them (Marmot, 2005; Wilkinson, 2006; Wilkinson & Pickett, 2006).

Empirical evidence linking income inequality to health outcomes is often found in cases analyzed in of the United States (Backlund et al., 2007; Lochner et al., 2001). Furthermore, we also see an association between income inequality and health outside the United States. Chen et al. (2009) investigated the suicide rates among the OECD countries and found that the Gini index is positively and significantly correlated with the suicide rates.

In Japan, many studies have found a close relationship between regional income inequality and health outcomes (Ichida et al., 2009; Oshio & Kobayashi, 2009; Shibuya et al., 2002), as surveyed by Subramanian & Kawachi (2004). These studies have forced people to widely recognize that inequality of income is a key element affecting health in Japan too.

The mechanism by which this phenomenon is brought about is also of interest to many researchers. Many previous papers (Eibner & Evans, 2005; Kawachi et al., 2007 Kawachi & Kennedy, 2002; Kondo et al., 2008) proposed and supported the relative deprivation hypothesis. It is important to know whom each person compares himself or herself to when investigating the relationship between health and income inequality based on the relative deprivation hypothesis. Previous studies defined an individual's degree of relative deprivation according to the distance between his or her income and the income of others in certain "reference groups" based on race, education, age, occupation, and geographical area.

However, it is usually impossible to know what someone's reference group is. Yet, as Suzuki et al. (2009) point out, people not only in Japan but also the world over are spending more time at work, and it seems reasonable to presume that for persons who spend more time at work than at home or in other activities, inequality at the workplace may have a greater effect on their health than inequality within the region. Especially in Japan, most full-time workers have more of the sense of belonging to the company they work for than to the place they live in. Furthermore, many Japanese companies, particularly big ones, have traditionally relied on an employment policy based on long-term staff employment. That is to say, Japanese companies play the role of communities. Under this assumption, it seems reasonable that many employees in the major Japanese companies and industries compare themselves with others working with the same company and construct their social capital in the workplace.

On the other hand, we believe that the problems that almost all the employees of the major Japanese companies and industries face do not include material deprivation. The relationship between intra-company labor income inequality and employee health in the major Japanese companies and industries suggests that psychosocial deprivation is a me-

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diator of worsening health. To further illustrate the association, we gather data of employees' labor income and health in the major Japanese companies and industries.

1. Data and methods

1.1. Health insurance societies. The data we use for our analysis are obtained from the monthly reports of the health insurance societies in Japan. Health insurance societies form an important component of the public medical care insurance system in Japan, which has been providing universal coverage since 1961. All persons in Japan must join one public medical care insurer. Furthermore, most citizens do not have the option to select their insurer.

Public servants, teachers, and employees of private schools and their dependents must be insured with mutual aid associations (Kyosai). Seamen and their dependents must be insured with seamen's insurance (Sen'in Hoken). Other employees and their dependents must be insured with health insurance (Kempo). The rest, for example, the self-employed, the farmers, and the unemployed, must be insured with the National Health Insurance (Kokuho).

Health insurance is handled by the Japan Health Insurance Association and the health insurance societies. Japanese employers and employees can jointly establish their own health insurance societies and have approved them by the Ministry of Health, Labor and Welfare (MHLW). The Japan Health Insurance Association manages the health insurance of workplaces that have not organized their own health insurance societies.

All insurers, including health insurance societies, are either legal public associations or government-run organizations. Therefore, most of their activities are constrained by law and government regulations, and for supervisory purposes, the Ministry of Health, Labor and Welfare (MHLW) requires the societies to submit monthly reports.

We construct our database from these reports, which are made available to the public from the MHLW's Health Insurance Bureau in accordance with the Law Concerning Access to Information held by Administrative Organs. The monthly reports include information on medical care expenses, the number of people who took sickness and injury leave, the number of births, and the number of fatalities. Fortunately, almost all leading Japanese companies have organized their own health insurance societies. Therefore, we can calculate the labor income distributions, rates of sickness and injury leave, and mortality rates on a company-by-company basis. We construct our database for the period from April 2003 to March 2007, that is, from the beginning of fiscal year 2003 (FY2003) to the end of FY2006, by using data of all the health insurance societies that existed during the observation period.

Some variables, such as the insurants' age and expenditure on preventive health measures, are reported only annually. Therefore, we employ the annual data, calculating the annual averages for the variables that are reported monthly, and construct a panel dataset consisting of the annual data for the four financial years from FY2003 to FY2006. The number of people insured through the health insurance societies in our dataset in FY2003 is around 30 million, which is about a quarter of Japan's total population and a half of Japan's workers. This means that our investigation is based on a nationwide survey.

1.2. Labor income data. Japan's Health Insurance Act divides the monthly salaries of employees into 39 grades as the basis for calculating premiums. The correspondence between grades and monthly salaries is shown in Appendix. The monthly reports provide the number of insurants for each monthly salary grade, and using this information, we can capture the labor income distribution of each company.

The distribution of monthly salaries after pooling all the observations over the entire period is shown in Figure 1. This indicates that there are different modes for male and female employees. For male employees, we see a mode in grade 23, which corresponds to a monthly salary of 410,000 yen. On the other hand, for female employees, we observe a mode in grade 14, which corresponds to a monthly salary of 220,000 yen. As one of the key variables in our empirical analysis below, we calculate the Gini index for each health insurance society as an indicator of labor income inequality within companies[1].

1.3. Preventive health measures. Some health insurance societies put in much effort on preventive measures. As Kouno (2005) shows, the preventive measures reduce medical care expenditure, the length of hospital stay, and outpatient visits. In other words, the preventive measures improve employees' health. We call these measures by which the health insurance societies try to reduce the risk of illness or injury of their members as "preventive health measures". These can be divided into three broad categories: the measures to spread health awareness, the measures for disease prevention, and the measures to encourage exercise.

[1] An alternative measure of income inequality would be the mean log deviation (MLD). Saito-Umeno and Kouno (2012) show that the MLD and Gini index for these data are highly correlated.

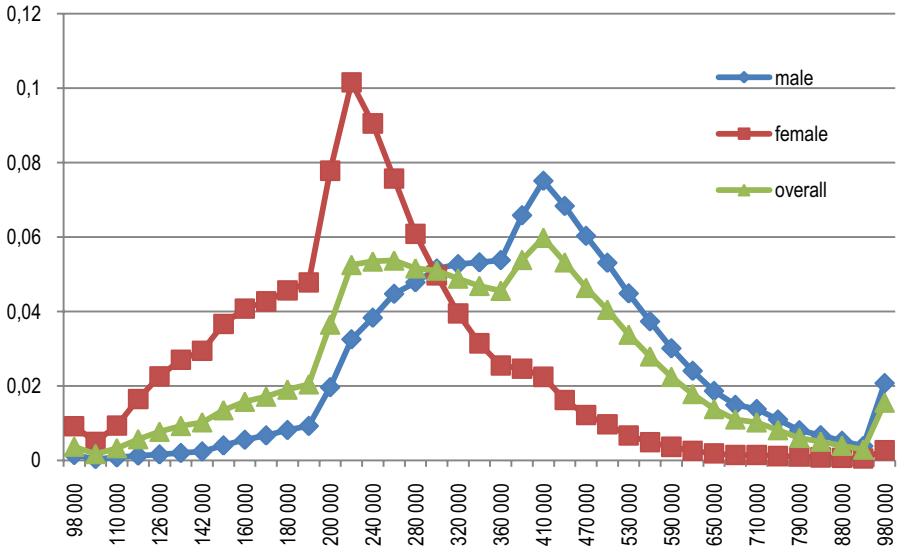

Fig. 1. Distribution of standard monthly salaries (pooled observations), yen

The measures to spread health awareness involve forwarding to the insurants a notice of the contents of their receipt – the invoice from a hospital or clinic sent to the Health Insurance Society – to confirm that the receipt is consistent with the actual treatment and consultations given by the doctors, pharmacists, and nurses.

The measures for disease prevention include health checkups, cancer detection, health guidance, and health consultation. The measures to encourage exercise involve promoting the use of gymnasiums and subsidizing health club exercise through corporate contracts. Information on the health insurance societies' expenditure on each of these categories is available from our database.

1.4. Turnover rate. Another variable we calculate from our database is the employee turnover rate for each society. We do so by checking the number of persons who withdraw from a society as provided in the monthly reports. It should be noted that if a person leaves a society, it means that he or she is leaving the company.

1.5. Health data. In this paper, we focus on the mortality rate and the rate of sickness and injury leave as health indicators. If an insurant cannot go to work for health reasons and, therefore, does not receive salary for a period of time, sickness and injury leave is provided from the fourth day onward. The amount provided per day is equivalent to 60% of the standard daily remuneration (calculated on the basis of the insurant's monthly salary). The period of provision for the sickness or injury is limited to 18 months from the day the provision commences. We calculate the rate of sickness and injury leave from the number of persons who received the benefit of the leave per number of insurants in a year.

The mortality rate of a company can be calculated from the data for funeral expenses. When an insurant dies, an amount equivalent to his or her monthly salary (100,000 minimum) is provided for the funeral expenses to the person who was being supported by the insurant[1]. We calculate the mortality rate from the number of occasions the funeral expenses are paid per number of the insurants in a year.

1.6. Voluntarily and continuously insurants. As a general rule, persons having forfeited their eligibility for coverage due to retirement or for any other reason must be insured with the National Health Insurance (Kokuho). However, such persons can upon application retain their eligibility as insurants for two more years if they have been insured continuously for at least two months prior to the forfeiture. We call such insurants the voluntarily and continuously insurants (VOLCONs). The descriptive statistics are provided in Table 1.

1.7. Method. To examine the relationship between income inequality within a company and health status, we conduct a series of multiple regression analyses.

In the first set of models, we regress the rate of sickness and injury leave against the average age, the proportion of VOLCONs, the proportion of female employees, the average monthly labor income, the Gini index of the monthly labor income for each gender, the expenditure of preventive health measures, and the turnover rate. For this, we have the following empirical specification:

[1] If there is no applicable person, the funeral expenses are paid to the person who actually makes the funeral arrangements. Therefore, the data for funeral expenses include the number of deaths, whether there is an applicable person or not, and reflects the number of deaths accurately.

$$y_{it} = \beta_1 Age_{it} + \beta_2 VOLCON_{it} + \beta_3 WOMEN_{it} + \beta_4 AVGWAGE_{it} + \beta_5 MaleWageGini_{it} + \beta_6 FemaleWageGini_{it} + + \beta_7 Turnover_{it} + \beta_8 Spreadinghealth_{it} + \beta_9 Diseaseprevention_{it} + + \beta_{10} Encourageexercise_{it} + \beta_{11} + \varepsilon_{it}.$$

In the second set of models, we set the mortality rate as the dependent variable. In the third and the fourth sets of models, we replace the Gini index of the labor income for each gender with the overall Gini index of the labor income as the independent variables.

Table 1. Descriptive statistics

	Average	S. D.	Minimum	Maximum
Number of male insurants	6774.029	14629	11.75	206826.3
Number of female insurants	2763.374	9094.995	1	339867.8
Average age	41.02374	3.203173	26.19042	52.87546
Proportion of voluntarily and continuously insurant	0.029383	0.019637	0	0.356941
Proportion of women	0.250091	0.159231	0.012785	0.96607
Average monthly labor income	375673.1	75531.63	193020.5	892255.3
Gini index (male monthly labor income)	0.192454	0.031533	0.07382	0.455411
Gini index (female monthly labor income)	0.172948	0.041523	0	0.352835
Turnover rate	0.013132	0.010172	0	0.184499
Spreading health awareness (expenditure per capita)	1877.701	1876.847	0	27893.14
Disease prevention (expenditure per capita)	13980.76	9170.274	0	175307
Encouraging exercise (expenditure per capita)	846.3296	2131.593	0	52478.47
Rate of sickness and injury leaves	0.002037	0.001521	0	0.019380
Mortality rate	0.000106	0.000084	0	0.001647

2. Results

The regression results are shown in Tables 2-5. The results of the first set of models indicate that a greater expenditure on disease prevention, a higher proportion of female employees, a higher mean monthly labor income, a lower monthly labor income inequality as indicated by the Gini index, and a lower turnover rate are all associated with lower rates of sickness and injury leave. What is more, this pattern is similar in both the pooled OLS and random effects models. Next, we conduct the same regressions for the second set of models using the mortality rate as the dependent variable. We obtain essentially the same results, with coefficients that are even more significant than in the first set of models.

In the third set of models, we use the overall Gini index of monthly labor income instead of the Gini index of monthly labor income for each gender. The results in this set alone indicate the relationship between health and income inequality in the opposite direction from the other sets.

In the fourth set of models, we obtain essentially the same results as the first and the second sets, although the coefficients are less significant than in the previous sets.

Table 2. Empirical results (rate of sickness and injury leaves)

	Pooled OLS			Panel (ramdom effect)		
	Coefficient	*t*-value	*P*-value	Coefficient	*Z*-value	*P*-value
Average age	6.86E-06	9.06	0.000	7.79E-06	5.58	0.000
Proportion of VOLCONs	-0.005389	-4.02	0.000	-0.002976	-2.03	0.042
Proportion of women	-0.001703	-11.62	0.000	-0.001674	-7.09	0.000
Average monthly labor income	-4.15E-09	-11.92	0.000	-4.57E-09	-8.21	0.000
Gini index (male monthly labor income)	-7.21E-05	-0.08	0.935	0.0012529	0.81	0.416
Gini index (female monthly labor income)	0.0011866	1.88	0.060	0.0023741	2.26	0.024
Turnover rate	0.0122407	4.44	0.000	0.0019887	0.98	0.327
Measures to spread health awareness	0.0000114	0.96	0.335	0.0000109	0.84	0.403
Measures for disease prevention	-1.71E-05	-6.34	0.000	-3.25E-06	-0.86	0.388
Measures to encourage exercise	0.0000148	1.43	0.154	6.81E-06	0.47	0.640
Constant	0.0006571	1.74	0.081	-0.000233	-0.31	0.754
Number of samples		6096			6096	
Number of societies		1524			1524	
R-squared		0.1136			0.1010	

Table 3. Empirical results (mortality rate)

	Pooled OLS			Panel (ramdom effect)		
	Coefficient	*t*-value	*P*-value	Coefficient	Z-value	*P*-value
Average age	5.86E-07	13.05	0.000	5.68E-07	10.96	0.000
Proportion of VOLCONs	-3.71E-05	-0.42	0.677	0.0000364	0.38	0.703
Proportion of women	-9.77E-05	-13.80	0.000	-9.83E-05	-12.05	0.000
Average monthly labor income	-5.55E-11	-2.82	0.005	-5.79E-11	-2.54	0.011
Gini index (male monthly labor income)	0.0001491	3.29	0.001	0.0001436	2.80	0.005
Gini index (female monthly labor income)	0.0001273	3.57	0.000	0.0001188	2.87	0.004
Turnover rate	0.0003363	2.45	0.015	0.0003324	2.39	0.017
Measures to spread health awareness	2.37E-06	3.12	0.002	2.24E-06	2.68	0.007
Measures for disease prevention	-1.03E-06	-7.53	0.000	-1.05E-06	-6.81	0.000
Measures to encourage exercise	1.04E-06	1.15	0.251	1.22E-06	1.18	0.237
Constant	-0.000183	-8.62	0.000	-0.000172	-7.16	0.000
Number of samples		6096			6096	
Number of societies		1524			1524	
R-squared		0.1374			0.1371	

Table 4. Empirical results (rate of sickness and injury leaves)

	Pooled OLS			Panel (ramdom effect)		
	Coefficient	*t*-value	*P*-value	Coefficient	Z-value	*P*-value
Average age	7.56E-06	10.47	0.000	8.47E-06	6.72	0.000
Proportion of VOLCONs	-0.005666	-4.33	0.000	-0.0035	-2.44	0.015
Proportion of women	-0.000671	-4.40	0.000	-0.000678	-2.69	0.007
Average monthly labor income	-3.78E-09	-11.81	0.000	-4.04E-09	-7.43	0.000
Gini index (monthly labor income)	-0.006718	-10.31	0.000	-0.00487	-4.38	0.000
Turnover rate	0.0131861	4.65	0.000	0.0020443	0.96	0.337
Measures to spread health awareness	7.31E-06	0.62	0.537	0.0000107	0.81	0.417
Measures for disease prevention	-1.73E-05	-6.40	0.000	-4.03E-06	-1.09	0.277
Measures to encourage exercise	8.90E-06	0.83	0.406	4.83E-06	0.32	0.753
Constant	0.0016004	4.97	0.000	0.0007389	1.22	0.222
Number of samples		6096			6096	
Number of societies		1524			1524	
R-squared		0.1300			0.1179	

Table 5. Empirical results (mortality rate)

	Pooled OLS			Panel (ramdom effect)		
	Coefficient	*t*-value	*P*-value	Coefficient	Z-value	*P*-value
Average age	6.02E-07	13.82	0.000	5.81E-07	11.43	0.000
Proportion of VOLCONs	-0.000061	-0.69	0.490	0.0000212	0.22	0.823
Proportion of women	-8.71E-05	-10.99	0.000	-8.78E-05	-9.70	0.000
Average monthly labor income	-3.06E-11	-1.58	0.115	-3.56E-11	-1.57	0.117
Gini index (monthly labor income)	0.0001008	2.63	0.008	0.0000916	2.08	0.038
Turnover rate	0.000405	2.91	0.004	0.0003799	2.70	0.007
Measures to spread health awareness	2.48E-06	3.25	0.001	2.33E-06	2.75	0.006
Measures for disease prevention	-1.11E-06	-8.07	0.000	-1.12E-06	-7.20	0.000
Measures to encourage exercise	1.10E-06	1.19	0.236	1.29E-06	1.22	0.224
Constant	-0.000173	-9.22	0.000	-0.000161	-7.40	0.000
Number of samples		6096			6096	
Number of societies		1524			1524	
R-squared		0.1307			0.1303	

3. Explanation of results

We see a clearer relationship between the dependent variable (health) and the independent variables in the models using the Gini index of monthly labor income for each gender and mortality rate than in the models using the overall Gini index of monthly labor income and the rate of sickness and injury leave, respectively.

Why do we see a clearer relationship between the dependent variable (health) and the independent variables in the model using the Gini index of monthly

labor income for each gender than in the model using the overall Gini index of monthly labor income?

The fact that the health of employees is more associated with the intra-company labor income inequality for each gender than with the overall intra-company labor income inequality imply that the former inequality reflects on the work-based social capital or organizational justice, which is the factor relating inequality to health, more than the latter inequality. Alternatively, this can imply that a person's reference group is not the others working at the same company but those working at the same company with the same gender.

The reason we see a clearer relationship between the dependent variable (health) and labor income inequality in the model using mortality rate than in the model using the rate of sickness and injury leave is that the rate of injury and sickness leave may depend on the type of industry in which the company operates and hence the type of work of its employees: a broken leg would make it impossible for a driver or flight attendant to work, but the same is not necessarily true for a white-collar worker. Compared with this rate, the mortality rate depends much less on the type of work involved or the vacation practices and policies of each company.

In this paper, we investigated the relationship between the health of employees and intra-company labor income inequality and showed that intra-company labor income inequality is associated with the mortality rate after controlling for certain confounding factors. Furthermore, we found that the health of employees is more closely associated with the intra-company labor income inequality for each gender than the overall intra-company labor income inequality. In this paper, the health of employees in companies with higher turnover rates is seen to be worse. It is difficult for the employees in these companies to build trusting relationships, that is, social capital, and this may affect their health. These results are consistent not only with the intuition that Japanese companies play the role of communities but also with the relative deprivation hypothesis, under the assumption that a person's reference group comprises those of the same gender working at the same company.

4. Discussion

We are not aware of any previous studies investigating the relationship between intra-company labor income inequality and employee health using a nationwide survey in Japan, whether in public health or social science, including business administration and economics. To begin with, previous economics papers investigating income inequality in Japan focused not on intra-company income inequality but on intergenerational inequality, the inequality between non-precarious workers and precarious workers, and the inequality between men and women (Kambayashi et al., 2008; Oshio, 2006; Shinozaki, 2006). One reason that nobody investigated intra-company labor income inequality in Japan is the difficulty to obtain the data necessary to calculate the said inequality. In Japan, the only relevant company-level survey is the Basic Survey on Wages Structure (BSWS) conducted by the Ministry of Health, Labor and Welfare (MHLW). However, the sample of employees for each company is very small, making it difficult to reliably measure intra-company labor income inequality. We consider it important to focus on income inequality within the companies because the link between income inequality and productivity is also an important issue in economics. In this paper, we find that there is an association between income inequality within companies and employee health. Some papers suggest that the worsening health of employees in a company can harm its productivity through "absenteeism" and "presenteeism" (Hemp, 2004; Stewart et al., 2003). Our paper will, therefore, contribute to initiating a new dimension in economics, that is, the linkage between income inequality and productivity through health.

Furthermore, we will also contribute to blazing a new trail in not only orthodox economics but also behavioral economics. The "fair wage-effort" hypothesis of Akerlof (1982) is a well-known proposition about the link between labor income inequality and productivity in behavioral economics. According to this hypothesis, if a worker receives more than the "fair wage", he contributes his full effort, and if a worker receives less than the fair wage, he reduces his effort. The economic consequences of this hypothesis depend on how the fair wage is determined. Akerlof and Yellen (1990) posited that people's concepts of fairness are based on comparisons with other salient standards according to the relative deprivation theory. They constructed a model in which workers compare themselves with others in the same company. These papers suggested that the determinants of workers' efforts were anger, jealousy, retribution, and human relation, based on Mayo (1949) and other findings of psychologists and sociologists. Our research shows that one of the determinants of workers' efforts is worker health.

Conlusions

Some may not consider the increase in labor income inequality a serious problem because the pay systems of Japanese companies are changing from age-based to performance-based systems. However, the distribution of human capital across Japan is denser

than in the United States, as Grossman and Maggi (2000) point out. Thus, one could argue that if there is a substantial inequality in labor income even when the inequality in employee ability is relatively small, many employees may reasonably feel that the increase in labor income inequality implies not a change in the pay system but a lack of organizational justice. We do not intend to criticize the performance-based pay system, but we must not forget that the extent to which people are treated with justice in the workplace independently predicts their health, as Elovainio et al. (2002) and Kivimäki et al. (2003) point out.

Finally, we must admit that our research is limited by data constraints. The merit of our dataset is that it covers the majority of Japanese employees working in the major Japanese companies and industries. Therefore, our investigation is based on a nationwide survey. However, our dataset is based on company-level data, and not on individual-level data.

Regrettably, we have not yet found any specific mechanism by which inequality in labor income affects the health of employees. For example, it has not yet been shown that individuals with lower labor incomes are less healthy than individuals with higher labor incomes in a company with large labor income inequalities. To examine this issue, we need to have individual-level data, including the data of the workplace and labor income. Finding such data as well as any empirical evidence relating health, productivity, and organizational justice in Japan remains a goal for future research.

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Appendix

Table 1. The correspondence between grades and monthly salaries

Category	Standard monthly salary (in yen)	Monthly salary bracket (in yen)
1	98,000	Up to 101,000
2	104,000	101,000-107,000
3	110,000	107,000-114,000
4	118,000	114,000-122,000
5	126,000	122,000-130,000
6	134,000	130,000-138,000
7	142,000	138,000-146,000
8	150,000	146,000-155,000
9	160,000	155,000-165,000
10	170,000	165,000-175,000
11	180,000	175,000-185,000
12	190,000	185,000-195,000
13	200,000	195,000-210,000
14	220,000	210,000-230,000
15	240,000	230,000-250,000
16	260,000	250,000-270,000
17	280,000	270,000-290,000
18	300,000	290,000-310,000
19	320,000	310,000-330,000
20	340,000	330,000-350,000
21	360,000	350,000-370,000
22	380,000	370,000-395,000
23	410,000	395,000-425,000
24	440,000	425,000-455,000
25	470,000	455,000-485,000
26	500,000	485,000-515,000
27	530,000	515,000-545,000
28	560,000	545,000-575,000
29	590,000	575,000-605,000
30	620,000	605,000-635,000
31	650,000	635,000-665,000
32	680,000	665,000-695,000
33	710,000	695,000-730,000
34	750,000	730,000-770,000
35	790,000	770,000-810,000
36	830,000	810,000-855,000
37	880,000	855,000-905,000
38	930,000	905,000-955,000
39	980,000	955,000 and over