Dynamic Changes of Social Mobility in Japan 1955-95

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Abstract

Many past researches on social mobility exhibits that mobility chance (unequal opportunity in intergenerational mobility) in industrialized societies is stable over time. However, those studies do not thoroughly capture dynamic changes in mobility chance because they do not identify and examine the three types of effects; period effect, cohort effect, and age effect. Focusing on 'overall' and 'class-specific' mobility chances, this paper explores the dynamic changes of intergenerational mobility in Japan by using the SSM national survey data collected every 10 years from 1955 to 1995.

The results of analysis to mobility tables which are made by the classification of six social classes exhibit that overall mobility chance measured by 'achieved ratio of perfect mobility' was equalized by the period effect in the period of 1955-65, and since 1965 it has been affected by the cohort effect that brought constancy for the cohort born in 1900-29, equalization for the cohort in 1930-49 cohort, and increase of inequality for the cohort in 1960-69.

When class-specific mobility chance (degree of class inheritance) is measured by log of odds ratio, all types of effects are found. However, the age effect is found in only one of six classes and stable over time. Therefore, the major determinants to form the changes in overall mobility chance were the cohort and the period effects. Most of the cohort effects found in four classes have intensified inequality, but progressed very gradually. The period effects in four classes happened temporally at different periods, but most of the effects had strong influence in bringing equality. Eventually, the class-specific period effects equalized the overall mobility chance in Japan until the 1950-59 cohort.

The analysis identifying the three types of effects shows the complicated dynamics of changes that the past studies have overlooked. The gradual cohort effects and the intermittent period effects that were inherent to individual classes contributed to the changes of overall mobility chance over time.

1. Temporal Change of Mobility chance

After the late 1970's, many studies on social mobility espouse the FJH thesis and demonstrate that *mobility regime* or *relative mobility rate* which shows unequal opportunity of intergenerational mobility does not change and remains stable over time in industrial societies. The FJH thesis presented by Featherman, Jones and Hauser (1975) states that the circulation mobility is basically the same in industrialized societies with a market economy and a nuclear family system. This mobility is equivalent to relative mobility rate which is eliminated structural effects made by technological and demographic changes from gross mobility rate.

The FJH thesis has become dominant since 1980's, replacing the industrialization thesis which states that a society's intergenerational mobility becomes equalized as it industrializes (Treiman, 1970). To test these theses, many cross-national and cross-temporal comparative studies are conducted by using data from industrialized and non-industrialized countries. Many of the results have supported the FJH thesis and have argued that the mobility regime is common across countries and constant across time (Hauser and Featherman, 1977; Featherman and Hauser, 1978; Baron, 1980; McRoberts and Selbee, 1981; Erikson *et al.* , 1979, 1982, 1983; Erikson, 1983; Grusky and Hauser, 1984; Robinson, 1984; Kerckhoff *et al.*, 1985; Erikson and Goldthorpe, 1987a, 1987b, 1992; Goldthorpe, and Payne, 1986; Ishida *et al.* , 1991; Jones *et al.*, 1994).

However, some researches do not support the FJH thesis, although these are fewer than supportive evidences. Those results display cross-national and cross-temporal variations (Breen, 1987; Hout and Jackson, 1986; Yamaguchi, 1987; Hauser and Grusky, 1988; Hout, 1984, 1988; Ganzeboom *et al.* , 1989; Wong, 1990, 1994; Wong and Hauser, 1992).

Even if the focus is limited to cross-temporal change, some studies do not support its constancy. For example, Hout (1984, 1988) reports that the association between class of origin and class of destination is weakened in the United States in the periods from 1962 to 1973, and from 1972 to 1985, and this means that mobility in these periods are equalized. Also, when Ganzeboom *et al.* (1989) analyze 149 mobility tables (including tables in different time points from 18 countries), they find a long-term trend of gradual equalization. Wong (1994) reanalyzes 18 countries from the work of Ganzeboom *et al.*(1989) and finds the linear trend coming up to openness for opportunity in few countries. But, he indicates that Japan does not have this trend.

2. Three Types of Effects to Change: Period, Cohort, and Age Effects

The interest to whether mobility chance becomes equalized or is constant increased the number of research that examined the industrialization thesis and the FJH thesis. These studies gave evaluations on industrialization and structural characteristics of modern societies. On one hand, as the industrialization thesis argues, industrialization accompanied with economic growth not only fosters material wealth, but also increases the degree of equal opportunity in intergenerational mobility. On the other hand, as the FJH thesis suggests, industrial societies have the invariant mobility regime that reproduces class structure and its unequal characteristics for each society.

Precedent studies examining changes occurred in a society are usually done by comparing among intergenerational mobility tables which are individually made from the data collected at different point in time. Or, for those studies paying attention only to cohort effect are done by making cohort variable from the dataset and comparing among cohorts. These methods are taken because these assume practical restriction that data were taken at just once or at few time points. However, these studies cannot analyze the actual changes of mobility chance because these analyses do not examine period effect, cohort effect, and age effect simultaneously.

Let's suppose that surveys have been taken every ten years and these have been taken three times. Call these time points *T1, T2 and T3.* In each time frame, respondents as child generation are divided among age group of 20-29, 30-39, 40-49, and 50-59 years old. Let's call these groups *A1, A2, A3* and *A4.* At this time, *A1* through *A4* in *T1* matches with the ten-year interval birth cohort categories of respondents *C1, C2, C3* and *C4.* Therefore, *A1* through *A4* in *T2* become *C2* through *C5.* Also, *A1* through *A4* in *T3* become *C3* through *C6.*

Figure 1.1 displays the example of the dataset explained above. It has an indicator such as mobility rate and odds ratio that measures inequality in intergenerational mobility table, and only cohort effect influences the changes of its value. In this figure, higher value indicates higher degree of inequality, just like in odds ratio. Four age groups surveyed at the same time point are marked by the same symbol, placed on the corresponding cohorts, and those are connected by a line. The marks on a same line (drew from right to left on the figure) correspond to the age groups *A1* to *A4* on the same time point.

The lines of this figure increases from the oldest cohort *C1* to the youngest cohort *C6*, which means that newer cohort has higher degree of class inheritance. If cross-temporal comparison is done without differentiating cohorts, it can be concluded that the period effects from *T1* to *T2* and from *T2* to *T3* cause the increase in inequality.

Figure 1.2 shows the example of age effect. The graph decreases as age increases in each time point. Each line has the same degree of slope. If we focus on the third cohort *C3* and observe its vertical changes which occurred between time points, the value decreases from *T1* to *T3*. If we employ time comparison without separating age groups, we can only conclude that there is no period effect, and we overlook the fact that inequality lessens as age increases.

Figure 1.3 displays the example of period effect. The lines *T1* through *T3* on the graph are horizontal, and the degree of inequality is constant in each time point. Therefore there is neither cohort effect nor age effect. Researches conducting cross-temporal comparison without considering cohort and age effects assume this kind of condition on this figure. In other words, when cohort effect and/or age effect (like on *Figure 1.1* and *1.2*) exist, simple cross-temporal comparison can not detect the actual change of the situation.

Moreover, there is other significance in including not only period effect, but also cohort and age effects in the analysis. By employing all three effects in a study, we are able to analyze the relationship between 'intergenerational' mobility and 'intragenerational' mobility.

The phenomenon that equalization occurs as age increases, as shown in *Figure 1.2*, is actually caused by intragenerational mobility as the time passes. As the figure indicates, all cohorts except for incomparable cohorts *C1* and *C6* decrease the degree of inequality every ten years from *T1* to *T2* and from *T2* to *T3*. Class of origin in intergenerational mobility tables is usually measured by asking respondents about father's main job as destination or reached job at a fixed age of respondent. Therefore, it is hard to think that father's class would change every ten years. It is more appropriate to think that 'intragenerational' mobility of respondents changed the degree of inequality in his intergenerational mobility. In this figure, the phenomenon that intragenerational mobility equalizes intergenerational mobility is determined by age.

Period effect in *Figure 1.3* also exhibits how intragenerational mobility influences intergenerational mobility. By looking at the changes in each cohort from *C2* to *C5*, the value of each cohort increases in the same amount every ten years, which results in strengthening inequality. As examined above, if class of origin were unchanged, intragenerational mobility of respondents in ten years changes the degree of inequality in intergenerational mobility. In this figure, the phenomenon that intragenerational mobility intensifies inequality in intergenerational mobility is determined by period.

3. Data

As discussed above, the analysis differentiating period, cohort and age effects is essential to assess the actual changes of intergenerational mobility, and makes it able to explore how intragenerational mobility influences intergenerational mobility. In order to conduct such an analysis, it is necessary to obtain at least three comparable survey data taken at different points of time in the same society. The dataset of National Survey of Social Stratification and Social Mobility (the SSM Survey) in Japan is appropriate for this study, since this survey has been conducted five times every ten years from 1955 to 1995. The SSM Survey is nation-wide, and the sample is randomly taken from the people of age 20 to 69. The sample was solely male until 1975, and then it sampled both male and female in 1985 and 1995 surveys. This study uses only male data because of the availability to compare the data taken at different points of time. [1]

From the mid-1950s to the mid-1970s, Japanese society was supported by high economical growth, and then it leveled down to the mid-1980s. From the middle to the end of 1980s was marked by the booming economy. From the beginning of the 1990s, Japanese economy entered serious recession. Since 1950s, Japanese economy fluctuated, but its structural changes by industrialization continued to be a highly industrialized society. Also from this point, data taken from the SSM survey is suitable for analyzing how mobility chance is transformed by industrialization.

Table 1 Classification of Classes

CLASS	*Occupation*	*Employment Status*	*Size of Company (number of employee)*
Upper White-collar	professional	all	all
	managerial	manager	30 or more
	managerial	employee	30 or more
White-collar Employee	managerial	employee	less than 30
	clerical/Sales	employee	all
Blue-collar Employee	manual	employee	all
Self-employed White-collar	managerial	manager/self-employed	less than 30
	clerical/Sales	manager/self-employed	less than 30
Self-employed Blue-collar	manual	manager/self-employed	all
Farmer	farmer	all	all

As *Table 1* shows, classification of classes for making intergenerational mobility table is done by the combination of the following: (1) occupation (professional/ managerial/ clerical/ sales/ manual/ farmer), (2) employment status (manager/ employee/ self-employed), and (3) size of company (30 or more than 30 employees/ less than 30 employees). This classification comprises the six classes: *Upper White-collar*, *White-collar Employee*, *Blue-Collar Employee*, *Self-employed White-collar*, *Self-employed Blue-collar*, and *Farmer*. This classification is applied to father's main job for origin class, respondent's first job for entry class, and respondent's job at the interview for current class.

Table 2 Characteristics of Classes (1995 Data)

Mean (Standard Deviation)

Class	*Education (year)*	*Annual Income (10,000 yen)*
Upper White	14.6(2.28)	790.5(489.3)
White-collar Employee	13.2(2.37)	556.1(254.4)
Blue-collar Employee	11.1(2.03)	435.8(197.2)
Self-employed White-collar	12.6(2.62)	661.7(465.8)
Self-employed Blue-collar	10.8(2.24)	526.7(304.9(
Farmer	10.1(2.38)	336.9(212.7)
Total	12.4(2.70)	559.9(355.3)
n	*2166*	*2015*
F	176.9**	70.2**

** significant at 1 percent level

Table 2 depicts the characteristics of education and income for each class. This is taken from the 1995 survey data, and it shows averages and standard deviations of the year of education (years the respondent receives formal education) and yearly income (before tax, 10,000yen/unit) in each class. *Upper White-collar* is the highest class; it has the highest years of education and income not only in 1995, but also in four other surveyed time points. *White-collar Employee* has the second highest years of education in all five time points and is located in the third or fourth place in income. Therefore this group is placed between middle class and upper class. *Blue-collar Employee* stays in the fourth or fifth place in years of education, and the fifth or sixth place in income. So this group is classified as lower class. *Self-employed White-collar* has the third highest years of education and the second highest income in all five time points, this group is placed in the middle to upper class. Since *Self-employed Blue-collar* stays in the fourth or fifth place in education, and the third or fourth place in income, this group is placed in the middle to lower class. *Farmer* is placed in the lowest standing in education, and has the lowest rank in income (except in 1975, where it is placed in the second lowest). It is the lowest class among the six.

4. Changes of Overall Mobility Chance

4.1 Achieved Ratio of Perfect Mobility

To measure the degree of inequality in overall mobility chance that a mobility table has as a whole, *Achieved Ratio of Perfect Mobility* is applied. This ratio resembles 'Index of Association' and 'Index of Dissociation' presented by Glass (1954), but assesses the total degree of inequality in a mobility table. [2]

$$\text{Achieved Ratio of Perfect Mobility} = \frac{\text{Observed Gross Mobility Rate}}{\text{Expected Gross Mobility Rate}}$$

Observed Gross Mobility Rate is calculated by the equation shown below. F_{ij} is an observed frequency of cell (i, j) of the mobility table, where i indicates a category for origin class , and j denotes a category for current class. F_{ii} is the observed frequency of cell located on the main diagonal. Also, N is the number of total samples of the mobility table. *Expected Gross Mobility Rate* is calculated by the equation presented below. $F_{i.}$ and $F_{.j}$ are the marginal frequencies. E_{ii} is the expected frequency of cell on the main diagonal when the independence model that assumes perfect mobility with equal opportunity is applied.

$$\text{Gross Mobility Rate} = (N - \sum_i F_{ii}) / N$$

$$\text{Expected Gross Mobility Rate} = (N - \sum_i E_{ii}) / N \qquad \text{for} \quad E_{ii} = F_{i.} \times F_{.i} / N$$

Achieved Ratio of Perfect Mobility is calculated by applying the equation above to each mobility table. This ratio shows the percentage of actually achieved mobility out of perfect mobility in terms of gross mobility rate. Mobility chance is more equal as the ratio approaches to 1. *Table 3* is the result of applying achieve ratio of perfect mobility to mobility tables in each time point. Line *a* of this table indicates *Observed Gross Mobility Rate*, and line *b* exhibits *Expected Gross Mobility Rate*. The amount of line *a* divided by the amount of line *b* on the same time point is *Achieved Ratio of Perfect Mobility*, shown in line *c*. This ratio increased about ten percent from 1955 to 1965 (0.667 to 0.764), but the amount of increase after 1965 is small.

However, we cannot conclude that the period effect during the decade of 1955-65 equalized opportunity, and we also cannot conclude that mobility chance after 1965 have been constant. There is enough speculation that cohort effect and age effect also affected the data, making the results of cross-temporal comparison spurious.

Table 3 Achieved Ratio of Perfect Mobility

	Surveyed Year				
	1955	*1965*	*1975*	*1985*	*1995*
a. Observed Gross Mobility Rate	.473	.627	.655	.673	.673
b. Expected Gross Mobility Rate	.709	.819	.837	.850	.844
c. Achieved Ratio of Perfect Mobility (a / b)	.667	.766	.783	.792	.797
(N)	*(1853)*	*(1857)*	*(2304)*	*(1981)*	*(1930)*

4.2 Fitting by Regression Model

The following analysis is done by identifying period, cohort, and age variables and examining the degree to which the change of each variable and the change of mobility chance coincide. To begin with, surveyed time point, cohort, and age are divided and grouped together, which is shown in *Table 4*.

Table 4 Numbers of Samples

Birth Cohort (year of birth)	Surveyed Year				
	1955	*1965*	*1975*	*1985*	*1995*
1890-99	244				
1900-09	390	212			
1910-19	418	362	253		
1920-29	501	479	450	296	
1930-39		572	608	499	386
1940-49			663	554	490
1950-59				441	495
1960-69					301

There are five surveyed time points from 1955 to 1995. Eight cohorts are made; these include respondents who are born in 1890-99, through those of them are born in 1960-69. There are four age groups in each surveyed year; these include respondents of the age groups 26- 35, 36-45, 46-55 and 56-65 respectively. Consequently, the data is divided into 20 groups. Numerical values presented on this table show the number of respondents who have no missing value on both origin class and current class in each group.

Figure 2 plots the values of achieved ratio of perfect mobility calculated from 20 tables which show mobility from origin to current class, as Figure 1 does. This figure also exhibits the achieved ratio of perfect mobility as to mobility from origin to entry classes. By comparing the achieved ratio on mobility when respondents entered their first job and the same ratio of mobility at the interview, it is possible to observe how intragenerational mobility transforms the degree of inequality in intergenerational mobility from origin to current class. The achieved ratio as to mobility to entry class is calculated by combining the same cohort surveyed at different time points, and making eight mobility tables for each cohort. This is possible because each cohort starts the first job approximately at the same time. [3]

Four points can be indicated from *Figure2* by looking at the transformation of achieved ratio without observing mobility to entry class. First, lines on the graph since 1965 are located higher than the line in 1955. That is, the achieved ratio increases from 1955 to 1965. Second, the ratio increases only a small amount in the 1930-39 and the 1940-49 cohorts. It seems that mobility chances in these cohorts are equalized. Third, although the line of 1955 increases leftward, continuous age effect is not found. Fourth, on the whole, mobility chance is equalized by period effect and cohort effect until the 1950-59 cohort.

It is well known that it is difficult to statistically identify period, cohort, and age effects separately and to extract net of effect for each of the variable. Therefore, in this study, the method to examine the degree of each effect is discussed below.

Let's assume that each mobility table from origin to current class of 20 groups in Table 4, excluding mobility to entry class, is a sample. Then, regression model is applied to the dependent variable Y which has the values of achieved ratio calculated from each mobility table. The Model of linear function and quadratic function shown below are applied to the variable. Model of cubic function ($Y = a + b_1 X + b_2 X^2 + b_3 X^3$) is also considered, but the model does not show much improvements, so this is discussed accordingly.

Model 1: $Y = a + b_1 X$

Model 2: $Y = a + b_1 X + b_2 X^2$

Each of time, cohort, and age variable is employed to the regression models as the independent variable X, and degree of fitness to the models is compared by R^2 in order to evaluate the strength of each effect. Also, comparing R^2 between linear and quadratic function makes it able to determine whether the change is linear or curvilinear.

Time variable is quantified as 1 to 5 that match to surveyed years ranged from 1955 to 1995. Cohort variable is made as 1 to 8 that match from the 1890-1899 cohort to the 1960-69 cohort. Age variable is quantified as 2 to 5 that match the age group from 26-35 to 56-65.[4]

This method is not suitable for extracting the net of effect by controlling the influence of other effects. However, it is difficult to differentiate three net effects because only 20 samples (mobility tables) are available for observation, as discussed above. In this study, the degree of fitness for each of the time, cohort, and age variable is compared without controlling the influences of other effects. This method is a rough examination to understand dynamic changes of mobility chance, but it is the second best method.[5]

Table 5 is the result of the analysis when achieved ratio in Figure 2 is applied to the regression models. R^2 are 0.498 for *Model 1* and 0.602 in *Model 2* when time is used as the independent variable. Both of them have good fit. Also, model of cubic function is the best fit (R^2=0.651) because the graph increases greatly during 1955 and 1965, but stayed constant during 1965 to 1975, and increased again during 1985 and 1995.

Table 5 Results of Regression Analysis to Achieved Ratio of Perfect Mobility

Independent Variable	*Model 1*			*Model 2*			
	R^2	a	b_1	R^2	a	b_1	b_2
Time	.498	.699	.025	**.602**	.631	.084	-.010
Cohort	.182	.721	.012	.183	.728	.008	.000
Age	.042	.743	.009	.071	.647	.070	-.009

When cohort is taken as the independent variable, R^2 in *Model 1* is 0.182 and in *Model 2* is 0.183. Fits of those models are not good. However, in Figure 2, since 1965, each cohort except for 1930-39 does not show big changes of its vertical location. Then, we conducted the same analysis solely on the data after 1965. When cohort is used as the independent variable, R^2 in *Model 1* is 0.074 and *Model 2* is 0.076. They are low. But, in model of cubic function, R^2 is 0.381. This value is higher than R^2 when time is the independent variable; 0.208 in both *Model 1* and *Model 2*, and 0.209 in model of cubic function.

Therefore, cohort effect has the major influence on changes of mobility chance after 1965. By cohort effect, the achieved ratio has been relatively constant from the 1900-09 to the 1920-29 cohort, increased from the 1930-39 to the 1950-59 cohort, and then it decreased in the 1960-69 cohort.

When age is employed as the independent variable, R^2 in *Model 1* is 0.042, and 0.071 in *Model 2*; they both have bad fit. There is no improvement in the model of cubic function; R^2 is 0.071. No age effect is observed.

The results of analysis show that mobility chance in Japan is influenced by the combination of period effect and cohort effect. First, equalization progressed drastically by the period effect from 1955 to 1965. Second, the cohort effect had a major influence on the trend after 1965. This trend was constant in the 1900-29 cohorts, and slowly equalized in the 1930-59 cohorts, and then it intensified inequality in the 1960-69 cohort. However, we cannot conclude from this analysis that the 1960-69 cohort has more unequal opportunity than the former cohorts. Because the dataset has obtained only one sample as a mobility table of the age range 26 to 35, and there is a possibility where the change by intragenerational mobility may occur after 1995.

4.3 Intragenerational Mobility and Intergenerational Mobility

To identify the influence of intragenerational mobility onto intergenerational mobility, the achieved ratio of mobility from origin to entry class is calculated for each cohort, and plotted by * sign and connected with a bold line in Figure 2. This ratio increased from the 1890-99 to the 1930-39 cohort (drastically from the 1930-39 to the 1940-49 cohort), and then it levels down slowly from then on.

In each cohort, plotted marks except * signs located above the bold line indicate that the mobility chances from origin to current class have been equalized since the respondents start their first job. On the contrary, plots located below the bold line mean that the mobility chances become unequal after entry. Thus, these changes of vertical location in each cohort indicate that intragenerational mobility from first job until surveyed time point changes the association between origin class and current class.

The influence of intragenerational mobility toward inequality of intergenerational mobility changes as follows. Firstly, in 1955, intragenerational mobility from entry to current class has the effect that strengthens inequality of intergenerational mobility in younger cohorts and bringing equality in older cohorts. Secondly, however, after 1965, intragenerational mobility has brought great influence to equalize mobility from origin to current class until the 1930-39 cohort. Thirdly, after the 1940-49 cohort, intragenerational mobility become to have weak effect that increases inequality of intergenerational mobility.

5. Changes of Class-specific Mobility Chance

5.1 Changes of Class Inheritance

Next, to measure inequality of mobility in each class, *log of odds ratio* is employed. θ_i is the log of odds ratio for class category *i* and is calculated as below where *log* denotes natural logarithm. This greater value shows higher inequality that is equivalent to higher class inheritance.

$$\theta_i = log \frac{F_{ii} \cdot F_{i'i'}}{F_{ii'} \cdot F_{i'i}}$$

When there are more than three categories of classes, category *i'* becomes a new category by combining them together except for category *i.* In this analysis, because of the classification of six classes, there are 6 of θ_i ; θ_1 , θ_2 , ……, θ_6 . Twenty values are obtained for each θi, since there are 20 mobility tables from the groups divided in Table 4.[6]

Figure 3.1 through *Figure 3.6* plot the results of each θ_i calculated from mobility tables from origin to current class. These figures also add log of odds ratio from origin to entry class. In the same way as achieved ratio of perfect mobility, it is calculated from each of eight mobility tables which combine the same cohorts surveyed at different point in time. These log of odds ratios are plotted by * marks and connected with a bold line.

Table 6 is the results of *Model 1* and *Model 2* by taking θ_i (except for entry class) in each class as the dependent variable. In the regression analysis done for θ of *Upper White-collar*, R^2 marks the highest (0.369) when *Model 2* is applied and cohort is used as the independent variable. θ_1 in *Figure 3.1* increase between the 1900-09 and the 1920-29 cohort, and then it decrease between the 1930-39 and the 1950-59 cohort. There is a speculation that period effect also contributes to this phenomenon because θ_1 in the 1910-19 and the 1920-29 cohort show vertical changes depending on the surveyed time. However, it is sure to say that the degree of inheritance in Upper White-collar is gradually weakened in the 1930-59 cohorts.

In *White-collar Employee*, R^2 marks the highest when age is applied as the independent variable in *Model 1* (0.312) and *Model 2* (0.390). As the graph in *Figure 3.2* indicates, the amount of θ_2 in each surveyed time point declines from right to left (as age increases). However, this decreasing trend is not linear; it decreases from the age range 26-35 to the 36-45, and then it fluctuates. Therefore, *Model 2* has better fit than *Model 1.* On the whole, degree of inheritance in White-collar Employee weakens as age increases (as one becomes older).

Table 6 Results of Regression Analysis to Log of Odds Ratios

CLASS	Independent Variable	Model 1 R^2	Model 1 a	Model 1 b_1	Model 2 R^2	Model 2 a	Model 2 b_1	Model 2 b_2
Upper White-collar	***Time***	.235	2.290	-.143	.257	2.549	-.365	.037
	Cohort	.243	2.375	-.114	**.369**	1.695	.245	-.040
	Age	.033	1.623	.068	.046	2.144	-.264	.047
White-collar Employee	***Time***	.102	1.097	-.099	.109	1.254	-.233	.023
	Cohort	.009	.697	.023	.082	1.235	-.262	.032
	Age	.312	1.563	-.218	**.390**	2.898	-1.067	.121
Blue-collar Employee	***Time***	.330	1.735	-.215	**.415**	2.383	-.770	.093
	Cohort	.178	1.648	-.124	.181	1.785	-.197	.008
	Age	.002	1.165	-.022	.011	1.714	-.371	.050
Self-employed White-collar	***Time***	.063	1.642	.091	.111	2.112	-.311	.067
	Cohort	.438	1.067	.189	.467	1.463	-.020	.023
	Age	.563	3.121	-.345	**.570**	3.595	-.646	.043
Self-employed Blue-collar	***Time***	.010	1.724	-.035	.041	1.367	.272	-.051
	Cohort	.137	1.169	.100	.145	1.375	-.009	.012
	Age	**.526**	2.726	-.316	.526	2.695	-.297	-.003
Farmer	***Time***	.196	1.997	.170	**.502**	3.254	-.907	.180
	Cohort	.268	1.806	.156	.274	2.005	.051	.012
	Age	.075	2.975	-.133	.101	2.021	.473	-.087

The analysis of *Blue-collar Employee* has the highest R^2 (0.415) when time is taken as the independent variable, and it is applied to *Model 2.* θ_3 of *Figure 3.3* decrease drastically from the line of 1955 to the line of 1965. However, since 1965, the vertical shift between lines on the figure is not prominent in each cohort. So it seems that the change is occurred by cohort effect. Due to this result, regression model with cohort as the independent variable is applied to θ_3 after 1965. The results of R^2 in both models are low (*Model 1* is 0.006, and *Model 2* is 0.072). The degree of fitness is improved when the data is applied to the model of cubic function (R^2 = 0.421) because θ_3 after 1965 increase in the 1900-29 cohorts, decrease in the 1930-49 cohorts and increase again in the 1950-69 cohorts. Degree of inheritance in Blue-collar Employee is weakened greatly by period effect during the year 1955-65. Since 1965, the degree of inheritance is strengthened in the 1900-29 cohorts, weakened in the 1930-49 cohorts, and strengthened again in the 1950-69 cohorts.

In the analysis of *Self-employed White-collar*, R^2 that takes age as the independent variable shows the highest result (*Model 1*: 0.563, *Model 2*: 0.570). However, this result can be explained in another way if we observe *Figure 3.4*. Two lines of 1955 and 1965, and three lines of 1975, 1985 and 1995 show similar behavior on the graph. In other words, the degree of inheritance becomes stronger for newer cohorts by the cohort effect until 1965, and the period effect reduced the level of inheritance from 1965 to 1975. After 1975, the degree of inheritance becomes stronger in newer cohorts, and the graph starts from lower level comparing to 1965 because of the previous period effect. The above result that R^2 is high when age is applied as the independent variable may be spurious, because of the combination of cohort effect and period effect.

θ_5 of *Self-employed Blue-collar* show similar change as Self-employed White-collar. When age is used the independent variable, R^2 is 0.526 in both *Model 1* and *Model 2*, and it is higher than when cohort or time is used as the independent variable. However, many plotted points on the lines from 1955 to 1985 in *Figure 3.5* overlap, and the 1900-59 cohorts show gradual increase except for the 1910-19 cohort which is somewhat higher than the rest. Since points plotted in 1995 are lower than the points plotted in 1985, the degree of inheritance becomes weaker by the period effect between these years. The reason why R^2 is high when applying age as the independent variable is because of the same reason in the case of Self-employed White-collar; it is a spurious result made by the combination of cohort effect and period effect.

In *Farmer*, R^2 is the highest (0.502) when time is used as the independent variable and *Model 2* is applied. This is because the lines on the graph, as shown in *Figure 3.6*, drop from 1955 to 1965 and go up from 1985 to 1995. Change of θ_6 is also explained by gradual cohort effect where newer cohort has greater inheritance, because R^2 in *Model 2* is 0.274 when cohort is used as the independent variable. However, since the same cohort changes the value at the different time points, this cannot be explained by cohort effect. Moreover, it is worth to notice that θ_6 is higher comparing to all other classes (more than 2). The degree of inheritance in Farmer is very strong.

The result of analysis about the change of intergenerational inheritance in each class reveals the complexity of changes in mobility chance. First, the period effects weakened inheritance of Blue-collar Employee and Farmer during the time phase of 1955-65, Self-employed White-collar in 1965-75, and Self-employed Blue-collar in 1985-95. In the meanwhile, the period effect in 1985-95 strengthened inheritance of Farmer. Second, after 1965, the cohort effects on one hand weakened inheritance of Upper White-collar in the 1930-59 cohorts and Blue-collar Employee in the 1930-49 cohorts. On the other hand, the cohort effects increasing inequality are found in Blue-collar Employee of the 1910-29 and the 1950-69 cohorts, in Self-employed White-collar and in Self-employed Blue-collar. Many of the cohort effects have the influence to intensify inequality. Third, age effect is evident solely in White-collar Employee, where the degree of inheritance is greater as age increases. This effect does not change inheritance level across time points.

5.2 Effect of Intragenerational Mobility

To analyze the effect of intragenerational mobility on intergenerational mobility in each class, let's compare log of odds ratios of the entry class (the bold lines with plots marked by *) and other marks located on the same cohorts, from *Figure 3.1* to *Figure 3.6*. Points located above the bold line show strengthened degree of inheritance after first job. On the contrary, points located below the line show weakened inheritance after entry. These vertical shifts exhibit that intragenerational mobility which happens from entry class to current class (when survey is taken) alters inheritance level in intergenerational mobility from origin class to current class.

In all classes except for Upper White-collar[7], many of the log of odds ratios for current class are located below the bold line. Especially, Self-employed White-collar (in Figure 3.4) and Blue-collar (in Figure 3.5) have almost all of the points far below the bold line. This suggests intragenerational mobility from entry to current class weakens class inheritance and equalizes mobility chance. This effect of intragenerational mobility is shown strongly in both Self-employed classes. Also, as the last section suggests, five kinds of period effect in four classes had vertical changes in each figure (except for Farmer in the 1900-09 cohort). In other words, those changes are caused by intragenerational mobility.

On the contrary, there are some effects where intragenerational mobility brings inequality. White-collar Employee after the 1930-39 cohort (in Figure 3.2) and Farmer (in Figure 3.6) have several points located above the bold line on the graph. Except for these effects, on the whole, we can conclude that intragenerational mobility equalizes intergenerational mobility to current class.

When we observe the change of θ as to entry class (on the bold line in Figure 3), there is a tendency where newer cohorts have stronger inheritance in Self-employed White-collar and Farmer. On the other hand, Upper White-collar, Blue-collar Employee, and Self-employed Blue-collar have the long-term trend that newer cohorts have weaker degree of inheritance, although it is not clear in the class of White-collar Employee. Moreover, two Blue-collar classes show the converging trend where θ as to entry class and θ as to current class approach each other as cohort becomes newer. This indicates that the effect of intragenerational mobility to equalize intergenerational mobility weakens in newer cohorts, since intergenerational mobility to entry class becomes equalized, in these two classes.

6. Overall and Class-specific Mobility Chance

The analyses of achieved ratio have made clear that overall mobility chance is influenced by the period effect and the cohort effect. The summary of these effects is as follows; *a*) the period effect has promoted drastic equalization from 1955 to 1965. After 1965, the cohort effect has made *b*) the 1900-29 cohorts constant, *c*) the 1930-49 cohorts equalized, and *d*) the 1960-69 cohort inequalized. On the other hand, the analysis of degree of inheritance for each class done by observing log of odds ratio show the age effect in White-collar Employee, but the cohort effects have existed in other four classes. Also, the period effects are seen in four classes and in five different ways.

Table 7 Changes of Mobility Chance

	Period effect	*Cohort effect*	*Age effect*
Achieved Ratio of Perfect Mobility	*a*)Equalized in 1955-65	After 1965 *b*) Constant in 1900-29c. *c*) Equalized in 1930-49c. *d*) Inequalized in 1960-69c.	
Log of Odds Ratio			
Upper White-collar		**Equalized in 1930-59c.**	
White-collar Employee			Equalized as Age Increases
Blue-collar Employee	**Equalized in 1955-65**	After 1965 Inequalized in 1900-29c. **Equalized in 1930-49c.** Inequalized in 1950-69c.	
Self-employed White-collar	Equalized in 1965-75	Inequalized in newer cohorts at 1955-65 & 1975-95	
Self-employed Blue-collar	Eequalized in 1985-95	Inequalized in newer cohorts until 1985	
Farmer	**Equalized in 1955-65** Inequalized in 1985-95		

Table 7 summarizes these results. 'Equalized' indicates the increase of achieved ratio or the decrease of log of odds ratio, and 'Inequalized' indicates the decrease of achieved ratio or the increase of log of odds ratio. 'c.' denotes cohort.

The results indicate the overall change of mobility chance and the change of inheritance level in each class are consistent. First, we summarize the influences of period effect. Equalization process during 1955-65 by the period effect, which is shown in overall mobility table, reflects equalization process in Blue-collar Employee and Farmer in the same time period. Equalization process occurred to Self-employed White-collar during the period of 1965-75 and Self-employed Blue-collar during the time period of 1985-95, and inequalization process occurred to Farmer during this period is not reflected on achieved ratio. Because the change has occurred just in one class during the time period of 1965-75, and the effect of equalization and inequalization cancel each other during the time period of 1985-95, the changes in those classes do not reflect on the overall mobility chance.

Next, we summarize the influences of cohort effect. Overall mobility chance after 1965 has undergone a transition of *b*) constancy, *c*) equalization, and *d*) inequalization. The reason why *b*) the 1900-29 cohorts have not changed in overall mobility chance is because the declines of inheritance in White-collar Employee of the 1910-29 cohorts (Figure 3.2) and Self-employed Blue-collar of the 1920-29 cohort (Figure 3.5) cancels out the inequalization process by the cohort effects of other classes.

Although many of the cohort effects in class-specific mobility chance had the influence to increase inequality as cohort becomes newer, the reason why *c*) the 1930-49 cohorts showed equalization process in overall mobility chance is because these cohorts overlap with equalization in Upper White-collar of in the 1930-59 cohorts and Blue-collar Employee in the 1930-49 cohorts. Also, the reason why *d*) the 1960-69 cohort become unequal is because this cohort has only the cohort effects to intensify inequality in Blue-collar Employee and Self-employed White-collar; the equalization process by the cohort effects in Upper White-collar of the 1930-59 cohorts and Blue-collar Employee of the 1930-49 cohorts already ends.

As the above indicate, the change of overall mobility chance is caused by the change of inheritance level in each class. Although many of the cohort effects in class-specific mobility chance have the influence to intensify inequality, the process of it is very slow as shown in Figure 3. By contrast, in the classes of Blue-collar Employee (Figure 3.3), Self-employed

White-collar (Figure 3.4), and Self-employed Blue-collar(Figure 3.5), the sharp declines between lines (surveyed time points) display that the period effects to equalize occurred temporarily at the different time period and the strength of their effects are greater than the cohort effects. Therefore, as a whole, overall mobility chance in Japan have been equalized until the 1950-59 cohort by changes of class-specific inheritance level, where the period effects surpassed the cohort effects.

There is no major contradiction between overall mobility chance and class-specific mobility chance about the influence of intragenerational mobility toward intergenerational mobility. Generally, for both overall and class-specific mobility chance, intragenerational mobility equalized intergenerational mobility.

In the analysis of overall mobility chance, (i) intragenerational mobility has equalization effect and inequalization effect at 1955 by cohorts, but (ii) has strong and persistent effect to equalize in the 1900-39 cohorts after 1965. Also, in most of class-specific inheritance of Figure 3, the degree of inheritance to entry class for these cohorts is lower than the degree of inheritance to current class.

In overall mobility chance, (iii) after the 1940-49 cohort, intragenerational mobility became to have weak influence to increase inequality in mobility to current class. It is because the mobility to entry class was equalized drastically in this cohort. If we look at the degree of class-specific inheritance to entry class, the newer cohorts have a tendency to equalize in Upper White-collar, Blue-collar Employee, and Self-employed Blue-collar. Especially this effect is strong for Blue-collar employee in the 1940-49 cohort.

Moreover, in two Blue-collar classes, intragenerational mobility has weak effect of equalizing mobility chance in newer cohorts. In these classes, mobility from origin to entry class has been equalized, but mobility from origin to current class has never equalized according to this equalization. Therefore, the influence that intragenerational mobility equalizes intergenerational mobility in terms of overall mobility chance is lost.

7. Conclusion

Whether opportunity in intergenerational mobility has been equalized, or been constant is an essential issue in evaluating modern industrial societies. However, since past studies do not analyze period, cohort, and age effects separately, they could not capture the dynamics in changes of mobility chance. Some studies may even have wrong judgment about changes of mobility chance because they draw conclusion from simple cross-temporal comparison and its spurious results.

The result of analysis to the SSM survey data, which was conducted five times over 40 years, indicates that mobility chance in Japanese society is influenced by the period effects and the cohort effects. Overall mobility chance is equalized drastically by the period effect between 1955 and 1965. After 1965, the major transition is caused by the cohort effect; the mobility chance is constant in the 1900-29 cohorts, equalized in the 1930-49 cohorts, and then inequalized in the 1960-69 cohort.

These transitions of overall mobility chance were caused by the period effects and the cohort effects which appeared in the changes of class-specific inheritance level for each class. On the one hand, many of the cohort effects brought unequal opportunity, but they worked gradually. On the other hand, the period effects occurred temporarily at different time periods, but they had stronger influences to equalize than the cohort effects. Consequently, some classes had the intermittent period effects which equalize overall mobility chance until the 1950-59 cohort.

Although increased inequality was found in the 1960-69 cohort, the age of this cohort at the 1995 survey is relatively young, so it is possible that the change to increase or decrease of inequality would occur by intragenerational mobility after 1995. From the above discussion, it is appropriate to argue that overall mobility chance in Japan was equalized until the 1950-59 cohort by the cohort effects and the period effects which are inherent to individual classes.

Wong (1994) analyzed 18 countries and concluded that mobility chance in Japanese society was stable. Ishida, Goldthorpe and Erikson (1991) reported that relative mobility rate in Japan is similar compared to Europe. It would be concluded from *Table 3* which compares mobility tables in each time point that mobility chance in Japan had not changed significantly since 1965. However, the result of analysis by separating period, cohort and age effects have shown the complicated dynamics of change which has never found from the past studies. The first characteristic of complexity is that overall and class-specific mobility chances are caused by the cohort effects and the period effects. The second is that these two effects result in both decrease and increase of inequality. The dynamics is that changes of overall mobility chance are formed from the gradual cohort effects and the intermittent period effects in each class. This dynamics cannot be explained by the industrialization thesis that emphasizes persistent tendency or the FJH thesis that stresses constancy of class inheritance.

Even though the present study analyzes mobility chance in Japan, it is possible to presume that mobility chance in modern industrial societies has gone through more complicated transition than did the past studies indicated. The past studies by cross-temporal comparison or cross-national comparison might not reveal the actual complex process of change in social mobility, and these studies might have evaluated inequality from spurious statistical results.[8]

Finally, it is important to note that intragenerational mobility has influence on intergenerational mobility to no small extent. Intragenerational mobility, on the whole, equalizes intergenerational mobility from origin to current class, but it transformed in the way to have the weak and opposite effects to increase inequality. This phenomenon is seen from equalization of mobility to entry class on one hand, and no equalization of mobility to current class on the other hand.

The change of the effect of intragenerational mobility change questions the procedures of past studies, which only concentrate on mobility from origin to current class. In other words, it is a misleading concept to evaluate social openness from changes of intergenerational mobility defined as mobility from origin to current class. The reason is because mobility chance to entry class and mobility chance to current class go through different tracks of change.

The transformation of 'intergenerational mobility to current class' is caused by the mixture of the change of mobility from origin to entry class, and the change of mobility from entry to current class. It is necessary to divide the intergenerational mobility into the mobility to entry class and the intragenerational mobility, and to evaluate causes for each change separately.

Notes

1. The number of male respondents for each survey is as follows: 2014 people in 1955, 2077 in 1965, 2724 in 1975, 2473 in 1985, and 2490 in 1995. The permission to use the data for the analysis was received from the 1995 SSM Research Committee.
2. The table below presents the results of Log-linear Model applied to intergenerational mobility tables at each surveyed time point. It examined the model below which postulates, 'the distribution of origin classes and current classes change over time, but the interaction between these two would not change over time.' E_{ijk} is an expected frequency of the cells (i, j, k) on a mobility table where i, j and k denote origin classes (O), current classes (C), and surveyed time point (T) respectively. λ is the parameter of the grand mean. λ^{O}_{i} , λ^{C}_{j}, and λ^{T}_{k} are the parameters for the marginal of the variable O, C, and T respectively. λ^{OC}_{ij} , λ^{OT}_{ik} , and λ^{CT}_{jk}, respectively, are the parameters for the interaction between the variables. 'log' denotes natural logarithm.

$$\log E_{ijk} = \lambda + \lambda^{O}_{i} + \lambda^{C}_{j} + \lambda^{T}_{k} + \lambda^{OC}_{ij} + \lambda^{OT}_{ik} + \lambda^{CT}_{jk}$$

The line *a* on this table shows the results of mobility tables at five point between 1955 and 1995. The line *b* through *f* are results of analyses of these tables but except for one time point. These results reject the model discussed above, and negate the hypothesis that the association between origin class and current class does not change over time. However, the Log-linear Model does not explain the change in degree (whether it decreased or increased) of 'overall' unequal opportunity that a mobility table has as a whole.

Table Results of Log-linear Model

Data	*(N)*	*Likelihood Ratio*	*d.f.*	*p*
a. 1955-1995	*(9925)*	153.71	100	.001
b. Except 1955	*(8072)*	106.67	75	.010
c. Except 1965	*(8068)*	127.58	75	.000
d. Except 1975	*(7621)*	117.41	75	.001
e. Except 1985	*(7944)*	120.70	75	.001
f. Except 1995	*(7995)*	107.06	75	.009

3. The number of samples on mobility table from origin to entry class are, from the 1890-99 to the 1960-69 cohort, 275, 633, 1069, 1803, 2164, 1719, 933, and 310 respectively.
4. Pearson's correlation coefficient between the time variable and the cohort variable is 0.785, between the time and the age variable is 0.000, and between the cohort and the age variable is -0.620.
5. The analytical procedure conducted on this study has to be cautious of three points. Firstly, since the numerical value of mobility rate and odds ratio is not collected by random sampling but is calculated from mobility table, it is not appropriate to conduct statistical tests usually employed in regression analysis. Therefore, statistical test is not conducted in this study. The purpose of this analysis is to compare the fitness of each model to the change of numerical values. Secondly, the dataset is structured in a way that the cohort effect is estimated easier than other effects. On one hand, the number obtained on mobility rate and odds ratio is four for each level of 1 through 5 of the time variable and for each level of 2 through 5 of the age variable. On the other hand, this number is 1, 2, 3, 4, 4, 3, 2 and 1 for each level of 1 through 8 of the cohort variable. Therefore, it is easier to estimate the value of older and newer cohorts. Thirdly, in the case when the age effect changes (*e.g.*: when the effect to increase with age disappears at later time point), the fitness of the age variable worsens. Because of the second and third problems, we will not only examine regression analysis, but also investigate *Figure 2* and *Figure 3.*
6. From one mobility table classifying I number of classes, I amount of 2x2 mobility tables where two categories of i and i' are identified and produced. From these mobility tables, the total of I for θ_i ($i=1, 2,\ldots\ldots, I$) are obtained. In this case, I=6 so θ_i are obtained from θ_1 for Upper White-collar to θ_6 for Farmer. There are 20 mobility tables from the division occurred in *Table 4*, 20 numerical values for each θ_i are obtained.
7. The effect which intragenerational mobility equalizes intergenerational mobility is not clear with the Upper White-collar.
8. The reason why many of the past studies conform to the FJH thesis might be because they analyze mobility tables without separating period, cohort and age effects. In other words, these studies analyzed mobility table where effects to decrease and to increase inequality in each class canceled each other.

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Figure 1.1 Example of Cohort Effect

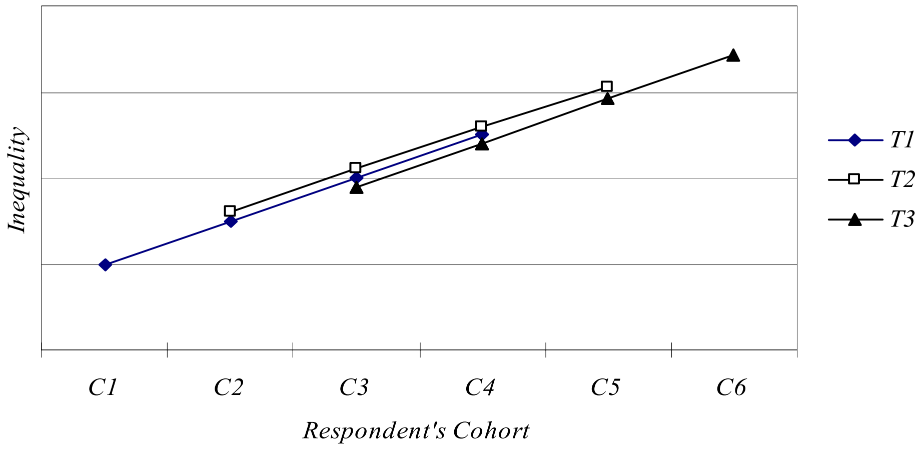

Figure 1.2 Example of Age Effect

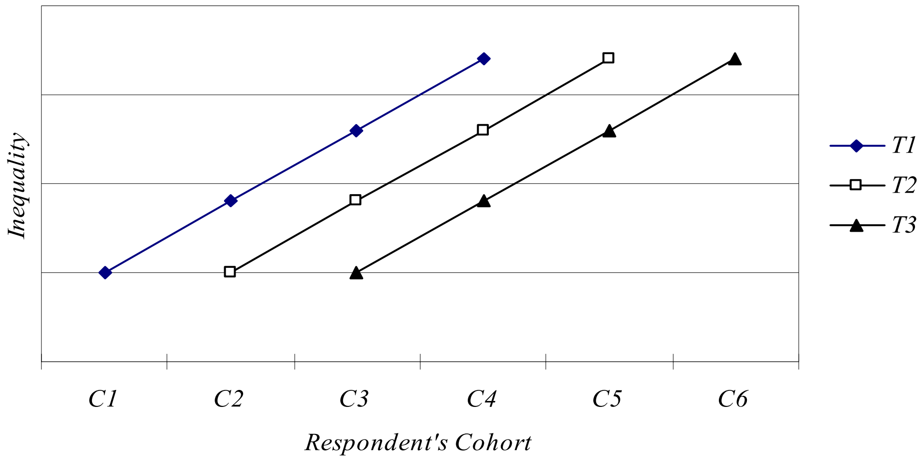

Figure 1.3 Example of Period Effect

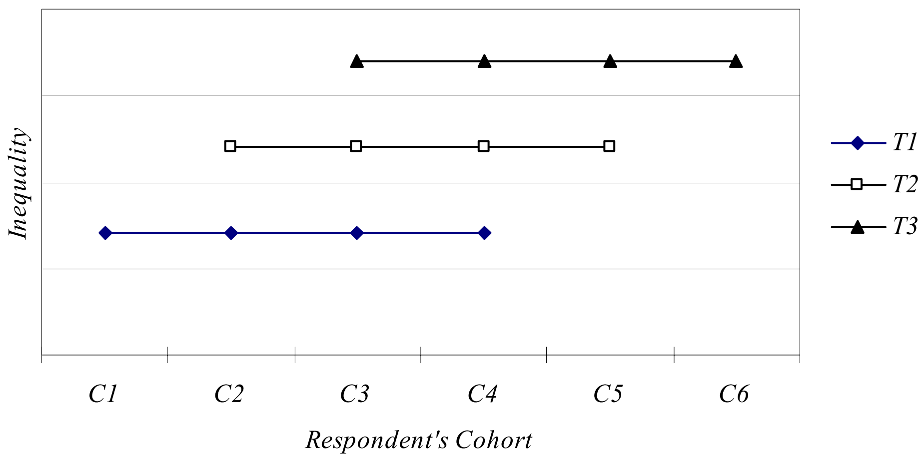

Figure 2 Changes of Achieved Ratio of Perfect Mobility

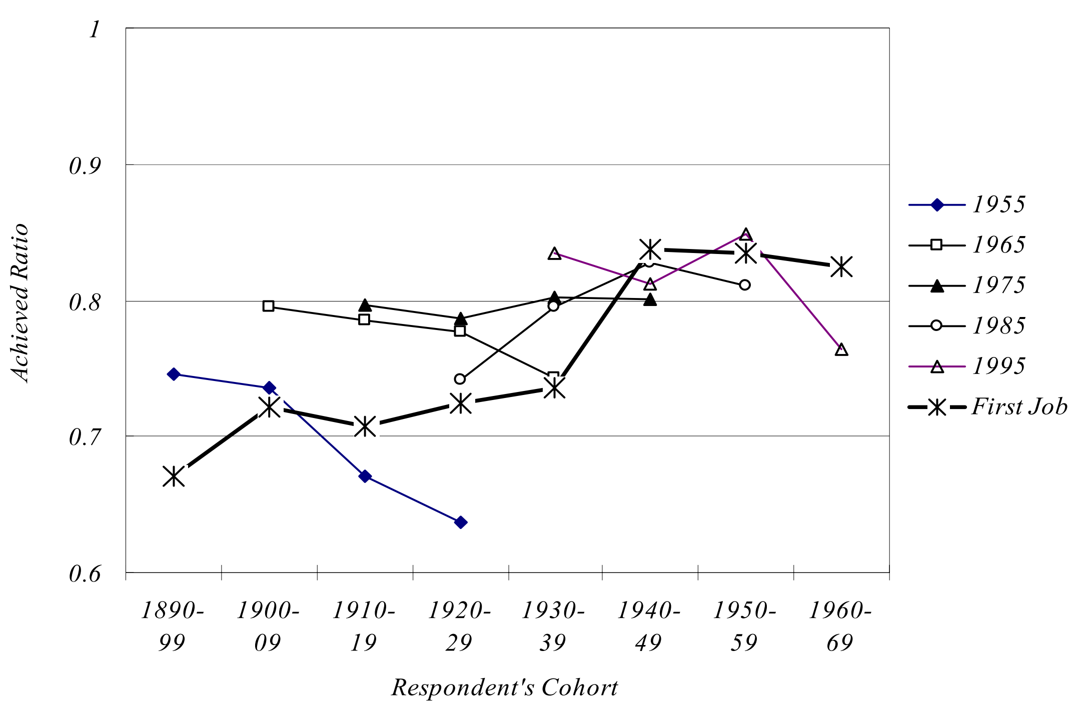

Figure 3.1 Upper White-collar

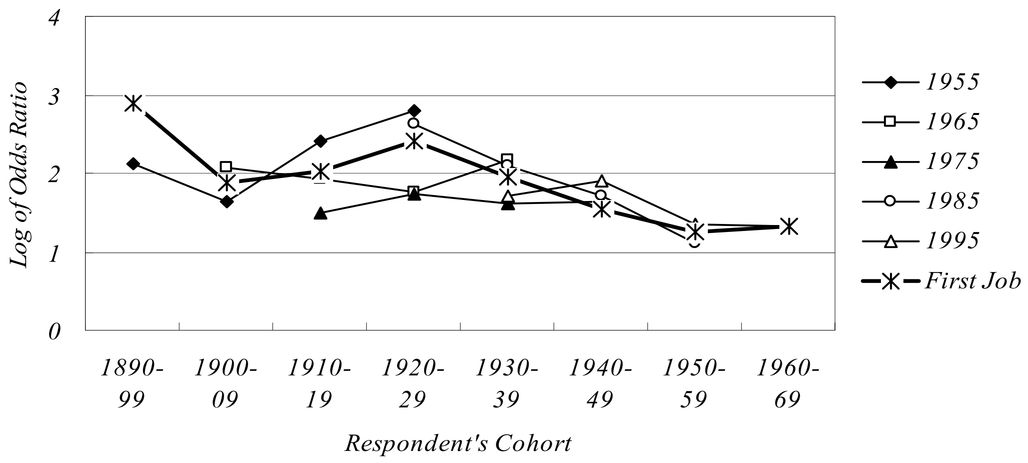

Figure 3.2 White-collar Employee

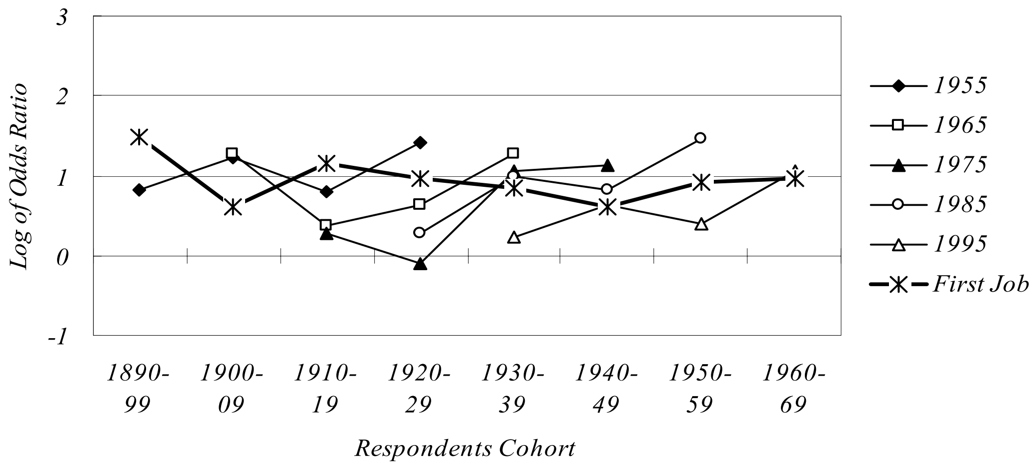

Figure 3.3 Blue-collar Employee

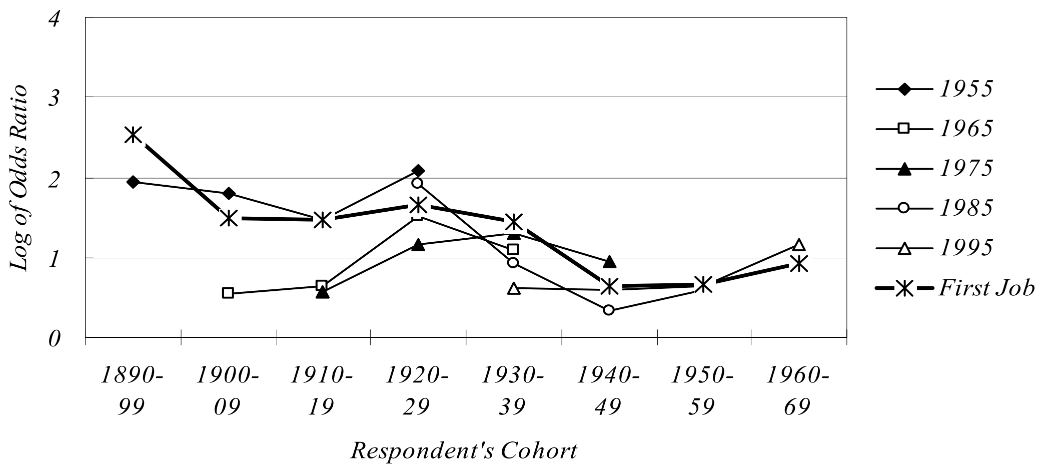

Figure 3.4 Self-employed White-collar

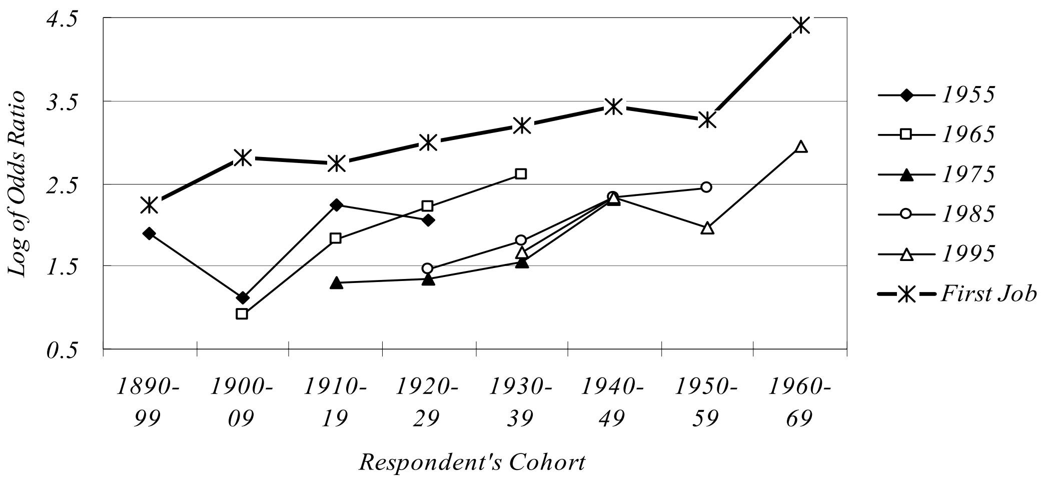

Figure 3.5 Self-employed Blue-collar

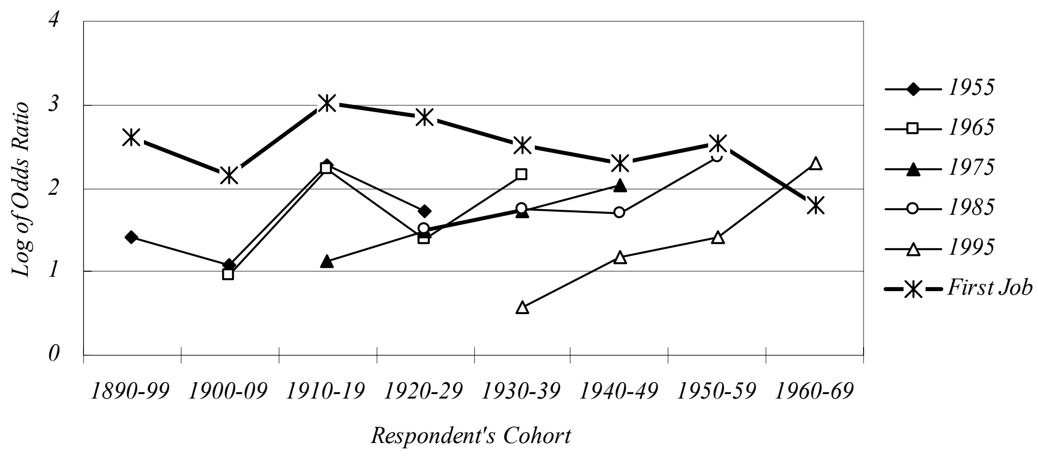

Figure 3.6 Farmer