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研　究　論　文

The age pattern of net migration rate in central Tokyo

– the case of Chiyoda ward

Masato Shimizu

This paper examines the changes in age-specific net migration rates from 1960 to 2001 in Chiyoda ward, Tokyo. The major findings are: 1) Before the mid 1980s, the age profile of net migration rates was characterized by high net in- and out-migration rates for those in their late teens and 20s. During the Bubble Economy and after, the age profile drastically changed. During the *Tosin Kaiki* period, it showed lower absolute values of net migration rates for ages 15-24 and relatively higher net migration rates for a number of older age groups. 2) While the net migration rate for the total population has generally been rising since the late 1980s, the temporal patterns of change in age-specific net migration rate differ from one age group to another. In the 1998-2001 period, the net migration rates rose significantly for those such as ages 15-24 and 40-54. It is suggested that at least from the perspective of age-specific rate, the recovery of net migration in the *Toshin Kaiki* period appears to be different in nature from that in the early and mid 1990s.

Ⅰ. Introduction

In the latter half of the 1990s, the central part of the Tokyo metropolis entered the period of *Toshin Kaiki*, or the “back to the city” movement. As is well known, the core area of Tokyo had long suffered from continuous population decline. After the collapse of the Bubble Economy in the early 1990s, however, net out-migration started to diminish, and, finally in the late 90s, the value of net migration became positive for the majority of the central wards in Tokyo. It is generally recognized that this change has been caused mainly by the revitalization of the housing market in the central wards: As a reaction to the collapse of the Bubble Economy, the price of land and housing had fallen drastically by the mid 1990s, and in the late 1990s, the boom of the large-scale construction of condominiums and apartments started (Tokyo-to 2002, Kokudo Kotsu Sho 2002). These houses are considered to have played a major role in promoting in-migration as well as suppressing out-migration, subsequently realizing population recovery for the first time in almost four decades.

In demographic terms, one of the salient features of the recent migration in central Tokyo is the

change in the age profile of migrants. Previous studies show that the central part of Tokyo had long been an area characterized by the in- and out-migration of young, temporary residents: In the 1950s and the early 60s, a number of teenagers moved in from non-metropolitan areas seeking jobs and education. A large part of those youngsters later returned to their places of origin or moved on to the suburban areas of Tokyo (Kawabe 1961, Watanabe 1978). In the course of time, however, the number of such in-migrants decreased partly because of the general decline in mobility at the national level (see Kawabe 1983), and also because of a decrease in the young population caused by lower fertility in the 1950s and after (see Itoh 1984). This change in in-migration, alongside the continuous out-migration of young, native residents at the time of their independence from their parents (see Kawabe 1983, Okuda 1993), produced long-term population decline in the area. On the other hand, the main actors of the recent *Toshin Kaiki* are those in their 20s to 40s, especially those over 30. For example, a recent questionnaire survey has shown that about 63 % of the respondents (household heads) living in the recently-sold condominiums in the central 8 wards of Tokyo were those in their 30s and 40s (Kokudo Kotsu Sho 2001). An analysis of the census data also reveals that during the 1995-2000 period, net in-migration in the central three wards of Tokyo was produced mostly by those aged 20-44, especially 30-39 (Tokyo-to 2002, Kokudo Kotsu Sho 2002)[1)]. This suggests that the present age structure of migrants differs from that in the 1950s and 60s.

Despite the above observation, however, the actual process of the change in migrants' age pattern has not been sufficiently documented. This is mainly due to the paucity of migration data. But the lack of such information limits our understanding of short-term, as well as long-term, migration trends and population recovery in central Tokyo. As for the shorter-term trend, we do not know whether the change in migrants' age profile occurred suddenly in the late 1990s or it had already started before the *Toshin Kaiki*. In central Tokyo, the recovery of net migration (to be precise, decrease in net out-migration) had already begun around 1992. Nonetheless, it has not been clarified whether the net migration change in the early 1990s and that in the late 90s were, in terms of age profile, two independent phenomena, or homogeneous parts of the decade-long process of population recovery. As for the longer-term change, it is also unclear until when the traditional age profile existed and when the new pattern began to emerge. In effect, we have not obtained enough

1) Some may argue that the elderly have played an important role in the *Toshin Kaiki*. For example, a survey conducted by Haseko Corporation (2001) demonstrates that, among those who bought condominiums in the Tokyo metropolitan areas, the percentage of those aged 60-69 rose from 4.1% in 1997 FY (fiscal year) to 8.0% in the first half of 2001. As is often pointed out, new condominiums in the core Tokyo area are sometimes of super-high standard. Since those who can afford them are likely to be at higher ages, the percentage of the elderly may well become higher in some condominiums. However, the recent *Toshin Kaiki* has been induced, not only by flows into high standard condominiums, but also by migration into other types of housing including public housing (see Yabe 2003). Moreover, since the mobility of the elderly is basically much lower than that of the younger population, the number of elderly migrants would be smaller than those, for example, in their 30s. These would be some reasons why the migration of the elderly has not been counted much in some studies.

data to assess the temporal stability of the past and the present migration patterns by age. To understand the details of the present *Toshin Kaiki* phenomenon, we thus require a more thorough examination of the processes of temporal changes in the age pattern of migration.

The purpose of this paper is to describe the changes in age-specific net-migration rates in the central part of Tokyo. Our main focuses are on the clarification of the characteristics of the *Toshin Kaiki* in comparison to other periods, and on the examination of the process of the age profile changes from the traditional to the present pattern. The indicator we use for the analysis is net migration rate by age, because this is almost the only measure of age-specific migration that can be obtained on a long-term basis. The area of study is Chiyoda ward, one of the three core wards in the Tokyo metropolis. The three core wards (Chiyoda, Chuo and Minato) are often treated as one geographical unit. However, the patterns of *Toshin Kaiki* and the population sizes of these wards are quite different. It is thus better to examine their migration trends ward by ward. As for the period to be examined, we selected the period from 1960 to 2001. This is mainly due to the limitation of data.

The next section overviews the population trend and some background information of Chiyoda ward. Section Ⅲ firstly explains the method to calculate net migration rate and then examines the characteristics of the total and age-specific net-migration rates by using graphs and a simple decomposition method. Section Ⅳ presents some implications of our analysis.

Ⅱ. Population in Chiyoda ward

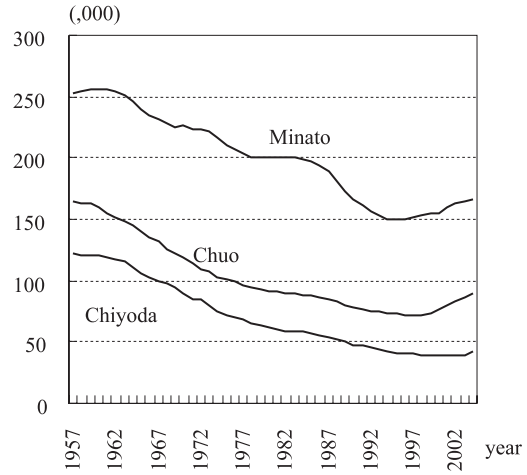
Chiyoda ward is situated in the central part of the 23-ward area (Figure 1). As is suggested by the large numbers of business headquarters and governmental buildings in the eastern and southern parts, this ward has long been the heartland of commercial and administrative activities in Japan. The land use is highly oriented towards business and public use (except for the Imperial Palace in the center). Accordingly, the number of residents is the smallest among the 23 wards. Residents are concentrated in the northern and western parts of the ward. The northern part contains districts with small-scale commercial activities. A number of residents live in buildings which serve as both workplace and residence. The western part, on the other hand, includes residential districts where

Figure 1. Study area

detached houses, condominiums and various issued houses concentrate (Chiyoda-ku 2002a).

As in the other central wards of Tokyo, the population in Chiyoda ward kept declining from the period of High Economic Growth until the beginning of the *Toshin Kaiki*. Figure 2 shows the trend in population change. The magnitude of depopulation was so intense that the number of inhabitants (based on basic resident registers) decreased to less than half between 1960 and 1990 (120,644 in 1960, 48,031 in 1990). The decline from the mid 1960s to the late 1970s and that in the late 1980s appear to be conspicuous. In the mid 1990s, however, the population decline almost ceased. And after hitting the low of 39,297 in 2000, the population started to increase. Compared to the other two central wards, population recovery in Chiyoda started late, and the pace of increase has been slow. According to Figure 2, Minato ward was the first to start recovering its population, and the steepness of population reversal seems to be most acute in Chuo ward. On January 1, 2004, the population of basic resident registers in Chiyoda was 41,676.

Figure 2. Population in the 3 core wards (1957-2004)



population derived from basic resident registers, as of Jan. 1
Source: *Jumin Kihon Daicho ni yoru Tokyo-to no Setai to Jinko*

Ⅲ. Analysis

1. Data

In this study, age-specific net migration is calculated from the data of population and survival ratio by the cohort survival ratio method (forward method). The population is based on the basic resident registers (on January 1, each year)[2]. We calculated survival ratios by using L_x (for the highest age category, T_x) in the life tables compiled every 5 years by the Tokyo metropolitan government. Since there are no life tables compiled for Chiyoda ward, we used those for the 23-ward area. Survival ratios for years without life tables were basically estimated by linear

2) It is generally recognized that population registers have problems in terms of accuracy arising from the tendency of under-registration among young people and the occasional sudden changes in the registered population due to ex-officio entries and deletions by the local government. However, these data are frequently used as the basic data for local administration. Kawabe (1984), who analyzed age-specific net migration rates in the 23-ward area, proclaimed that the level of under-registration would not be so significant as to distort the age-pattern of net migration. Furthermore, the sudden fluctuations of population by ex-officio entries and deletions could be, to a degree, smoothed by the statistical procedures mentioned later.

interpolation. After 2000, we linearly extrapolated the ratios by using the data of 1995 and 2000.

Originally, we calculated the net migration rates for both sexes, for each year, and for every age. In the actual analysis, however, we employed the following procedures. First, we used the three-year moving averages of age-specific populations to calculate net migration rates. The age-specific populations in Chiyoda ward are sometimes so small that some age-specific net migration rates show large annual fluctuations. Because these fluctuations hinder us from properly discerning migration trends, the three-year moving averages of the populations were employed to stabilize the trends[3]. Second, the net migration rates examined in the analysis are basically those for 5-year age groups and for the total of males and females. This is to additionally attenuate the irregular fluctuations of the age-specific rates caused by the smallness of the population[4]. When we need more detailed information, however, we portray the rates for one-year age groups, though rather tentatively. As for the calculation of net migration rates for 5-year age groups, the numbers of net migration for five one-year age groups were added up and divided by the population of corresponding 5-year age groups. Accordingly, the net migration rate for the total population is the sum of the net migration of all one-year age groups divided by the total population[5]. Lastly, the period of examination is from 1960 to 2001. The reason why we start from 1960 is that the life tables for the 23-ward area exist only for 1960 and after. As for the end period, the latest (2002) net migration rate for the total population was strikingly higher than the previous rates, suggesting the possibility of the emergence of a new trend. Since we need future data to properly evaluate the rate in 2002, we stop at 2001 in this paper.

2. Net migration rate for the total population

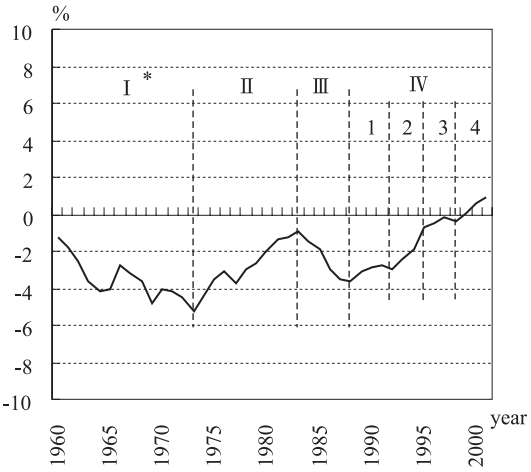
Figure 3 shows the net migration rate for the total population from 1960 to 2001. According to this figure, its trend can be divided into several phases. The first phase is from 1960 to 1973. Despite a few ups and downs, the net migration rate basically declined in this period. The rate

3) Calculating the three-year moving average of net migration rates is another way to stabilize the trend in the rates. Either way, the results are almost the same. In the following section of this paper, we use age-specific populations and net migration rates to decompose a change in net migration rate for the total population. The averaged populations, in addition to net migration rates, are needed for such an analysis. It also seems procedurally better to maintain a more direct relationship between the population and the net migration rate. We thus calculate the moving averages of populations first and then derive net migration rates from those averaged populations.

4) At the municipality level, the five-year average of an event is often used to determine the level of a demographic indicator (e.g. TFR for municipalities by the Health and Welfare Statistics Association). However, since it becomes more difficult to examine an annual change in net migration rate with the 5-year average, we use only the data of three years to calculate the moving average.

5) In this paper, the net migration of "birth to age 0" is excluded from the analysis, because the net migration of this category cannot be properly fit into the decomposition analysis in the later section. It is necessary to keep this point in mind when we compare the results of the present analysis and the official number of net migration published by the Tokyo metropolitan government, which is derived from the difference between the total number of in-migration and out-migration. For all years examined here, the percentage of the absolute number of "birth-to-age 0" net migration is at most 2% of the sum of the absolute number of each age-specific net migration.

Figure 3. Net migration rate in Chiyoda



* See text for explanations of the numbers.

changed from –1.3 % in 1960 to –5.3 % in 1973. The second phase is from 1973 to 1983, when the rate almost continuously rose. The rate recovered back to the level of 1960 and surpassed it at the end of this phase, reaching –1.0 % in 1983. In the third phase, the rate again declined. This trend continued up to 1988, when the rate hit the low of –3.6 %. After 1988, the trend turned basically upward again. To examine the recent trend in detail, we divided the post-1988 period into four more phases. The phase right after 1988 continues from 1988 to 1992 (Phase Ⅳ-1). The net migration rate basically rose, but the change of the rate was rather small. The rate in 1992 was –3.0 %, less than a one percent-point change from that in 1988. After 1992, the rate rapidly recovered (Phase Ⅳ-2). This trend continued up to 1995. In 1995 the rate was –0.7 %, higher than the level of 1983. Phase Ⅳ-3 is from 1995 to 1998. The rate in this period remained relatively stable at just below 0 %. Phase Ⅳ-4 is from 1998 to 2001. During this period, the net migration rate finally surfaced over 0 %. The rate reached 0.9 % in 2001.

From a socio-economic point of view, these trends in net migration rate correspond to the macro-scale socio-economic changes over the last four decades. For instance, the changes in net migration rate during the 1960s and 1970s seem to reflect the general economic situations from the era of High Economic Development, via the first oil shock in 1973, to a period of stable development up to the early 80s. The changes in the late 80s and after seem to be basically related to the Bubble Economy and its collapse. During the Bubble Economy, labor shortage caused by high economic development and the extraordinary rise in land price stimulated the movement of people. After the 'burst' of the Bubble, however, the mobility of people subsided until the time of the *Toshin Kaiki*, when residence change gained momentum again.

It is generally recognized that these large-scale socio-economic changes discussed above have been some of the main factors that have affected migration at the regional and national scales. In the case of migration in Chiyoda, the relationship with those factors would not be the same as in the cases of regional and national migration[6]. However, as the migration trends at the regional and national levels have experienced multiple 'migration turnarounds' (Ishikawa ed. 2001, Inoue 2002),

6) According to the graphs presented by the Statistics Bureau (2002), the pattern of net migration change in the Tokyo metropolitan area is not consistent with that in Chiyoda ward. However, the trends of the 23-ward area and that of Tokyo as a whole are, despite differences in the level of rates, quite similar to that in Chiyoda.

the net migration rate in Chiyoda has also changed its trend at least several times over the last 40 years. This may imply that the pattern of net migration rate in Chiyoda possesses some commonalities with the migration trends at the regional and national scales.

3. Age-specific net migration rate

In this section, we present the changes in age-specific net migration rates in two ways. First, we show the age-specific rates for selected years in an orthodox form of period age-profile, mainly to grasp the general characteristics of age-profile changes. Years chosen are the turning points in the trend of net migration rate discussed above (1973, 1983, 1988, 1992, 1995, 1998), in addition to 1960 and 2001. Second, age-specific net migration rates are presented on an annual basis from 1960 to 2001. This is to examine the change of each rate more thoroughly.

(1) Age-profiles of net migration rate

Figure 4 shows the age-specific net migration rates for 8 years from 1960 to 2001. It is clear from these graphs that the age-profile of net migration rate has drastically changed over the last 40 years. The pattern of change, however, has not been uniform throughout the period. Here we discern the characteristics of each phase by examining the profile change between the first and the last years of each phase. Our major findings can be summarized as follows (see also Table 1).

For the first two phases from 1960 to 1983 (Phases Ⅰ, Ⅱ), the most salient feature was the similarity of the basic forms of age-profiles, despite some differences in the level of rates (Figure 4(a)). In 1960, the age-profile of net migration rate was characterized by three features: high net in-migration rates for ages 10-19 (especially 15-19), high net out-migration rates for ages 20-29, and lower net out-migration rates for older ages. As was already mentioned, the first two features used to be considered typical for the central part of Tokyo. According to Figure 4(a), although the net migration rate for age 10-14 was much lower in 1973, comparatively high net in- and out-migration rates for those aged 15-29 were commonly observed at the following two time points. The major difference in the profiles at those three years was the level of the rates for those under 55. In 1973, age-specific migration rates were lower than in 1960 for almost all age groups up to 50-54. Levels for ages 10-24 and 40-49 were conspicuously lower. In 1983, net migration rates were generally higher than in 1973. The rates for those aged 10-24 were almost back to the level of 1960, and the rates for groups such as ages 5-9 and 25-49 were higher than those in 1960.

Net migration rates in the following Phases Ⅲ and Ⅳ-1 (1983 - 1995) show that since the beginning of the Bubble Economy, their age-profiles have exhibited new characteristics (Figure 4(a)-(b)). First, the most significant feature is the low net migration rate for age 15-19. In 1983, the rate was 10.5 %. In 1988, it was 3.3%. The rate remained basically at that low level both in 1992 and 1995. A part of the above-mentioned features of net migration - high net in-migration rate for the late teens – disappeared. In other words, it may be proclaimed that the basic structure of the age-profile of net migration rate was partly dismantled by the emergence of the Bubble Economy.

Second, changes for the older age groups were also conspicuous. While net migration rate in 1988 was lower than that in 1983 for every age group, the difference was especially salient for, besides age 15-19, those aged 40-54. The lower rates for those aged 55 and over are also to be noted, because the rates for those groups were almost stable in Phases Ⅰ and Ⅱ (Figure 4(a)). These features of the older age groups seem to have been related to various socio-economic changes during the Bubble Economy, including intense land speculation and the consequent out-migration of long-term residents. Third, the timing of the rate change seems to have differed from one age group to another. As far as we compare the profile of each phase, the rates at ages 50 and over seem to have already started to recuperate in the 1988-1992 period. On the other hand, the rates for the 0-9 and 20-49 age groups rose considerably between 1992 and 1995. It is suggested that the net migration recovery after the Bubble Economy did not occur simultaneously for all age groups; it proceeded firstly for older groups and then for younger groups.

After 1995, changes in net migration rate continued for several age groups (Figure 4(c)). In the 1995-98 period, the rate for those aged 10-14 declined while the rate for the 25-29 age group rose. Between 1998 and 2001, the rates for ages 15-24 and 40-54 went up. The rises for the latter middle-aged groups, alongside the small but steady hike in the rate for the 35-39 age group between 1995 and 2001, would be related to the mass

Figure 4. Age profiles of net migration rate in Chiyoda

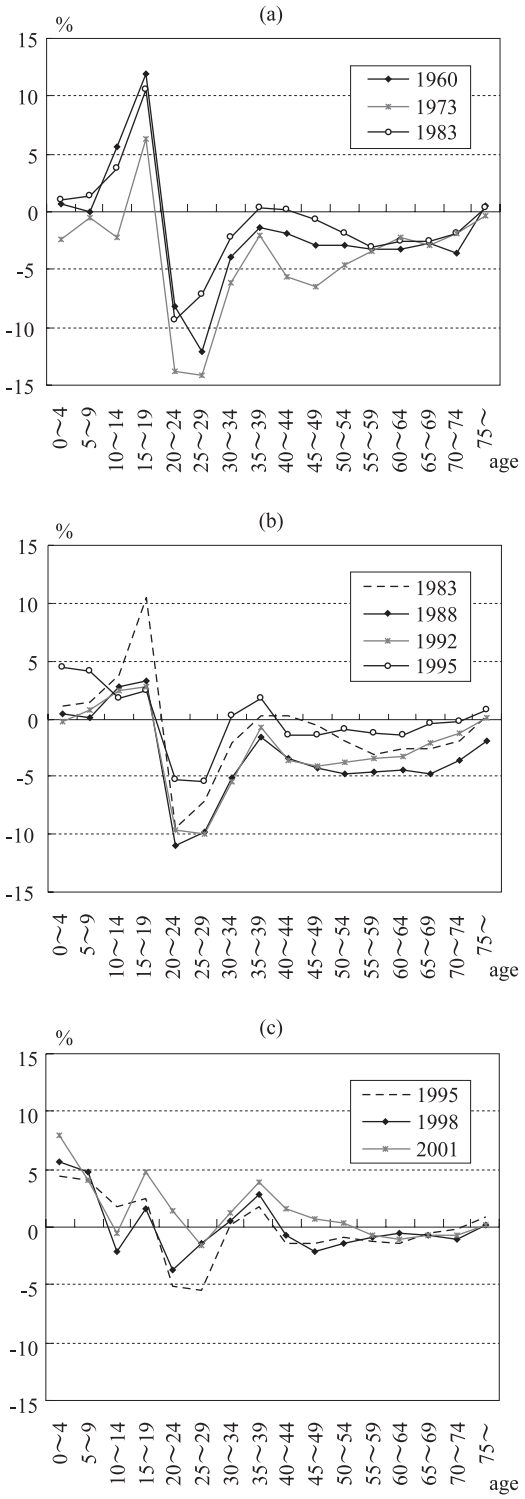


Table 1. Major characteristics of the age-profile of net migration rates

Phase	main features
Ⅰ～Ⅱ ('60-'83)	- high net in-migration rate for 15-19 - high net out-migration rates for 20-29 - generally lower rates in 1973 than in 1960/1983
Ⅲ～Ⅳ-2 ('83-'95)	- decline in net in-migration rate for 15-19 - decline in net migration rates for ages 40+ ('83-'88) - earlier recovery of net migration rates for older groups ('88-)
Ⅳ-3～Ⅳ-4 ('95-'01)	- lower net migration rate for 10-14 - rise in net migration rates for 15-29, 35-54

housing construction in the recent *Toshin Kaiki*. The rises for ages 20-24 and 25-29 led to the disappearance of high net out-migration rates for those age groups, implying a further destruction of the traditional age profile of net migration rate. The recovery of the net migration rate for age 15-19 in 2001 was a new phenomenon, but the rate was still low in comparison to the level before 1983.

When we compare Figures 4(a) and 4(c), it is clear that the age pattern of net migration rate in 2001 was totally different from the one in the past. As far as the above figures show, the major changes in the age profile of net migration rate seem to have concentrated after the mid 1980s.

(2) Trends in age-specific rate

Observing the net migration rates for selected years is sometimes not enough to grasp their actual trends, especially when age-specific rates show large changes in the in-between years. We thus prepared Figure 5 to examine the trends for the entire period (note that the scale of the vertical axis varies from one graph to another). These graphs indicate that the rates for many age groups went through similar changes as that for the total population, especially after the late 1970s. From 1960 to the mid 1970s, however, the trends for some age groups deviated from that of the total population. In the following, we describe some traits of age-specific net migration rates to supplement the description in the former section.

Figure 5(a) shows the trends in net migration rates for ages 0-14. We can point out at least four features. First, the trends for ages 5-9 and 10-14 displayed two large hikes in the mid 1960s and the early 1970s. These surges were also observed for the total population, but less conspicuously. Consequently, the trend of general decline, observed for the total population in Phase Ⅰ, was ambiguous for these two groups. Second, the recovery of net migration rate around 1989 was relatively large for these three age groups. In effect, their net migration rates in 1989 were at similar levels to, or higher than, those in the first half of the 1980s. Third, except for small recovery in 1995, the rate for age 10-14 declined continuously from 1990 to 1999. This was a feature not found for the total population. Fourth, the rate for age 5-9 did not rise in the *Toshin Kaiki* period, implying that this age group did not contribute much to the recent recovery of the overall (=total population's) net migration rate.

As for the rate at age 10-14, one more point needs to be mentioned. As the figure shows, the rate fluctuated quite drastically especially until 1973. To examine these vigorous changes in more details, the rate changes by one-year age groups were presented for selected ages (Figure 6). The

rate for age 14, alongside that for age 15, declined rapidly during the late 1960s and the early 1970s. This would have been caused mainly by an increase in high school enrollment during this period and the consequent decline in job-seeking in-migration from the non-metropolitan areas for these ages (see Kawabe 1984). In fact, some of the decline at these ages seems to have been supplemented by a rise in the rate for age 18, the predominant age of high school graduation (Figure 6(b)). It is thus considered that while the former section indicated the general significance of teenage net migration rates in Phases Ⅰ and Ⅱ, the role that each age played for teenage net migration, especially the roles of those aged 14,15 and 18, significantly changed during Phase Ⅰ.

In regard to the 15-29 age groups, we observed the following features (Figure 5(b)). First, the decline in the 1960s seems to have stopped earlier for all three groups than for the total population. In the case of age 15-19, the low point came in 1969 (5.3 %), and after a small rise, the rate remained relatively stable for the following several years. The rates for the other two age groups show similar trends, although they reached their low points earlier. As indicated in the introduction, one of the main causes of population decline in the central part of Tokyo could have been the decrease in in-migration of those in their late teens. As far as the *rate* is concerned, however, the level of net migration was relatively stable in the early 70s. Second, the rate for age 15-19 declined almost continuously from 1983 (10.5 %) to 1994 (1.0 %). This was quite different from the trend of general recovery for the total population in Phases Ⅳ-1 and Ⅳ-2 (1988-1995). Third, the rates for ages 20-24 and 25-29 rose almost incessantly in the 1990s. Their rates were –10.9 % and –10.6 % in 1990, but –2.1 % and –0.8 % in 1999, respectively. Unlike the case for the total population, there was almost no stagnation in the mid 90s. Fourth, the rate for age 25-29 declined after 1999. Therefore, this age group did not play an important role in the population recovery after 1999.

The characteristics of the trends for ages 30-49 (Figure 5(c)) are as follows. First, the decline in the 1960s and the early 70s was barely observed for ages 30-34 and 40-49, but was non-existent for age 35-39. Second, there were small surges or stagnation in the rates from the late 1980s to the early 90s. This type of change was also observed for the total population, but not for the majority of the age groups. The exceptions were ages 0-14, the generation of children of those in their 30s and 40s. Third, by the mid 1990s, the rates for the 40-49 age groups did not recover to the levels in 1983, the peak in the early 80s. In other words, the degree of their recovery in the mid 1990s was smaller than that for those in their 20s and 30s. Fourth, while the rates remained relatively stable (ages 35-44) or declined (ages 30-34, 45-49) for a few years from the mid 1990s to 1999, they showed basically upward trends after 1999.

Figures 5(d) and 5(e) show the trends for those aged 50 and over. First, as in the case of Figure 5(c), the similarity with the trend for the total population was not clear during the 1960s and the early 70s. A weak tendency of decline might have been observed in the late 1960s for those in their 50s, but the rate for age 60-64 seems to have been rather rising in this period. In the case of ages 70 and over, the annual fluctuation of the rate was quite large especially until 1967. This may have

Figure 5. Age-specific net migration rates in Chiyoda

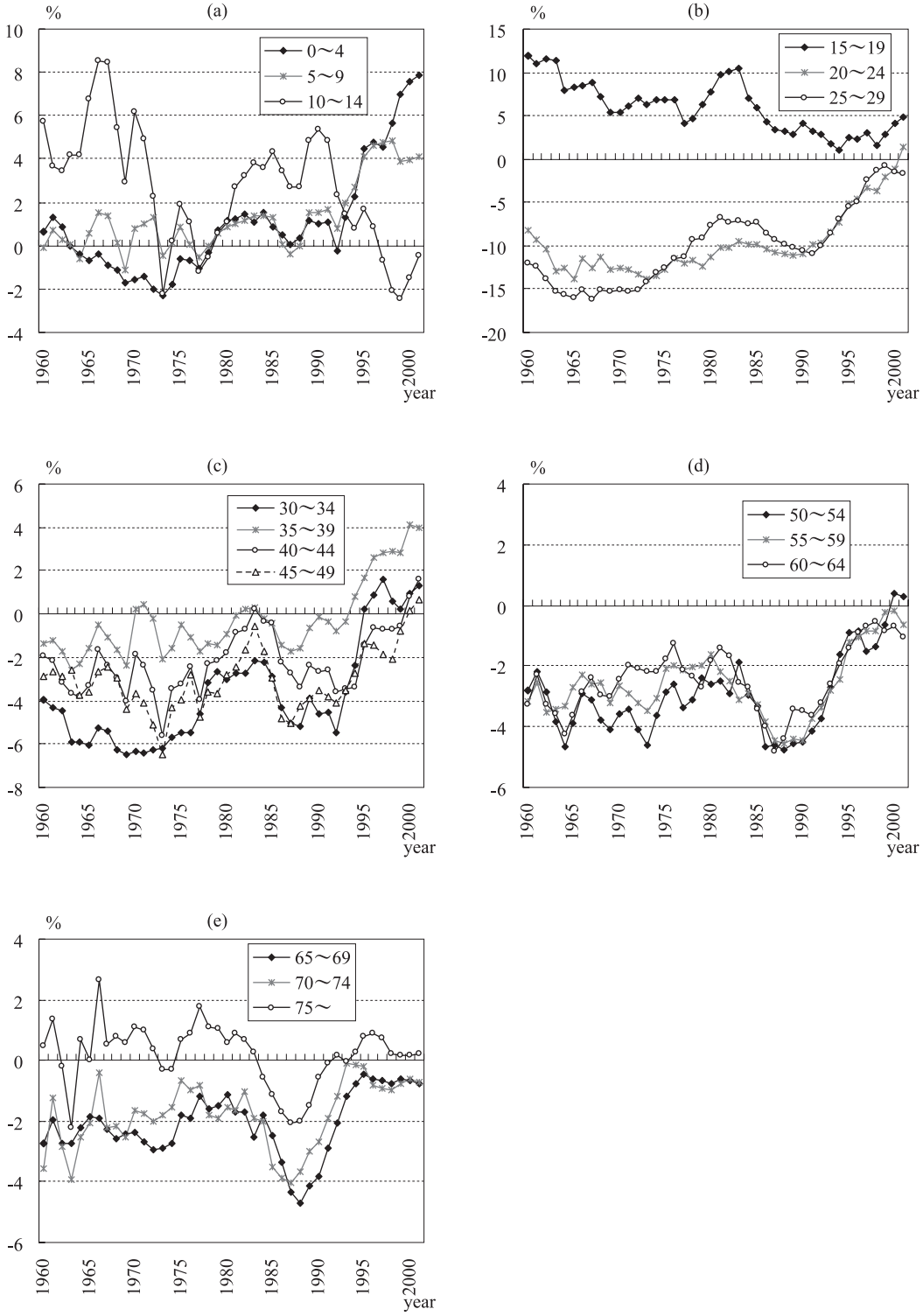
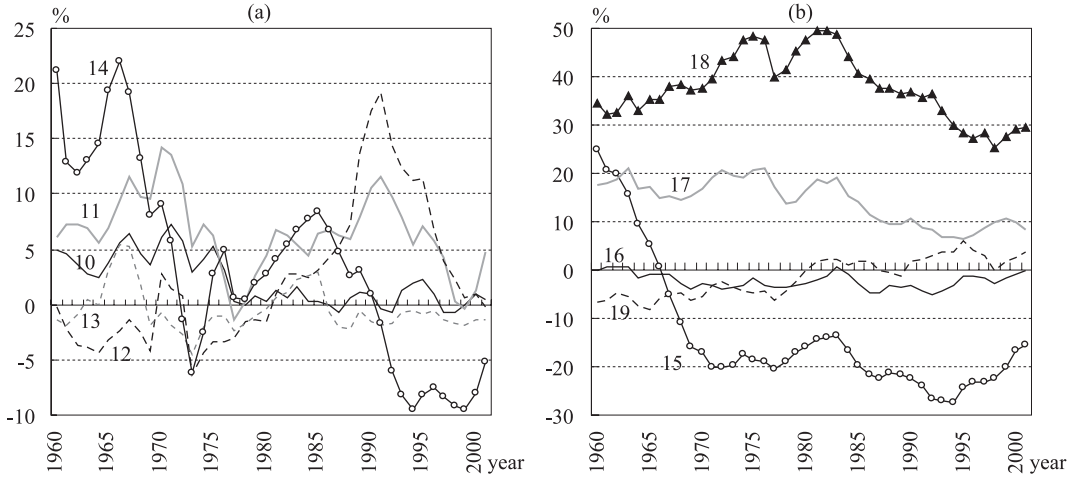


Figure 6. Age-specific net migration rates in Chiyoda: ages 10 -19



been caused by the smallness of the elderly population in the past, and the resultant instability in the estimation of the net migration rate. Second, the timings of the rises after the late 1980s were different from that for the total population. For those aged 50-59, the rises started around 1991. For those aged 65 and over, the rates rose almost continuously from the late 1980s to the early or mid 1990s. Third, after these rises stopped, the rates declined a little and became almost stabilized for those aged 65 and over. This suggests that the changes in net migration rates for these age groups did not contribute much to the *Toshin Kaiki*.

4. Decomposition of the change in net migration rate

In order to summarize quantitatively the characteristics mentioned above, we calculated the contributions of the changes in age-specific net migration rates to the change in the total net migration rate. The contributions were obtained by the following decomposition:

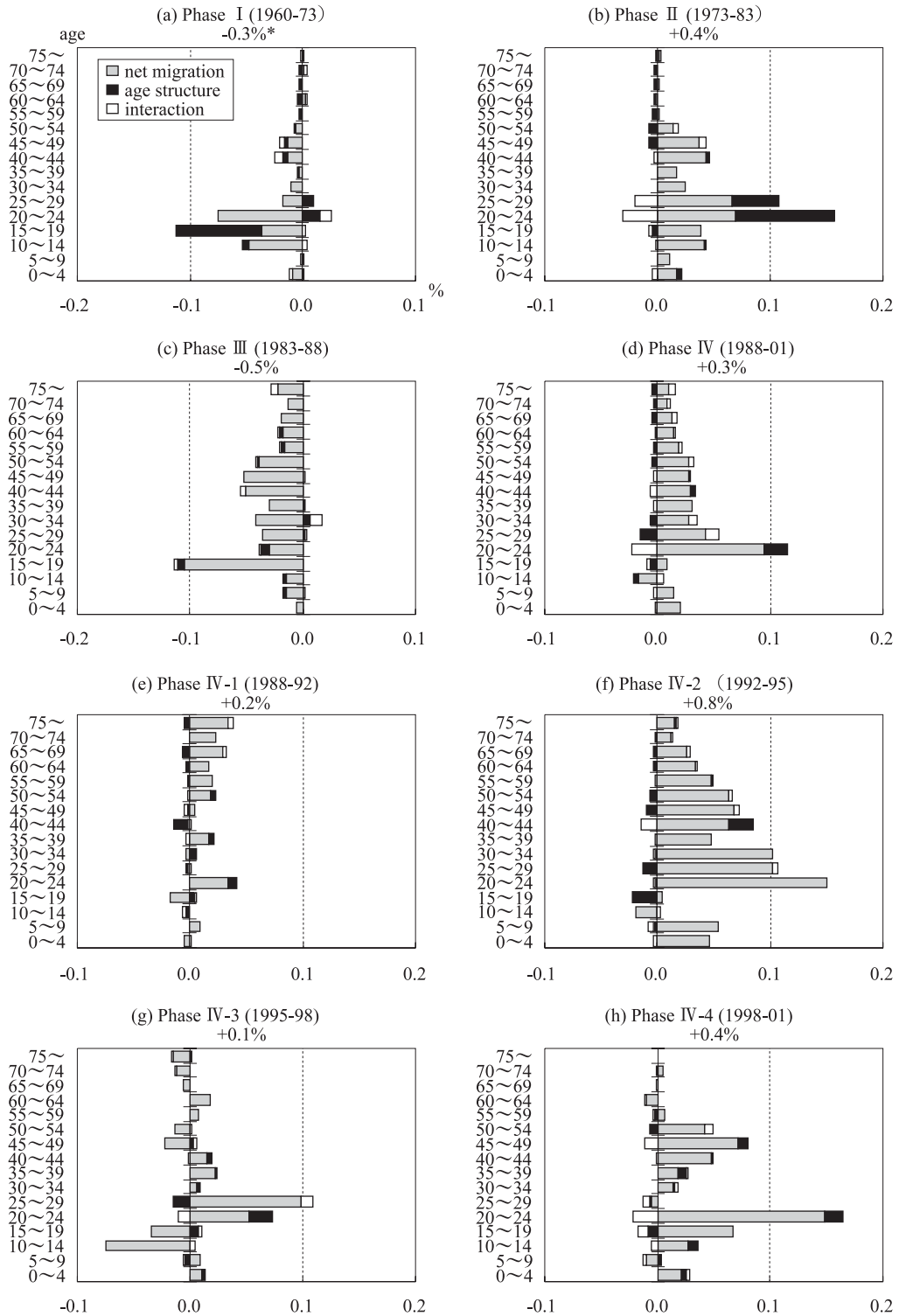
$$
\begin{aligned}
m^{j+n} - m^{j} &= \frac{M^{j+n}}{P^{j+n}} - \frac{M^{j}}{P^{j}} \\
&= \sum_{i} \frac{m^{j+n}{}_{i} \cdot P^{j+n}{}_{i}}{P^{j+n}} - \sum_{i} \frac{m^{j}{}_{i} \cdot P^{j}{}_{i}}{P^{j}} \\
&= \sum_{i} m^{j+n}{}_{i} \cdot p^{j+n}{}_{i} - \sum_{i} m^{j}{}_{i} \cdot p^{j}{}_{i} \\
&= \sum_{i} (m^{j+n}{}_{i} - m^{j}{}_{i}) \cdot p^{j}{}_{i} + \sum_{i} (p^{j+n}{}_{i} - p^{j}{}_{i}) \cdot m^{j}{}_{i} \\
&\quad + \sum_{i} (m^{j+n}{}_{i} - m^{j}{}_{i})(p^{j+n}{}_{i} - p^{j}{}_{i})
\end{aligned}
$$

M^{j+n} : the number of net migration for the total population at year j+n,
P^{j+n} : total population at year j+n,
M^{j+n}_i : the number of net migration for age group i at year j+n,
P^{j+n}_i : population of age group i at year j+n,
m^{j+n} : net migration rate for the total population at year j+n,
m^{j+n}_i : net migration rate for age group i at year j+n,
p^{j+n}_i : the percentage of the population of age group i over the total population at year j+n

The three terms of the fourth expansion express the effect of the change in net migration rate, the effect of the change in the percentage of an age group (i.e., change in age structure), and the effect of interaction between the changes in m and p, respectively. Our main interest has been in the effect of the change in net migration rate, but in consideration of the post-war fertility decline and the subsequent transformation in age structure, we also check whether changes in age structure have affected the change in net migration rate for the total population. Periods examined here are the 7 phases used in section Ⅲ, plus the period of 1988-2001 to see the long-term change after the late 1980s. In the following figures, contribution is expressed not as a percentage of the total change in the rate, but as a real number. Hence the graph indicates the percent point, by which the net migration rate for the total population should have been raised (or lowered) by the changes in m, p and interaction. In addition, contribution is presented on an annual basis for comparing between the phases. We calculated the annual value of contribution by dividing the phase-long contribution by the number of years in each phase (‘n’ in the above equation).

Figure 7 shows the results of decomposition. At least three types of characteristics are observed in these graphs. The first characteristic is on the contributions by the 15-24 age groups: 1) Their total effect (that is, the total of the effects of net migration rate, age structure and their interaction) seem to have a specific relationship with the changes in the overall net migration rate (Figures 7(a)-((d)). Namely, the contribution by age 15-19 was large when the overall net migration rate declined (Phases Ⅰ, Ⅲ), but small when it rose (Phases Ⅱ, Ⅳ). In turn, the contribution by age 20-24 was large when the overall net migration rate went up, and relatively small when it declined. 2) When the total effect is divided into the effects of net migration rate and age structure, different pictures can be drawn. In Phases Ⅰ and Ⅱ, a large part of the total contribution by ages 15-24 stemmed from the change in the percentage of their population (i.e., change in age structure). Differences in the absolute values of the effects of net migration rate were thus small between Phases Ⅰ and Ⅱ. The change in age structure is considered to have been caused by the post-war fertility decline and the consequent decrease in the percentage of youngsters, but it should also have been produced by the change in net migration rate for teenagers, e.g. those aged 10-14. On the other hand, such was not the case in Phases Ⅲ and Ⅳ. The effect of age structure was much smaller in these phases. The effect of net migration rate was thus at a similar level as the total

Figure 7. Contributions to the change in net migration rate for the total population



*change in net migration rate for the total population per year = $(m^{i+n} - m^{i}) / n$

effect. For age 15-19, the absolute value of contribution decreased remarkably from Phase Ⅲ to Ⅳ. In contrast, the contribution by those aged 20-24 increased considerably. This suggests that in the late 80s and after, the changes in net migration rate for these age groups came to have different effects on, or different relationships to, the changes in the overall net migration rate. This observation is in accordance with the changes in the age profiles of net migration rates discussed above.

Second, when we examine the absolute values of contribution for the other age groups, several groups show notable changes between the phases (Figures 7(a)-((d)). Some examples of the effect of net migration rate are: the increases for ages 25-39 from Phase Ⅰ to Ⅱ; the increase for ages 40-49 from Phase Ⅰ to Ⅱ and the decrease for those ages from Phase Ⅲ to Ⅳ; the decrease for age 10-14 from Phase Ⅱ to Ⅲ; the increase for age 0-4 from Phase Ⅲ to Ⅳ; larger values for ages 50+ in Phases Ⅲ and Ⅳ than in Ⅰ and Ⅱ. As for the effect of the change in age structure, the positive effect for age 25-29 was conspicuous in Phase Ⅱ.

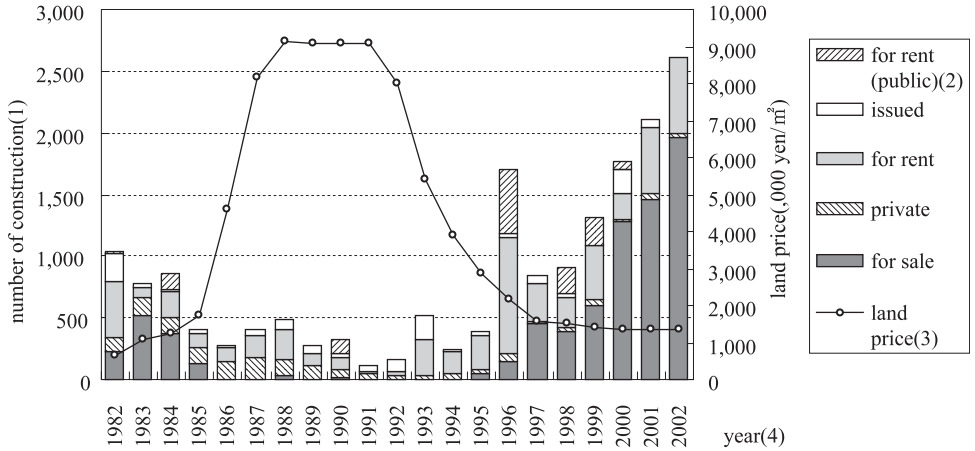
Third, despite the fact that comparably large positive contributions by age 20-24 were commonly observed for the sub phases after 1988, the age patterns of contribution were quite different from one phase to another (Figures 7(e)-((h)). In Phase Ⅳ-1, contributions by those aged 50 and over were dominant. In Phase Ⅳ-2, contributions by those under 49 surpassed those by older groups. Phase Ⅳ-3 was characterized by negative contributions by teenagers and positive contributions by those in their 20s. Phase Ⅳ-4 showed significant contributions by ages 15-24 and 40-54. As far as we judge from the differences between Figure 7(h) and other figures, it seems possible to define the *Toshin Kaiki* as different in nature from the rises in net migration rate in other periods.

Ⅳ. Net migration rate, land price and housing construction

Trends in net migration rate are generally related to various social and economic changes. To supplement the results of the above analysis, this section presents some socio-economic background for the changes in net migration rates. We focus on the period from the Bubble Economy up to the time of *Toshin Kaiki*, and observe the relationships between net migration rate and trends in land price and housing construction (Figure 8, Table 2).

It seems to be widely recognized that the decline in net migration rate in the mid 80s was, to a large extent, related to intense land speculation and the consequent out-migration of (in many cases, long-term) residents (e.g., The Tokyo Institute for Municipal Research 1991, Watanabe 2002). In fact, land price in Chiyoda ward skyrocketed in this period (Figure 8), and, as we observed above, net migration rates for those aged 50 and over rapidly declined, a feature not observed in other periods. As far as the present analysis is concerned, however, the influence of land speculation may not be the only reason for population decline. As was indicated in Figure 7(c), the 15-19 age group gave the largest contribution to the decline in the overall net migration rate in the late 80s. While

Figure 8. The number of new dwelling construction and land price



(1) The number of new dwelling construction started. "New dwelling" is to stand for newly established housing by new construction and reconstruction (except for "for rent(public)").
(2) Increase in the stock of public dwelling for rent. The number is set at 0 when the stock decreases.
(3) Average price of publicized land price (residential land).
(4) Data of calender year except for housing "for rent (public)" (fiscal year) and land price (as of Jan.1).

Table 2. Major characteristics of age-specifc net migration rate, land price and housing construction by Phase

Phase	net migration rate	land price, housing construction
Ⅲ('83-'88)	- decline for 15-19, 50+	- steep rise in land price - deline in housing construction
Ⅳ-1('88-'92)	- recovery for older groups	- levelling-off of land price
Ⅳ-2('92-'95)	- recovery for most groups	- rapid decline in land price
Ⅳ-3('95-'98)	- rise for 20-29	- increase in housing construction(rental→for sale)
Ⅳ-4('98-'01)	- rise for 15-24, 40-54	- drastic increase in housing construction(for sale)

this age group certainly included the family members of older out-migrants, it should have also contained a number of in-migrants from the non-metropolitan areas. It is thus logical to assume that a certain part of the decline in the overall net migration rate might have been caused by a decrease in those in-migrants. The reason for such a decrease could have been a general decline in the long-distance, metro-bound in-migration of youngsters, but it is also possible that teenage in-migrants increasingly selected other parts of Tokyo for their destinations. For the evaluation of the latter possibility, we should examine factors such as the relocation of educational institutions and business establishments.

As for the late 80s and after, the relationships among net migration rate, land price and housing construction varied from phase to phase. In Phase Ⅳ-1, net migration rates recovered for those at higher ages. This tendency corresponds to the leveling-off of the rise in land price at around 1988. In consideration of the fact that the rise in land price (and housing cost) was a likely cause to

promote out-migration in Phase Ⅲ, the change in net migration rate in the following Phase Ⅳ-1 would have been caused by the end of the increase in out-migration, or by the decrease in out-migration especially of the elderly. In fact, the number of new housing construction started in this period remained at a very low level, so it is difficult to imagine a notable increase in new in-migrants.

In Phase Ⅳ-2, the recovery of net migration rate was observed for a wider range of age groups. This recovery seems to have been in accordance with the rapid decline in land price (Figure 8). It is not clear, however, whether this recovery was caused by an increase in in-migration or by a decrease in out-migration. In general, a decline in land price (and housing price or rent) sometimes leads to an increase in in-migration from other areas. But this change could also function to suppress the outflow of potential migrants. It is also notable that the increase in the number of housing construction, which could also function to increase in-migration and decrease out-migration, remained at a low level in this period. Furthermore, that increase in housing construction seems to have been generated largely by the introduction of the "housing linkage system[7]," whose effect on sustaining resident population has been questioned (e.g. Koizumi and Aso 1996, p.481)[8]. Therefore, we cannot easily presume the balance between in-migration and out-migration. But, if we nonetheless focus on in-migrants in this period, we can assume that these people would have been more mobile residents, because the majority of the new houses were rental and issued houses.

In Phase Ⅳ-3, changes in net migration rates were relatively small for the majority of the age groups, but the rates rose steadily for those in their 20s. The number of housing construction basically increased in this phase, including an exceptional increase in 1996. It is possible to assume that the housing construction in this period triggered the rise in net migration for those in their 20s. While the changes in in-migration and out-migration are unknown, those who in-migrated in the earlier part of this period would mostly have been shorter-term residents, since the majority of the newly constructed houses were rental units. In the later part of this phase, the construction of houses for sale (*bunjo-jutaku*) increased. This phase could thus be regarded as a transition period, in which the composition of in-migrants changed from those with shorter-term prospects of settlement to those with longer-term ones.

In the following Phase Ⅳ-4, net migration rates rose for those aged 35-54, especially for those aged 40 and over, as well as for some of their children's generation. The number of housing construction increased to a very high level during this phase. The main part of the housing units

7) This system was set by the Chiyoda ward government in 1992 to promote developers to attach specific number of housing units to large-scale buildings at the time of their construction (Watanabe 2002).

8) Lee et al.(1996, p.474) show that while numbers of districts in the 6 central wards of Tokyo recorded population decline in the 80s, these districts maintained or even increased the floor area of housing. They surmised that, in reality, a considerable part of the newly-provided housing floor could have been used as offices. According to Chiyoda-ku (2002b), the percentage of housing units in which households actually resided was only 61% in 1998.

constructed during this period consisted of houses for sale. The number of housing construction leads us to speculate that these new houses should have brought in the large number of new in-migrants from other areas, especially those aged 35-54, most of whom would have a prospect of longer-term settlement in comparison to the inhabitants of rental houses. These new houses also seem to have functioned to absorb potential out-migrants and suppress their out-migration from Chiyoda, consequently promoting the sustainable longer-term settlement of local residents. One question is the reason for the rises in net migration rates for ages 15-24. Since it is hard to imagine that they could have afforded to purchase their own houses, it seems proper to speculate that the recent construction of rental units is related to the rise in their net migration rates.

Ⅴ. Summary and conclusion

This paper described the changes in age-specific net-migration rates in Chiyoda ward from the 1960s to the time of the *Toshin Kaiki*, and examined the characteristics of the age profiles of net migration rates. Our major findings were as follows: 1) In 1960, the age profile of net migration rate was characterized by high net in- and out-migration rates for those in their teens and 20s. Although the age-specific net migration rates were generally low in the early 70s, the absolute values of net migration rates remained relatively high for those aged 15-24 until the early 1980s. In the period of the Bubble Economy and after, however, the age pattern of net migration rate changed drastically. Compared to the early 80s and before, the age profile in the *Toshin Kaiki* period was characterized by lower absolute net migration rates for ages 15-24 and relatively higher rates for a number of older age groups. 2) As for the recent change, the net migration rate for the total population has generally been rising since the late 80s. But when we look at the age-specific net migration rates, the temporal patterns of change in age-specific net migration rate are different from one age group to another. It is suggested that at least from the perspective of age-specific rate, the recovery of net migration rate in the *Toshin Kaiki* period is different in nature from the recovery in the early and mid 1990s.

In its third basic plan, Chiyoda ward stressed the significance of promoting the settlement of family households (Chiyoda-ku 2002b). Citizens who monitored the government policies of Chiyoda also expressed a number of opinions in favor of creating better living environments for family households (Chiyoda-ku 2003). According to the present study, net in-migration rates for those in their late 30s and 40s, many of whom are in the life stage of family formation, have recently rose. Consequently, the age profile of net migration rate in Chiyoda has come to share some characteristics with that of suburban residential areas, where large numbers of family household reside. It should be recognized, however, that as the recent tendency of late marriage and low fertility suggests, the increase of those in their 30s and 40s may not necessarily be linked to the increase in family households and their longer-settlement. To understand the change in the local

population and its implications in more detail, we would need to re-examine the trends in net migration rates for the middle-aged groups and those for the generation of their children, as well as the relationships between age-specific net migration rates and changes in household structure.

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東京都心地域における純移動率の年齢パターン
― 東京都千代田区の事例

清水　昌人

本研究では，東京都千代田区の年齢別純移動率の変化を，1960年代から近年の都心回帰期まで観察し，純移動率の年齢パターンの特徴を検討した．その結果，以下の点が明らかになった．１）1960年の純移動率の年齢パターンは，10～20歳代における高い転入・転出超過率を特徴としていた．1970年代前半には純移動率も全体的に低下したが，15～24歳の純移動率の絶対値は，1980年代はじめまではおおむね高い値を示していた．しかし，バブル経済期以降，純移動率の年齢パターンは大きく変化した．都心回帰の時期には，15～24歳の純移動率の絶対値は80年代初頭以前よりもかなり低い水準にあり，他方，それより高い年齢層の多くで相対的に高い純移動率が観察されるようになった．２）1980年代後半以降でみれば，総人口の純移動率は，基本的に上昇傾向にある．しかし，年齢別に観察すると，純移動率の変化のパターンは年齢ごとに異なる．1998～2001年の期間では，15～24歳や40～54歳などで純移動率が大きく上昇した．年齢別純移動率の観点からいえば，都心回帰期の純移動率の回復は，1990年代はじめや半ばにおける回復とは異なる特徴をもつといえる．