COMPONENTS OF POPULATION GROWTH IN SEOUL : 1960—1966*

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A total of 2,445,000 persons were counted within the boundary of Seoul at the time of the 1960 Census of Korea. The 1966 Census shows that the number of persons living in Seoul at the time of the census was 3,805,000, indicating an increase of 1,360,000 persons during the intercensal period of 1960—1966. This paper attempts to identify the components of this increase and their relative contributions to the growth of population within the administrative boundary of Seoul for this period.

Theoretically, the size of population in a city for a specified time period can change through an interplay of three basic processes; net balance of in and out-migration (net migration), net balance of births and deaths (natural increase), and boundary changes (annexation). The size of population will rise if the inflow of migration is greater than the outflow, if the number of births exceeds the number of deaths, and if the city expands its boundary and annexes a part of surrounding populated territory. It appears that each one of these components played an important role in making a high population growth rate for Seoul during the 1960—1966 period.

On January 1, 1963, substantial boundary adjustments were made for a large number of provinces and municipalities in Korea. Through this adjustment, Seoul annexed a large part of surrounding areas including parts of Yangju-Kun, Kwangju-Kun, Kimpo-Kun, Sihung-Kun, and Boochon-Kun from the province of Kyungki-Do.[1] It was estimated from the census data that approximately 155,000 persons were living in the areas of annexation at the time of the 1960 Census. This number in the annexed area plus the number of 2,445,000 persons counted in the 1960 boundary make up the total number of 2,600,000 persons living in the adjusted boundary of Seoul

1. *Dong Wha Yearbook, 1968.* Dong Wha Tong Shin, Seoul, Korea, 1969, p. 665.

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as of 1960. The number of added persons through annexation accounts for 11 percent of the total increase of 1,360,000 persons in Seoul during the 1960—1966 period.

Having adjusted the boundary changes, we find that the number of increase within the fixed boundary of Seoul during the intercensal period was 1,205,000 persons. This portion of increase is then entirely attributable to net migration and natural increase. Lacking reliable vital statistics on birth and death for the population of Seoul during the period, we proceed first to find the amount of contribution made by migration for the increase.

There are two possible sources of migration that could have contributed to the increase of population in Seoul. One is international migration and the other is internal migration. Available information on persons leaving and entering the country during the 1960—1966 period indicates that the amount of net international migration for Seoul during the period would have been too small to affect the growth of population of Seoul to any significant extent. Table 1 shows the number of persons who crossed the national boundary of Korea by exit and entry status for the 1960—1966 period. The net balance shows that 29,000 more people left the country than those who entered the country during this period. It would appear that only a small fraction of this net exit is international net migration for the country and the majority constitute the persons traveling for the purpose of trade, study, official affairs, etc. Therefore, we have concentrated in making estimates of net internal migration for Seoul ignoring the negligible effect of international migration for the period.

Table 1. Number of Border Crossers by Exit and Entry Status, Korea, 1960—1966.

Year	Number	
	Entry	Exit
1960	18,402	15,582
1961	17,994	20,846
1962	22,766	25,934
1963	29,406	34,527
1964	39,693	44,811
1965	45,080	50,522
1966	86,349	96,484
Total	259,690	288,706
Difference		
Exit	288,706	
Entry	259,690	
Net Exit	29,016	

Source: *KOREA STATISTICAL YEARBOOK* 1962 and 1967, Economic Planning Board, Republic of Korea.

In making estimates of net migration, I employed the Census Survival Ratio method, since the lack of reliable vital statistics prevented me from using any direct method for computing the net migration. A census survival ratio is simply the ratio of the total population of the country at age x or age group x—x+n at a given census to the corresponding age cohort of the previous census. The age-specific survivors are computed by

multiplying the survival ratio by the provincial or city population in the corresponding age group in the first census. The expected survivors are subtracted from the observed population in the later census for each corresponding age group to make estimates of net migration.

The Census Survival Ratio method has certain built-in mechanisms to make corrections for inadequacies of the age data. However, the method requires certain assumptions and the estimates of net migration will be satisfactory only if these assumptions hold. The assumptions are: "(i) The national population is closed, i.e., entered only by birth and left only by death. (ii) The specific survival ratios are the same for each state (province or city) as for the nation. (iii) The ratio of the degree of enumerated population bears to the true population to that of the nation is the same for the same cohort in both censuses."[2]

As previously indicated, the level of international migration for the 1960—1966 period does not appear to be significant enough to violate the assumption of the closed population in Korea. As for the second assumption, Korea is relatively small in size, and regional variation of life style, level of living, and sanitary condition do not appear to be great. Even though Seoul appears to enjoy many advantages of rapid economic development, the large income gap existing between the rich minority and the poor majority and the adverse conditions of overcrowdedness tend to balance the advantages of the industrial development in the Seoul area. For these reasons, the level of mortality in Seoul does not seem to be much deviant from that of the rest of the country. An examination of age data for the 1960 and 1966 censuses reveals that the enumeration errors appear to be quite consistent for the corresponding age cohorts in the two censuses. Also, the built-in mechanism of the census survival ratio method is supposed to take care of the enumeration errors that might have existed in the 1960 and 1966 censuses if the extent of errors was not great. The Census Survival Ratio method, therefore, would produce a satisfactory estimate of net migration in Korea for the period.

In applying the Census Survival Ratio method, several adjustments had to be made to make the age statistics comparable for the two censuses. In 1960, simply ages were asked and recorded in the census schedule. Ordinarily in Korea, a person is given one

2. The Committee on Internal Migration of the International Union for the Scientific Study of Population, *Measures of Internal Migration and Their Analytical Uses*, Parts I and II, *Internal Migration*, Provisional Text, 1968, p. 109.

year of age at the time of birth. As the calendar year changes, the person gains another year of age. Thus a person born on December 31 becomes two years old the next day. In the 1966 Census, however, date of birth instead of ordinary age was asked, and completed ages were published in the census tables. To make the data comparable, the 1960 age statistics had to be changed to completed ages. The change has been possible by applying the conversion multipliers developed by J.S. Park at the Bureau of Statistics. Comparing the completed ages obtained from the 1960 Post Enumeraiton Survey with the ordinary ages obtained from the main census, Park developed an equation for the age conversion and produced conversion multipliers for each age group. In the following is the list of age-specific conversion multipliers developed by Park.[3]

Age Conversion Multipliers

Age	Male	Female
0—4	1.2571	1.2534
5—9	0.9132	0.9084
10—14	1.0047	1.0007
15—19	0.9848	1.0035
20—24	0.9456	0.9692
25—29	0.9455	0.9669
30—34	0.9642	0.9517
35—39	1.0015	0.9835
40—44	0.9633	0.9525
45—49	0.9768	0.9787
50—54	0.9392	0.9341
55—59	0.9373	0.9711
60—64	0.9341	0.9547
65 and over	0.8750	0.8838

Table 2 presents the ordinary and converted ages of the 1960 Korean population; Table 3 presents the counterparts of population for the 1960 boundary of Seoul.

The next problem is to find a comparable age structure of the 1960 population for that of the 1966 population in the constant boundary of Seoul. Age statistics of the population in the annexed areas of Seoul in 1960 were not made available in the census publications, and age-sex structure for the population was indirectly constructed. A mixed pattern of agricultural and industrial land use of the annexed area leads us to believe that the population in the area would exhibit an age-sex structure of half urban and half rural character. An ideal population representing this mixed character is that of Eup. Eup is an administrative unit supposedly containing a population between 20,000 and 50,000 and normally possessing characteristics of both rural and urban areas in significant proportion. Contending that the characteristics of Eup population would vary significantly from region to region, I applied the age-sex composition of Eup population in Kyungki-Do to the population of the annexed areas of Seoul. Table 4 shows the 1960 population of Seoul by age group and sex in the 1966 fixed boundary.

3. Jae Soo Park, *An Evaluation Study for the Accuracy of the 1960 Population and Housing Census of Korea*, Bureau of Statistics, Economic Planning Board, Seoul, Korea, 1966.

Table 2. Population of Korea by Age Group and Sex before and after Age Conversion, 1960.

Age	Male		Female	
	Before Conversion	After Conversion	Before Conversion	After Conversion
0—4	1,820,312	2,228,314	1,729,252	2,168,309
5—9	1,958,374	1,788,392	1,823,172	1,656,169
10—14	1,480,274	1,487,236	1,341,976	1,342,915
15—19	1,248,791	1,229,809	1,134,363	1,138,333
20—24	1,175,602	1,111,649	1,103,847	1,069,849
25—29	916,751	866,788	996,435	963,453
30—34	729,096	701,066	829,238	789,186
35—39	687,559	688,590	729,178	717,147
40—44	598,867	576,889	588,603	560,644
45—49	518,017	505,999	515,744	504,759
50—54	444,283	417,271	440,293	411,278
55—59	318,745	298,760	345,793	335,800
60—64	257,447	240,481	309,124	295,121
65 and above	384,490	336,429	550,516	486,546
Unknown	7,350	7,350	7,739	7,739
Total	12,543,968	12,545,023	12,445,273	12,447,248

Source: *1960 Population and Housing Census of Korea.* Bureau of Statistics, Economic Planning Board, Seoul, Korea.

Table 3. Population of Seoul by Age Group and Sex before and after Age Conversion, 1960.

Age	Male		Female	
	Before Conversion	After Conversion	Before Conversion	After Conversion
0—4	158,809	199,639	151,118	189,487
5—9	179,912	164,298	168,901	153,430
10—14	124,451	125,036	118,277	118,360
15—19	137,948	135,851	138,724	139,210
20—24	133,956	126,669	128,612	124,651
25—29	98,336	92,977	116,778	112,913
30—34	84,832	81,795	97,145	92,453
35—39	82,462	82,586	79,126	77,820
40—44	71,557	68,931	57,990	55,235
45—49	53,182	51,948	46,679	45,685
50—54	42,471	39,889	36,627	34,213
55—59	22,835	21,403	25,878	25,130
60—64	14,021	13,097	20,421	19,496
65 and over	17,032	14,903	35,641	31,500
Unknown	891	891	790	790
Total	1,222,695	1,219,911	1,222,707	1,220,373

Source: *1960 Population and Housing Census of Korea.* Bureau of Statistics, Economic Planning Board, Seoul, Korea.

Table 4. 1960 Population of Seoul in 1966 Boundary.

Age	Male population in			Female population in		
	1960 boundary	annexed area	1966 boundary	1960 boundary	annexed area	1966 boundary
0—4	199,639	14,811	214,450	189,487	13,773	203,260
5—9	164,296	11,483	175,779	153,430	10,420	163,850
10—14	125,036	8,093	133,129	118,360	6,959	125,319
15—19	135,851	7,765	143,616	139,210	7,352	146,562
20—24	126,669	6,570	133,239	124,651	7,290	131,941
25—29	92,977	5,554	98,531	112,913	6,744	119,657
30—34	81,795	4,703	86,498	92,453	5,168	97,621
35—39	82,586	4,648	87,234	77,820	4,699	82,519
40—44	68,931	4,031	72,962	55,235	3,414	58,649
45—49	51,948	3,304	55,252	45,685	2,999	48,684
50—54	39,889	2,570	42,459	34,213	2,361	36,574
55—59	21,403	1,703	23,106	25,130	1,823	26,953
60—64	13,097	1,211	14,308	19,496	1,461	20,957
65 and over	14,903	1,594	16,497	31,500	2,392	33,892
Unknown	891	62	953	790	54	844
Total	1,219,911	78,102	1,298,013	1,220,373	76,909	1,297,282

Source: See Table 2

Another problem in applying the Census Survival Ratio method is related to constructing age cohorts of 1966 corresponding to those of 1960. The 1960 Census was taken as of December 1, and the 1966 Census was taken as of October 1, leaving an intercensal period of exactly 5 and 5/6 years. The necessary re-grouping of the population for the corresponding age cohort was made by the interpolation method, since the age data in the census were not broken down by months.

After the necessary adjustments were made for the data for the application of the Census Survival Ratio method, we have proceeded to compute census survival ratios and net migration for the intercensal period of 1960—1966. Computations of survival ratios and net migration and their results are presented in Tables 5, 6, 7 and 8.

Table 5. Survival Ratio of male population by age, December 1960 - October 1966.

Dec. 1, 1960		Oct. 1, 1966		
Age	Population (in thousands)	Age	Population (in thousands)	Survival Ratio
0—4	2,288	5 5/6—10 5/6	2,316	1.0122
5—9	1,788	10 5/6—15 5/6	1,746	0.9765
10—14	1,487	15 5/6—20 5/6	1,361	0.9153
15—19	1,230	20 5/6—25 5/6	1,199	0.9748
20—24	1,112	25 5/6—30 5/6	1,104	0.9928
25—29	867	30 5/6—35 5/6	931	1.0738
30—34	701	35 5/6—40 5/6	712	1.0157
35—39	689	40 5/6—45 5/6	656	0.9521
40—44	577	45 5/6—50 5/6	542	0.9393
45—49	506	50 5/6—55 5/6	450	0.8893
50—54	417	55 5/6—60 5/6	359	0.8609
55—59	299	60 5/6—65 5/6	233	0.7793
60 over	577	65 5/6—over	340	0.5910

Source: See Table 2.
1966 Population Census of Korea, Bureau of Statistics, Economic Planning Board, Seoul, Korea.

Table 6. Survival Ratio of female population by age, December 1960 - October 1966.

Dec. 1, 1960		Oct. 1, 1966		
Age	Population (in thousands)	Age	Population (in thousands)	Survival Ratio
0—4	2,168	5 5/6—10 5/6	2,147	0.9903
5—9	1,656	10 5/6—15 5/6	1,633	0.9861
10—14	1,343	15 5/6—20 5/6	1,272	0.9471
15—19	1,138	20 5/6—25 5/6	1,111	0.9763
20—24	1,070	25 5/6—30 5/6	1,103	1.0308
25—29	963	30 5/6—35 5/6	957	0.9938
30—34	789	35 5/6—40 5/6	793	1.0051
35—39	717	40 5/6—45 5/6	672	0.9372
40—44	561	45 5/6—50 5/6	541	0.9643
45—49	505	50 5/6—55 5/6	469	0.9287
50—55	411	55 5/6—60 5/6	400	0.9732
55—59	336	60 5/6—65 5/6	292	0.8690
60 over	782	65 5/6—over	533	0.6816

Source: See Table 2.
1966 Population Census of Korea, Bureau of Statistics, Economic Planning Board, Seoul, Korea.

Table 7. Net Migration for Seoul, Males, 1960—1966.

Age (1960)	Observed Population (1966)	Expected Population (1966)	Difference (Net Migration)
0—4	267,939	217,066	50,873
5—9	208,939	171,648	36,800
10—14	214,266	121,853	92,413
15—19	185,505	139,997	45,508
20—24	180,765	132,280	48,485
25—29	143,776	105,803	37,973
30—34	108,973	87,856	21,117
35—39	96,053	83,055	12,998
40—44	72,580	68,833	4,047
45—49	52,116	49,136	2,980
50—54	36,552	36,553	—1
55—59	18,659	18,007	652
60+	20,258	18,206	2,052
* Total	1,605,890	1,249,993	355,897

* Unknown figures included in total.

Table 8. Net Migration for Seoul, Females, 1960—1966.

Age (1960)	Observed Population (1966)	Expected Population (1966)	Difference (Net Migration)
0—4	250,411	201,288	49,123
5—9	206,849	161,572	45,277
10—14	226,166	118,690	107,476
15—19	195,510	143,088	52,422
20—24	178,416	136,005	42,411
25—29	140,902	118,915	21,987
30—34	111,006	98,119	12,887
35—39	87,111	77,337	9,774
40—44	64,329	56,555	7,774
45—49	52,962	45,213	7,749
50—54	41,599	35,594	6,005
55—59	28,283	23,422	4,861
60+	45,024	37,385	7,639
* Total	1,628,568	1,253,183	375,385

* Unknown figures included in total.

The Census Survival Ratio method cannot give estimates of net migration at ages below 5 and 5/6 years since persons in this age cohort did not exist at the time of the 1960 Census. A separate estimate was made for this age group using the following formula.

$$NM\ (m, o—5\ 5/6) = 1/2 \times \frac{P(m, o—5\ 5/6)}{P(f,\ 20—49)} \times NM(f,\ 20—49)$$

$$NM\ (f, o—5\ 5/6) = 1/2 \times \frac{P(f, o—5\ 5/6)}{P(f,\ 20—49)} \times NM\ (f,\ 20—49)$$

where,

NM (m, o—5 5/6) is the estimate of net migration for males at ages 5 5/6 and below, 1960—1966.

NM (f, o—5 5/6) is the estimate of net migration for females at ages 5 5/6 and below, 1960—1966.

P (m, o—5 5/6) is the observed number of males at ages 5 5/6 and below in 1966.

P (f, o—5 5/6) is the observed number of females at ages 5 5/6 and below in 1966.

P (f, 20—49) is the observed number of females between ages 20—49 in 1966.

NM (f, 20—49) is the number of net migration for females between ages 20—49, 1960—1966.

Applying appropriate figures in the formula, we find;

$$NM\ (m, o—5\ 5/6) = 1/2 \times \frac{288,844}{777,274} \times 147,255$$

$$= 27,354$$

$$NM\ (f, o—5\ 5/6) = 1/2 \times \frac{269,981}{777,274} \times 147,255$$

$$= 25,567$$

That is, the number of net intercensal migration for male children at ages 5 5/6 and below is estimated as 27,000, and that for females is estimated as 26,000. We do not expect that the estimates made here would be very accurate. However, these crude estimates could serve several useful purposes.

Adding these estimates to those earlier estimates of persons at ages above 5 5/6 years, we find that the number of total net migration for male is 383,000 while that for females is 401,000. The total net migration for Seoul during the intercensal period is

then estimated as 784,000. This number constitutes 58 percent of the total increase of 1,360,000 persons in Seoul during the intercensal period.

We subtracted this number of net migration from the total increase of population in Seoul within the 1966 fixed boundary during the intercensal period to estimate the number of increase due to natural increase. The balance of births and deaths is estimated as 421,000 for the period, which constitutes 31 percent of the total increase of population in Seoul during the 1960—1966 intercensal period. It should be noted that the natural increase of 421,000 persons are those in the areas of 1966 boundary. The average annual percentage increase attributable to natural increase for Seoul in the fixed boundary of 1966 during the intercensal period is 2.77, which is slightly lower than the corresponding rate of 2.90 for the country during the same period.

Summing up, the population increase of Seoul for the intercensal period of 1960—1966 is accounted for by three components: annexation, migration, and natural increase. It appears from this analysis that the net migration was the single most important component, contributing 58 percent of the total increase. The excess of births over deaths contributed 31 percent of the increase and the boundary change added 11 percent of the total increase.