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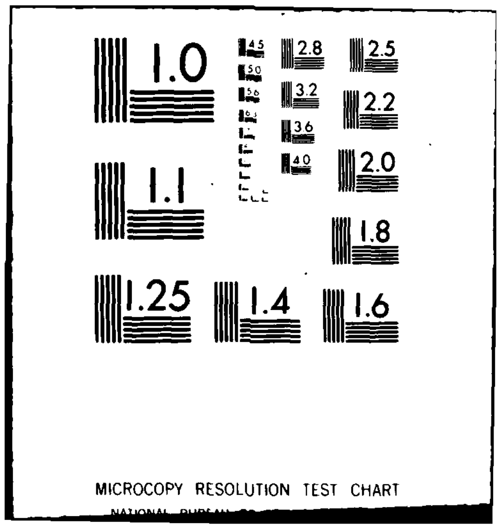
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AN EMPIRICAL ANALYSIS OF THE MOMENTUM OF GROWTH FOR THE 30 LARGEST COUNTRIES

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Paper prepared for presentation at the
Annual Meeting of the Population Association of America,
St. Louis, April 22, 1977

DEPARTMENT OF STATE

February 6, 1980

Mr. Harry Schrecengost
Defense Technical Information
Center
Cameron Station
Alexandria, Va. 22314

Dear Mr. Schrecengost:

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Sincerely,

Edward N. Lundstrom
Research Documentation Officer
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The original purpose of this paper was to examine some of the issues associated with a population which had stopped growing, using an essentially demographic perspective. Very quickly, three things became clear:

1. There are few, if any, statements of concensus on the social and economic benefits of a stationary population. At a recent Council of Europe seminar held in Strasbourg, one argument held that excessive fertility is a menace to living standards. On the other hand, a number of participants viewed the current fertility declines in their countries as marking not the end but the beginning of their population problems.

2. There is evidence that countries which have reached zero population growth are now beginning to actively encourage pro-natalist policies.

3. For the majority of the larger countries of the world, the issue of population stagnation is likely to be a theoretical issue for generations to come. Based on an analysis of 1970 data, 12 of 130 examined had approached replacement level and of those, only 5 actually approximated a zero growth situation.

The ~~major research problem thus seems to be~~ purpose of this paper is to examine the issue of how close to a zero growth situation are countries and what are the major contributing factors in current growth. Norman Ryder (1972: 89) recently stated that "there may be no social question of comparable importance on which we have so little current wisdom as the consequences of transformation from a growing to a stationary age distribution."

An examination of current literature points to the increasing awareness of the importance of population as a variable in Development Plans. For example, in 1973, Stamper conducted an analysis of the Development Plans of 70 countries and found that only about one-third recognized any population issues in their plans. Recently, however, particularly since the World Population Conference in Bucharest, there is evidence that countries are becoming increasingly more aware of population as a critical variable in development plans.

The question of to what extent the growth rate of world population is declining has also recently received prominent attention in the aftermath of the conferences in Stockholm (Environment), Bucharest (Population) and Rome (Food). According to Lester Brown (1976) the rate of growth has dropped from 1.9% in 1970 to 1.64% in 1975. Additional optimistic statements on declining growth rates are found in a publication of the Population Reference Bureau (1975). Ravenholt, Director of the Office of Population, AID, is quoted as stating that a vigorous family planning effort over the next 10 years could bring the world's birth rate below 20 per thousand, and the growth rate below 1 percent by 1985. "If this is accomplished, then the world population total should be less than 5.5 billion by the year 2000" (People, Vol. 3, #2, page 34, 1976).

It has been suggested, however, that these recent estimates are based on a somewhat overoptimistic evaluation of some shaky data, particularly estimates of trends in Chinese fertility and mortality (The Environmental Fund, 1976). Recent estimates of the Chinese crude birth rate (CBR) range between a low of 14 per 1000 (Population Reports, 1976) and a high of 36 per 1000 (Blackwelder, 1976). Considering the

1970 size of the Chinese population, a CBR of 14 and crude death rate (CDR) of 6 would result in an annual increase of 7 million people as compared to a 20 million annual increase calculated on the basis of Blackwelder's estimates. This and numerous other examples can be found, for both large and small countries, to suggest that with the best of all intentions analysis of world population data is often an exercise of faith as much as analysis of factual data.

What is certain, however, is that even with initial successes already achieved in fertility reduction, world population, and the populations of most countries, will increase considerably before leveling off.

I now turn to the issue which has been dealt with in the professional literature but is apparently not yet fully understood -- that is, the issue of the contributing demographic factors to population growth. According to Lester Brown, "The goal of national population policies has shifted in several countries during the seventies from slowing population growth to stabilizing population. Among the governments seeking zero population growth are those of India, China, Mexico and Bangladesh. India and China, the world's two most populous countries, want to halt growth by the year 2000" (Brown, 1976: 28). As we will point out, such a policy, based on fertility reduction, is highly unrealistic unless fertility falls way below replacement level.

In order to illustrate what happens to population growth when a reduction in fertility occurs to replacement level we look at data for France and Mexico. These two countries are chosen because of both their similarities and their differences. In 1970 the French and Mexican populations were almost identical in size, yet they differed remarkably in age composition, age specific fertility rates and life expectancy. Figure 1 presents the age composition as well as the basic demographic parameters of the two populations. The question we pose asks what will happen to the population growth pattern of France and Mexico should both achieve immediate replacement level fertility? Population change due to natural increase is determined by fertility and mortality. But it has been demonstrated that rates of natural increase in populations are determined not only by the underlying level and pattern of fertility and mortality but also by the prevailing age distribution whose shape can either enhance or depress crude rates of birth or death. (See Keyfitz, 1971, Frejka, 1973 and Keyfitz, 1970)

Fertility at the replacement level (a net reproduction rate of 1.00 in conjuction with specific mortality conditions) is often associated with an immediate cessation of growth. There is, however, built into an age structure, a demographic momentum which operates to allow growth to occur for some time after fertility rates reach replacement level. With the net reproduction rate (and Lotka intrinsic rate of natural increase) demographers have sought to eliminate the undermining effects of age composition, in order to measure the consequences of the continuation of given intrinsic conditions of fertility and mortality on the growth of populations. (See Espanshade, 1975 and Preston, 1970).

Figures 2 and 3 demonstrate various aspects of this process for both France and Mexico, based on the following procedures. The NRR (net reproduction rate) for both countries is assumed to be 1.00 for both countries. The simulation procedure retained the 1970 age specific fertility pattern and adjusted the level of fertility (through the Total Fertility Rate) at a rate which resulted in a NRR of 1.00. For France, this TFR was 2.11 and for Mexico, this was 2.28. Mortality conditions were retained at their 1970 levels. Based on these two assumptions, a population projection program was used to project each population forward. This essentially resulted in setting the 1970 fertility conditions at replacement level and any future population growth (in a closed society) was thus attributable to the impact of the age structure.

Figure 2 demonstrates the trend in CBR and CDR's for France and Mexico over a 100 year period. We note that the gap between births and deaths narrows and approaches zero for France and Mexico about the year 2030. A partial explanation for the continuing growth can be seen in Figure 3 where the number of women aged 20-24 is projected as an example of the momentum. We note that despite the fact that the Total Fertility Rates remain constant, the number of births and the CBR continues to increase for some time. Summing over all childbearing cohorts, one can thus illustrate how the changing age structure, with constant age specific fertility rates, contributes to the growth of population.

Figure 4 demonstrates that for France, with its age composition of 1970, the percent increase is 19 percent, which indicates that if mortality and fertility were to be at replacement level there would nevertheless result, before zero growth was achieved, a transitional population growth of 19 percent. The population increase for Mexico would amount to 72 percent over the 1970 total. Should replacement level be achieved by 1985, the Mexican population would become stationary at about 116 million

(135% over 1970) and the French at about 65 million (30% over 1970). The population total for replacement level achieved in the year 2000 would be about 156 million for Mexico (212% over 1970) and about 71 million for France (42% over 1970).

The data for France and Mexico have illustrated the point that achieving replacement level fertility is but the first step in the direction of a zero growth situation, or a stagnant population. Comparison of the French and Mexican data also showed that the eventual size of the zero state is highly dependent on the initial age structure. If we now extend the analysis of the momentum of growth to additional countries, we can obtain a measure of minimum population growth for a country and can examine the likelihood of population stagnation in the near future. Table 1 presents a summary tabulation of the demographic momentum for 126 countries by selected world regions. We see that 81, or two-thirds, of countries would grow by at least 50%, almost all of these being in Asia, Latin America and Africa.

In order to display individual country data and still keep the analysis manageable, it was decided to deal only with the world's largest countries. A later stage of the current project will include all countries for which data is available. The following analysis thus includes only the 30 countries with 1970 population totals of 20 million or larger. Together these 30 countries represent over four-fifths of the estimated world population total in 1970. A list of the countries, their 1970 population and a number of demographic characteristics are presented in Table 2.

Age Composition Differentials

Before examining momentum of growth the first important issue to deal with is the extent to which countries differ in age composition and to determine the extent to which each country's age structure differs from that of a hypothetical stationary age structure (a hypothetical country named STAT). For current purposes a stationary population based on a life expectancy at birth of 70 and a Total Fertility Rate of 2.1 (with age specific fertility rate similar to the U.S. schedule) was used.

Table 3 is an index of dissimilarity matrix where each cell in the matrix represents a measure of the dissimilarity of a particular country's age structure from that of another country. This matrix is based on the data in Appendix A. The index of dissimilarity is a measure which is a function of a geometrical construct, the segregation curve. (Duncan and Duncan, 1955: 210-217). The index measures differences in the distribution of two age structures, and is computed as half of the sum of the absolute value of the differences between two percentage distributions. Thus we note that the index of dissimilarity between France and Mexico is 24.8. This implies that 25% of the populations of either France or Mexico would have to be redistributed amongst the age cohorts for the age compositions to be similar. We see that the France - Italy index is 3.4, reflecting a highly similar structure. On the other hand, the United Kingdom - Philippines index is 28.0, reflecting a high degree of age dissimilarity of these two populations.

There are 465 indices in Table 3, and the possible number of paired comparisons for the index of dissimilarity matrix is 107,880. In order to determine the interrelationship of age distribution patterns for all countries simultaneously a technique was used which allows for analysis of the underlying structure of the matrix in graphic form. This is the Guttman-Lingoes Smallest Space Analysis (SSA-I), which is a technique for viewing the structure of a matrix of relationships between variables: correlations, indices of dissimilarity, or any other such measure. SSA-I "enables one to determine the smallest Euclidean space in which one may adequately portray graphically the interrelationships of a set of points ... whose proximity is a function of the degree to which two points are found together relative to n other points." (Laumann, 1969: 188)

The technique provides a metric representation of nonmetric information, based on the relative distance between a set of points. Each variable is represented by a point in a Euclidean space of two or more dimensions. The points are plotted in the smallest space possible that will preserve the rank order of the relations. When the correlation between the variables i and j is higher than between the variables k and l, then the distance d will be smaller between i and j than between k and l. (Guttman, 1968, Lingoes, 1972). The smallest space analysis space diagram thus represents the index of dissimilarity matrix data in graphic form, where the closer together countries are on the diagram, the greater the similarity in their age distribution relative to all the other paired comparisons. The space diagram is a graphic representation of the index of dissimilarity matrix for the 30 countries plus STAT.

By examining the Space Diagram, we see that the Stationary Population is on the left hand extreme of the diagram and that the Philippines is on the right hand extreme. As one moves from left to right, the index of dissimilarity of each country with Stationary increases, implying an increasing difference between that country's age structure and the age structure of the stationary state population. (See Table 4, Column 1 for the index of dissimilarity of each country with the Stationary Population).

It was also possible to prepare an index of dissimilarity matrix for differentials based on the STABLE population age structures of the 30 countries. This was done by using the projection program with the 1970 demographic parameters to simulate a STABLE population. Table 4, Column 2, presents the index of dissimilarity of each country's simulated STABLE age structure with STAT, the STATIONARY population. We see that the majority of the 1970 age structures (24 of the 30) are within 5% of their STABLE age structure. The exceptions are USA (8%), USSR (9%), Canada (11%), Yugoslavia (10%), Poland (11%) and Japan (13%). This suggests that quasi-stable population theory is highly relevant for the majority of the largest countries.

The SSA space diagram suggests that of the largest countries there is a clear distinction between the age structures of the developed world and the developing world, with China (the world's largest population and a country of considerable mystery) separating the two groups of countries. The index of dissimilarity of all countries to the left of China in the space diagram differ between 5% (United Kingdom) and 15% (Canada) from the STATIONARY structure. To the right of China, the range is between 25% (South Africa) and 32% (Philippines) from the STATIONARY structure. Now if we superimpose the population growth attributable to the age structure (See Table 4, Column 3) onto the space diagram, we see that for the developed country group the percent population increase over 1970 ranges between 14% (United Kingdom) and 42% Canada. The range for the developing countries is between 44% (South Africa) and 72% (Mexico). The aggregate percent growth attributable to age structure for the 30 countries combined is estimated at 45%, that for the 12 developed countries is 27% and for the 17 developing countries (excluding China) the increase is 59%. It is apparent that the more dissimilar a country's age composition is to the stationary structure, the greater the eventual increase in population. For example, the zero order correlation coefficient between the index of dissimilarity with STAT (Table 4, Column 1) and the percent increase due to the age structure (Table 4, Column 3) is .96 with an r^2 of .92.

The data on population growth attributable to age structure demonstrate the power of population momentum and the degree to which most developing countries are already virtually assured of major population increases, whatever happens to fertility levels. For comparative purposes, data are presented for the eventual increase in population should replacement level be achieved in 1985 (Table 4, Column 4) and in the year 2000 (Table 4, Column 5). This combines growth due to age structure and fertility, and the reduction is linear between 1970 and 1985 or 2000. We note that for 5 countries (USA, USSR, Japan, Italy and Poland) the year in which stationarity is achieved makes very little difference to the eventual percentage increase in population. On the other hand, for some countries, notably Columbia, Mexico, Philippines, Thailand and Iran, delays of 15 or 30 years in reaching replacement level make substantial differences in the eventual estimated populations.

The above analysis has pointed out that there is a considerable variation in the shape of the age structure of the world's largest countries. We have also demonstrated that even with immediate reduction of fertility to replacement level, there is the prospect of considerable growth. Table 4 has, in addition, shown the estimated increase if replacement level is delayed for 15 or 30 years. The final section of this paper looks at some aspects of the demographic changes which would occur as a result of immediate replacement level fertility.

Once again, we look at two countries, France and Mexico, the first being representative of developed countries and the second representative of the world's developing countries. One of the major issues in discussion of the impact of declining fertility on social structure is the changing proportion of the population in three major age categories: children under 15, the population aged 15 to 64 and the population 65 years and older. First, what happens to the absolute size of these three groups and to their relative proportions should replacement fertility be achieved immediately (the initial 1970 point)? A number of points can be made from the data in Table 5 as illustrated in Figure 5.

Children:

In 1970, almost one-half of the Mexican population was under age 15 while the similar proportion in France was one-quarter. As we see from Figure 5, rapid fertility reduction in high fertility developing countries would result in immediate declines in the proportion of children, but after the initial decline and a slight cyclical increase the proportion of children under 15 would level off at between 20% and 25% of the population. This proportion is slightly below the levels which are found in most developed countries in 1970. The immediate short term effects of drastic reductions in fertility for high fertility countries are seen as reduction in both the absolute number and proportion of children, accompanied in the long run by a leveling off, first of the absolute numbers and, later, of the proportion of the population, this proportion being inthe 20 to 25 percent range. For countries with relatively low fertility over the past few decades (such as France) we see from Figure 5 that replacement level fertility leads to very little change in absolute numbers and slightly reduces the proportion of children in the population.

The Potential Labor Force (15-64):

We see from Table 5 (illustrated in Figure 5) that immediate fertility reductions in high fertility countries are accompanied by two demographic consequences. First, the population aged 15-64 continues to increase, both absolutely and as a proportion of the total population. Thus, not only is there a possibility for more women to enter the labor force (as fertility declines) but as we see, the actual labor force continues to grow. In Mexico (and most other developing countries with high fertility), the percent of population in the 15-64 age group could increase by up to 20% before leveling off at about 65% of the total population. Second, a decline in the dependency ratio accompanies the age shifts, with obvious consequences for economic activity and capital expenditure. An examination of what happens to the French population aged 15-64 shows that little change would occur in the proportion, despite a small absolute increase in the size of the 15-64 group.

The Elderly Population (65 and above):

The data in Table 5 (and Figure 5) point to an increasing proportion of the population of Mexico in the 65+ age category. This is the oft-spoken about aging process of a country attributable mainly to reductions in fertility rather than changes in health conditions and mortality rates.

Figure 5 is not intended to be a new contribution to demographers' knowledge, but rather to illustrate the path of changing age structures for both developing and developed countries. Moreover, it indicates the character of the age distribution of a stagnant population, which for current high fertility countries manifests a dramatic shift.

The above analysis has pointed to some demographic consequences of fertility decline. Despite the rather poor record which demographers have had in predicting future population growth, they are able to make fairly accurate estimates of the character of a stationary (or stagnant) population. Even where mortality rates vary considerably, the age structures of countries are highly predictable. The data presented in this paper has focused on the momentum of growth with immediate reduction in fertility. As we observed in Figure 3, this can cause sharp short term changes in the growth or decline of specific age groups. In reality, however, most of the larger countries are not likely to undergo such a dramatic short-run change in fertility reduction. This suggests that specific age groups are likely to undergo less traumatic variations from year to year as they move toward a stationary population situation.

What are the socio-economic consequences of demographic change? As this paper has pointed out, few countries are currently experiencing a zero growth situation, and of those that have, preliminary indications are that there is no consistent response to the demographic reality. For the majority of the world's largest countries, the issue of a stagnant population is, due to demographic inertia, some generations away.

With regard to the stagnation thesis of zero growth, it is difficult as yet to evaluate the impact for there is very little evidence available. Ryder, in an article on zero population growth, suggests that "demographic characteristics are probably of relatively small importance as determinants of the development of capital equipment, employment levels, and the pace of social change, and therefore of the economic efficiency of a society". (Ryder, 1973: 53) The overall impression given in the Ryder article and in other articles included in a volume on "The No Growth Society" is that once we understand the operation of the momentum of growth and the projective changes in sub-populations within a society, the solutions that seem plausible, effective and acceptable are nondemographic in character. The demographer may point out that a stationary population involves an aging work force. The economic institutions, however, have many options available to deal with this situation. Another example: It has been suggested that the recent rising crime rate in the U.S. is attributable to the increasing proportion of teenagers in the Baby Boom generation. It is also suggested that crime rates will decline in the future. The question to ask is whether similar problems are likely to occur with increased proportions of teenagers attributable to declining fertility in a high fertility country (momentum rather than boom).

Responses to demographic change as well as responses to a zero growth society would appear to rest not on the demographic characteristics themselves but on the social structural environment. Any attempt to evaluate a stationary population as leading to a loss of social dynamics or contributing to a sense of "dullness", or attempts to examine the relationship of zero population growth to zero economic growth, currently tend to be based on speculation, political philosophy or personal preference. No convincing statements on social and economic problems directly related to the demographic conditions of a stationary population seem to be currently available.

In conclusion, I would like to suggest that in the forseeable future it seems more expedient for population policy to focus primarily on the question of population reduction while at the same time taking a secondary interest in the eventual end result--a slow growth or no growth population.

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Tables and Figures for

AN EMPIRICAL ANALYSIS OF THE MOMENTUM OF GROWTH FOR THE 30 LARGEST COUNTRIES

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University of Illinois, Urbana

Paper prepared for presentation at the
Annual Meeting of the Population Association of America
St. Louis, April 22, 1977

TABLE 1

Momentum of Growth for 126 Countries

Percent increase for a country based on the assumption that Replacement Level fertility is achieved in 1970, by Region

Region	less than 19	20-29	30-39	40-49	50-59	60-69	70-79	Total %	Total N
Europe and N. America	31	31	18	14	7	0	0	100*	22
Asia	0	3	6	24	36	21	9	100	35
Latin America	0	7	0	7	26	44	15	100	29
Africa	0	0	5	23	45	28	0	100	40
Total (%)	5.5	7.9	6.3	18.4	31.7	24.7	5.5	100	
Total (N)	7	10	8	23	40	31	7		126

* May not sum to 100 due to rounding.

TABLE 2

Thirty Countries with 1970 Populations of 20 Million or Greater

	Population (in millions)	1970 Population Data TFR	LE	CBR	CDR	NRR
U.S.A.	205	2.30	70.8	17.6	10.0	1.09
USSR	243	2.43	70.1	17.9	8.5	1.14
Canada	21	2.34	72.1	17.9	7.7	1.12
France	50	2.83	71.3	20.1	10.6	1.34
Italy	54	2.41	70.9	16.4	10.8	1.14
Spain	34	2.82	70.9	19.5	8.5	1.29
Yugoslavia	20	2.35	67.0	18.6	9.5	1.07
Poland	33	2.20	70.4	17.5	8.6	1.03
Romania	20	2.88	68.6	21.4	9.9	1.33
United Kingdom	56	2.72	71.1	18.3	11.0	1.28
Brazil	93	5.23	62.7	37.3	8.6	2.27
Colombia	21	6.60	59.8	45.4	9.7	2.76
Mexico	50	6.11	63.5	42.6	7.7	2.68
Argentina	24	2.88	67.7	21.7	9.6	1.32
Burma	28	6.19	42.2	43.7	21.7	1.92
Indonesia	121	6.46	46.5	46.9	18.2	2.18
Philippines	37	6.74	57.9	44.8	10.5	2.75
Thailand	36	6.56	60.5	42.5	9.3	2.77
Bangladesh	74	6.73	45.9	48.9	19.1	2.24
India	537	5.30	50.3	40.9	14.6	1.92
Pakistan	59	7.33	49.8	47.5	16.6	2.63
Turkey	35	5.91	56.2	40.9	12.7	2.35
China	772	3.99	60.5	29.6	10.9	1.68
Japan	104	2.13	70.3	19.0	7.4	1.00
South Korea	32	4.76	59.1	32.2	9.8	1.98
Ethiopia	25	6.11	40.0	45.4	23.7	1.76
Nigeria	55	6.62	39.8	50.8	23.9	1.90
Egypt	33	6.12	43.7	44.2	15.0	2.26
South Africa	22	5.95	51.9	41.3	15.3	2.16
Iran	29	6.88	51.6	46.8	15.3	2.55

Data: Compiled by the Population Dynamics Group, University of Illinois, based on data from the US Census Bureau and U.N. publications.

TABLE 3

Index of Dissimilarity Matrix for the Age Composition of
30 Countries and a Stationary Population (STAT)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1. USSR	-																														
2. Canada	8	-																													
3. USA	7	4	-																												
4. France	9	9	8	-																											
5. Italy	9	10	8	3	-																										
6. Spain	7	6	5	5	5	-																									
7. Yugoslavia	5	7	7	9	8	5	-																								
8. Poland	5	7	6	7	7	6	5	-																							
9. Romania	6	9	9	7	7	5	5	6	-																						
10. United Kingdom	12	11	8	4	4	7	11	10	10	-																					
11. Egypt	19	13	17	22	23	19	17	17	20	24	-																				
12. South Africa	16	11	14	19	20	16	14	15	17	21	3	-																			
13. Turkey	16	11	15	19	20	17	15	15	18	21	4	4	-																		
14. China	10	6	10	14	15	11	10	10	13	16	8	6	7	-																	
15. Japan	8	9	11	10	10	8	6	9	8	12	20	17	19	12	-																
16. South Korea	18	13	16	21	22	19	17	17	20	23	3	4	4	8	20	-															
17. Burma	17	11	15	20	21	17	15	15	18	22	3	1	4	7	18	4	-														
18. Indonesia	21	15	19	24	25	21	19	19	23	26	2	5	5	10	22	4	4	-													
19. Philippines	23	17	21	26	27	23	21	22	25	28	5	7	7	13	24	6	7	2	-												
20. Thailand	20	16	19	24	25	21	19	19	22	25	3	6	5	11	23	4	5	2	3	-											
21. Bangladesh	21	15	19	24	25	21	19	20	23	26	3	6	5	11	23	4	5	2	2	2	-										
22. India	22	16	20	25	26	22	20	20	23	27	3	6	6	11	22	5	5	2	3	2	2	-									
23. Iran	21	15	19	24	26	22	20	20	23	26	4	7	6	11	23	5	6	3	3	2	2	3	-								
24. Pakistan	20	14	18	23	24	20	18	19	22	25	3	5	4	10	22	4	4	2	3	2	1	3	2	-							
25. Brazil	18	12	16	21	22	18	17	16	20	23	2	3	4	7	19	3	2	3	6	4	4	4	5	4	-						
26. Columbia	22	16	20	25	26	22	21	21	24	27	4	7	6	12	24	4	6	3	3	2	2	3	2	3	5	-					
27. Mexico	22	16	20	25	26	22	20	20	24	27	4	7	6	12	24	4	6	3	2	2	2	2	2	2	5	2	-				
28. Argentina	6	4	5	7	7	3	4	6	6	9	16	13	14	8	7	16	14	18	21	19	19	19	20	18	15	20	20	-			
29. Ethiopia	17	12	16	21	22	18	16	16	19	23	2	2	5	7	18	4	1	4	6	5	4	4	5	4	3	6	5	15	-		
30. Nigeria	21	16	20	25	26	22	20	20	23	27	3	6	6	11	22	5	5	1	2	3	2	1	4	3	4	3	3	19	4	-	
31. STAT	14	15	12	7	6	9	14	12	11	5	28	25	26	20	14	27	26	30	32	30	30	30	31	29	27	31	30	12	26	30	-

TABLE 4

Index of Dissimilarity and Percent Growth
to Stationary Population, for 30 Countries

	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5
	Index of Dissimilarity		Percent Growth to Stationary with NRR=1 in:		
	1970/STAT	STABLE/STAT	1970	1985	2000
U.S.A.	11.6	3.7	32	34	38
USSR	13.9	4.6	29	28	33
Canada	14.8	3.5	42	48	52
France	7.2	9.9	19	30	42
Italy	6.3	4.3	15	17	22
Spain	9.4	7.0	26	38	47
Yugoslavia	13.7	3.7	30	35	40
Poland	12.4	1.1	33	27	27
Romania	10.8	10.9	23	40	55
United Kingdom	5.2	8.8	14	20	29
Brazil	26.6	27.1	58	95	146
Colombia	31.1	33.3	67	138	224
Mexico	30.8	32.0	72	132	212
Argentina	11.8	10.6	29	46	54
Burma	25.6	28.1	46	57	89
Indonesia	29.8	31.1	55	105	157
Philippines	32.1	32.6	63	127	203
Thailand	29.6	32.6	58	117	189
Bangladesh	30.0	33.1	61	99	155
India	30.5	27.6	63	101	145
Pakistan	28.8	33.2	47	95	156
Turkey	25.5	30.2	52	94	149
China	19.7	19.6	41	65	90
Japan	14.2	1.0	28	25	26
South Korea	27.2	23.5	53	81	119
Ethiopia	26.4	27.8	45	76	108
Nigeria	30.3	31.0	60	95	138
Egypt	27.5	30.7	54	94	148
South Africa	24.7	26.6	44	73	114
Iran	30.6	33.3	59	114	186

TABLE 5

Percentage Age Distribution: Mexico and France from 1970 to 2070; based on assumption that Replacement Level fertility is achieved in 1970

	MEXICO			FRANCE		
	Percent Age Distribution			Percent Age Distribution		
Year	Up to 14	15-64	65+	Up to 14	15-64	65+
1970	46.3	50.8	2.9	24.6	63.3	12.0
1975	39.0	57.7	3.4	24.1	62.9	13.0
1980	31.8	64.5	3.7	23.0	64.0	13.0
1985	24.6	71.5	3.9	21.7	66.5	11.7
1990	26.9	68.8	4.4	22.1	65.7	12.2
1995	27.9	67.3	4.8	22.1	65.3	12.6
2000	27.2	67.5	5.3	21.8	65.3	12.9
2005	25.2	68.9	5.9	21.3	66.0	12.7
2010	23.3	70.0	6.7	20.9	66.8	12.3
2015	22.3	70.0	7.7	20.7	65.8	13.5
2020	22.3	68.8	9.1	20.7	65.0	14.3
2025	22.3	66.8	10.9	20.7	64.9	14.4
2030	22.5	64.7	12.8	20.6	64.4	15.0
2035	22.3	62.5	15.2	20.5	63.9	15.6
2040	22.0	64.8	13.2	20.5	64.4	15.1
2045	22.0	66.2	11.8	20.5	64.6	14.9
2050	22.1	66.5	11.4	20.5	64.6	14.9
2055	22.1	65.9	11.9	20.6	64.5	14.9
2060	22.3	65.1	12.7	20.5	64.4	15.1
2065	22.2	64.8	13.0	20.5	64.4	15.1
2070	22.1	65.1	12.8	20.5	64.4	15.1

SPACE DIAGRAM

Smallest Space Solution (SSA-I) for the Age Composition Dissimilarity of 30 Countries and a Stationary Population.

Based on the Index of Dissimilarity Matrix in Table 3.

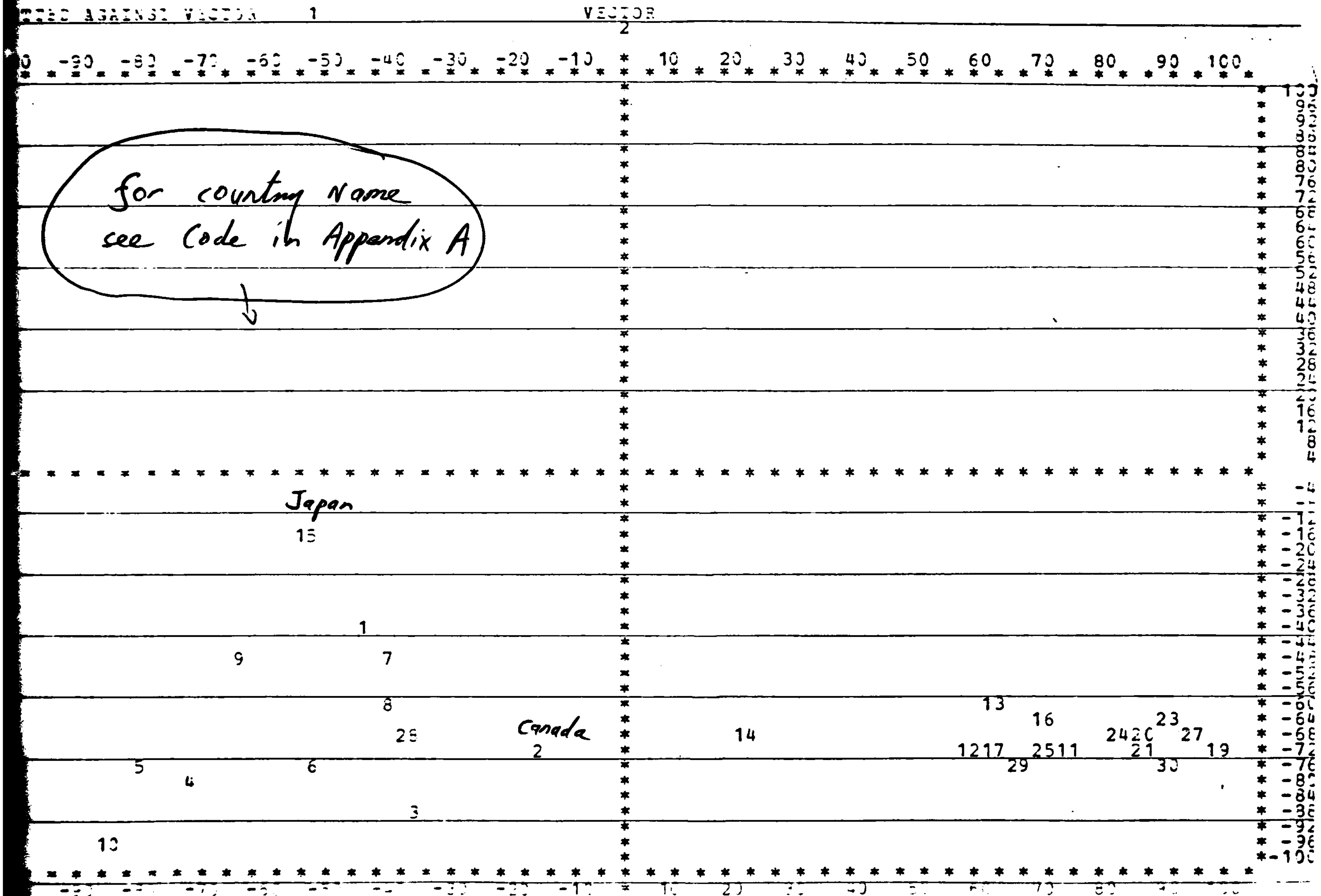
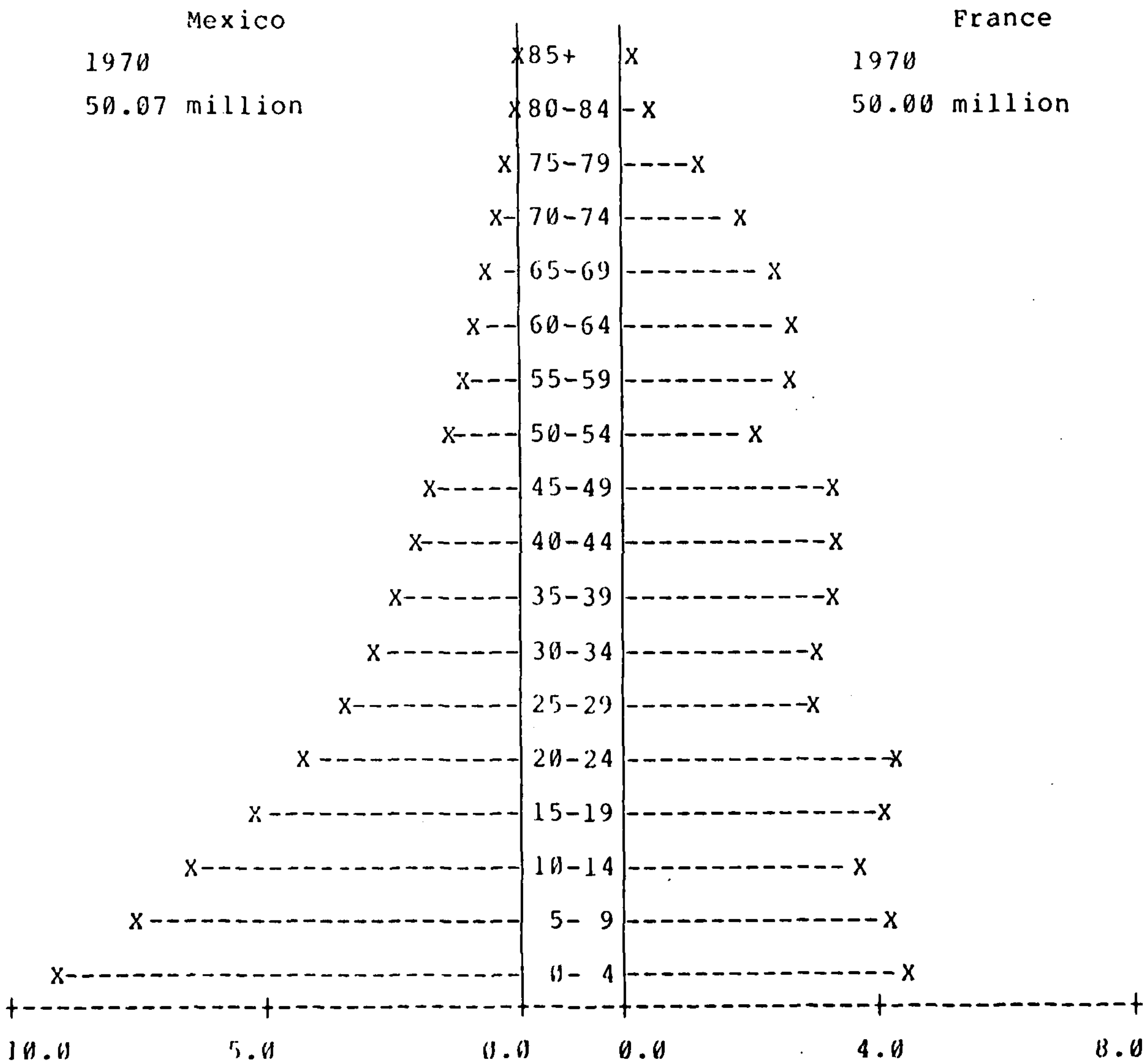


FIGURE 1

Age Composition of France and Mexico, 1970

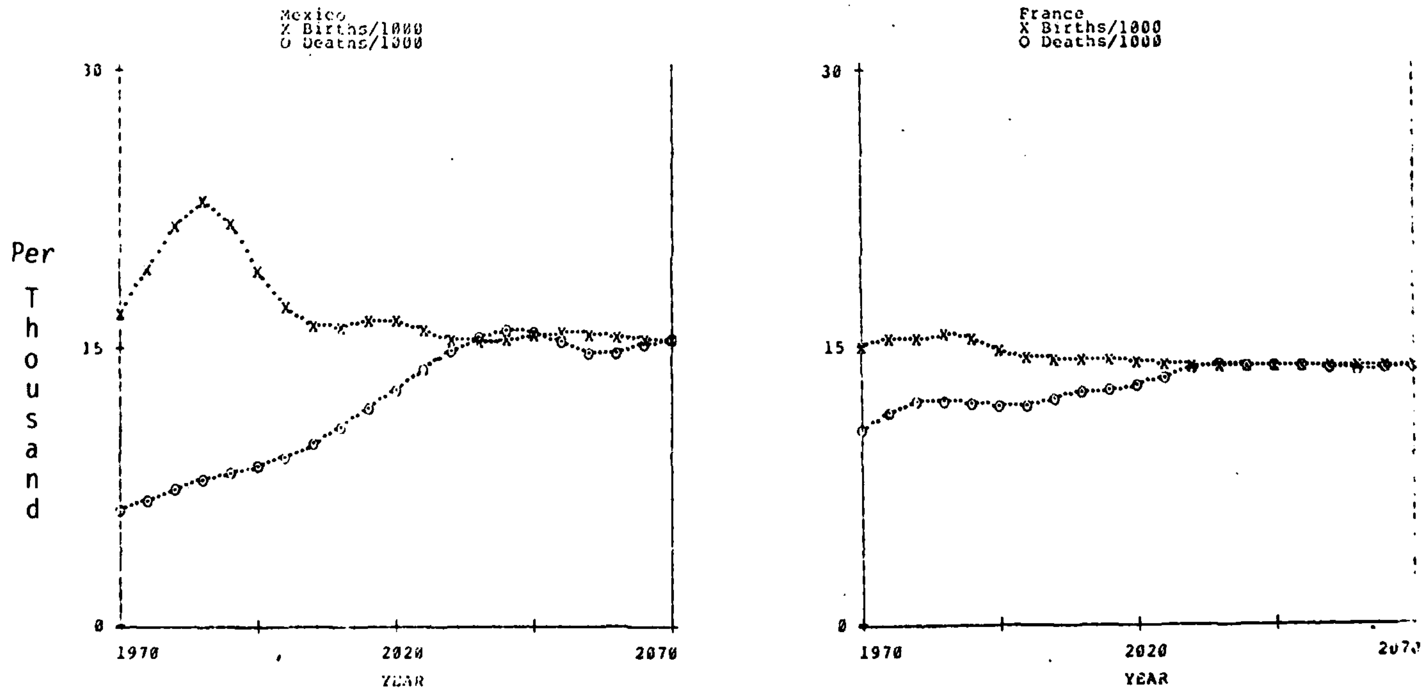


1970 Characteristics	Mexico	France
Total Fertility Rate	6.1	2.8
Crude Birth Rate	42.6	20.1
Life Expectancy at Birth	63.5	71.3
Crude Death Rate	7.7	10.6
Dependency Ratio	.97	.58

FIGURE 2

Crude Birth Rate and Crude Death Rate for Mexico and France

Projection to the year 2070 based on fertility reduction
to replacement level in 1970



Mexico

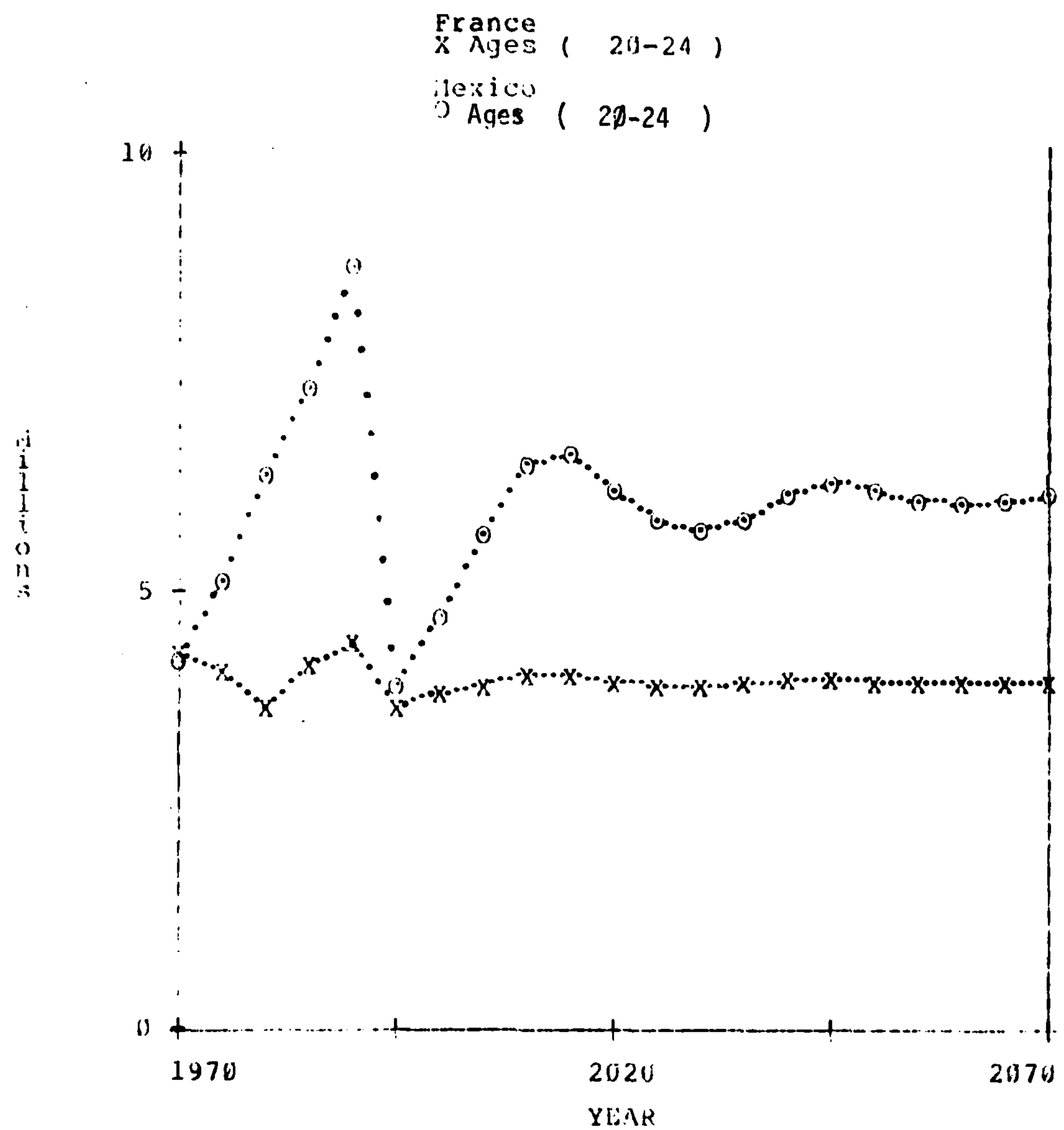
	1970	1995	2020	2045	2070
X	16.96	19.30	16.66	16.05	15.92
O	6.41	8.67	13.09	16.19	15.91

France

	1970	1995	2020	2045	[illegible]
X	15.09	14.91	14.26	14.15	14.[illegible]
O	10.64	11.85	13.01	14.14	14.1[illegible]

FIGURE 3

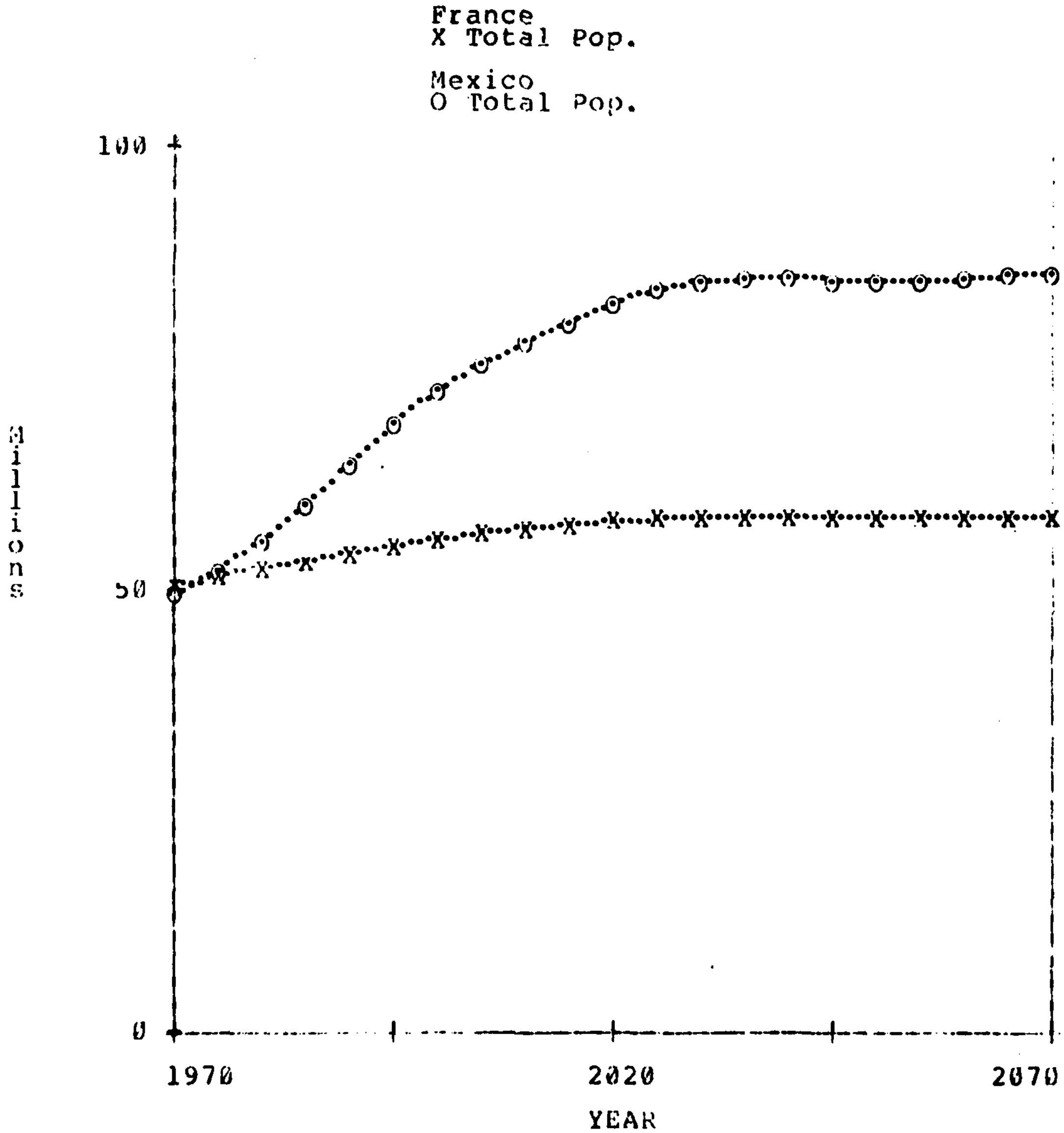
Projection of Population Aged 20-24, for France and Mexico
Projection to the year 2070 based on fertility reduction to replacement level in 1970



	1970	1995	2020	2045	2070
X	4.34	3.72	4.03	4.05	4.04
O	4.25	3.93	6.19	6.25	6.13

FIGURE 4

Projection of Total Population for France and Mexico
Projection to the year 2070 based on fertility reduction
to Replacement level in 1970

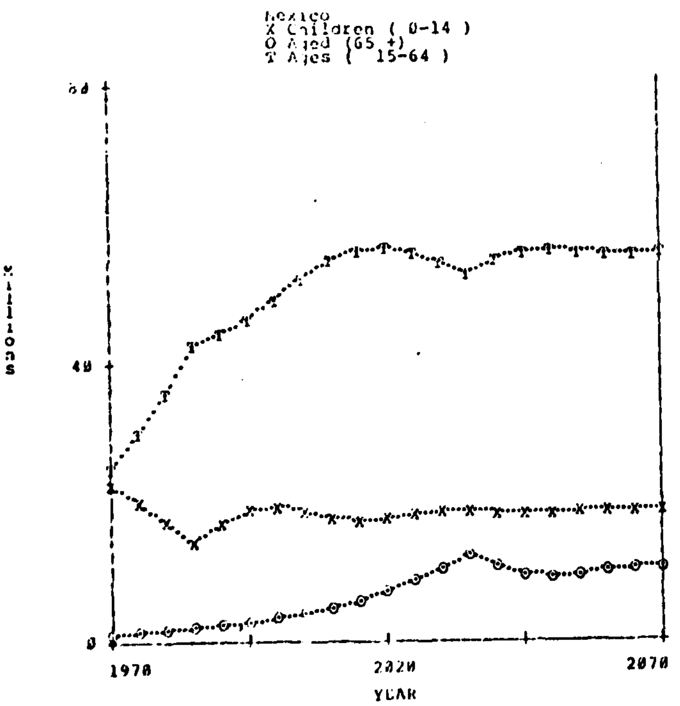


	1970	1995	2020	2045	2070
X	50.78	55.82	59.01	59.55	59.63
O	49.97	69.23	82.44	84.72	85.65

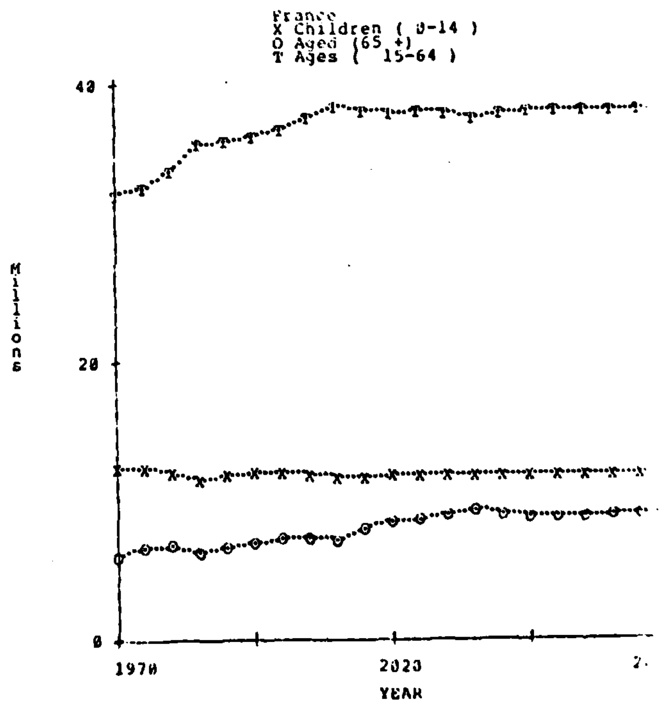
FIGURE 5

Projection of Age Groups 0-14, 15-64 and 65+ for France and Mexico

Projection to the year 2070 based on fertility reduction
to Replacement Level in 1970



	1970	1995	2020	2045	2070
X	23.12	19.34	18.21	18.60	18.95
O	1.43	3.31	7.49	10.03	10.94
T	25.42	46.62	56.74	56.89	55.76



	1970	1995	2020	2045	[illegible]
X	12.52	12.34	12.20	12.20	[illegible]
O	6.11	7.04	8.45	8.87	[illegible]
T	32.15	36.44	38.36	38.48	[illegible]

APPENDIX A

Age Composition (in percent) for
30 Countries and a Stationary Population (STAT)
1970 Data

AGE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0-4	8.5	9.9	8.4	8.9	8.7	9.6	9.0	8.1	10.1	8.6	17.2	16.3	15.9	12.3	8.9	15.0	16.0	18.5	19.2	17.9	18.6	17.5	18.0	18.1	16.1	18.4	18.2	10.0	17.0	18.3	7.0
5-9	9.7	10.7	9.7	8.4	8.6	9.1	9.2	8.5	7.0	8.5	13.8	12.9	13.6	11.4	7.8	14.3	13.2	13.4	15.4	14.9	14.6	14.6	14.9	14.6	13.6	14.4	15.1	9.3	13.2	14.5	7.0
10-14	10.0	10.7	10.2	7.4	7.7	8.8	9.5	10.4	8.9	7.4	11.8	11.0	12.2	10.6	7.6	13.8	11.6	12.2	12.3	12.7	12.3	12.5	12.7	12.2	11.9	13.7	13.0	9.4	11.3	12.0	6.9
15-19	9.3	9.6	9.4	8.2	7.3	8.0	9.6	10.5	8.9	6.8	10.1	9.9	10.3	10.7	8.8	10.3	10.1	10.4	10.6	10.5	10.3	10.5	10.9	10.1	10.4	10.7	10.5	9.0	10.0	10.2	6.9
20-24	7.2	8.5	8.4	8.5	7.5	7.7	7.7	8.7	7.4	7.7	8.7	8.6	8.3	8.8	10.4	8.4	8.6	8.8	8.7	8.1	8.4	9.0	8.6	8.2	8.7	8.5	8.5	8.2	8.7	8.7	6.8
25-29	5.7	6.8	5.7	6.0	6.3	6.9	7.2	5.8	6.3	6.5	7.4	7.4	6.3	7.1	8.7	7.0	7.4	7.5	7.0	6.5	7.0	7.5	6.6	6.9	7.4	6.8	6.9	7.3	7.6	7.6	6.8
30-34	8.7	5.9	5.6	6.1	6.8	6.3	7.8	6.7	7.8	6.1	6.3	6.6	5.8	6.6	8.0	6.3	6.6	6.3	5.6	6.2	6.0	6.3	5.4	5.9	6.2	5.6	5.8	6.8	6.6	6.5	6.7
35-39	7.2	5.9	5.5	6.6	6.7	7.0	8.0	7.0	7.7	5.9	5.4	5.7	6.0	6.0	7.9	5.4	5.8	5.3	4.7	5.3	5.0	5.2	4.7	5.0	5.3	4.9	4.9	6.7	5.6	5.3	6.6
40-44	7.8	6.0	5.8	6.7	6.9	6.8	7.0	6.9	7.3	6.1	4.6	5.0	5.1	5.4	7.1	4.4	5.0	4.4	3.9	4.5	4.2	4.3	4.0	4.3	4.6	4.4	4.1	6.6	4.8	4.3	6.5
45-49	5.1	5.7	6.0	6.6	6.8	6.4	5.6	6.0	6.4	6.7	3.8	4.3	3.7	4.8	5.6	3.9	4.2	3.6	3.3	3.5	3.5	3.5	3.5	3.6	3.9	3.4	3.5	6.0	4.0	3.5	6.4
50-54	4.1	4.9	5.4	4.2	4.5	5.1	3.0	3.8	3.7	5.8	3.2	3.6	2.7	4.2	4.6	3.2	3.5	2.9	2.7	2.8	2.9	2.8	2.9	3.0	4.1	2.7	2.7	5.0	3.3	2.6	6.2
55-59	4.7	4.3	4.9	5.2	6.0	4.9	4.8	4.8	5.3	6.2	2.6	2.9	3.2	3.6	4.3	2.7	2.7	2.2	2.2	2.3	2.4	2.2	2.4	2.5	2.5	2.3	2.2	4.5	2.7	2.1	6.0
60-64	4.1	3.5	4.2	5.3	5.2	4.4	4.2	4.6	4.6	5.8	2.0	2.2	2.7	3.0	3.6	2.1	2.2	1.7	1.6	1.8	1.8	1.7	2.0	2.1	1.9	1.4	1.8	3.9	2.1	1.6	5.6
65-69	3.2	2.7	3.3	4.8	4.1	3.6	3.5	3.6	3.7	4.9	1.5	1.6	2.1	2.3	2.9	1.5	1.6	1.2	1.1	1.4	1.4	1.2	1.5	1.6	1.5	1.4	1.3	2.9	1.5	1.1	5.0
70-74	2.3	2.5	2.8	3.7	3.5	2.8	2.0	2.4	2.5	3.6	0.9	1.2	1.4	1.6	2.0	1.2	1.0	0.7	0.7	0.8	0.9	0.7	1.0	1.1	1.1	0.7	0.9	2.0	1.0	0.7	4.1
75-79	1.8	1.5	2.3	2.4	2.1	1.7	1.2	1.4	1.4	2.4	0.6	0.6	0.7	0.9	1.2	0.6	0.4	0.5	0.5	0.5	0.5	0.4	0.6	0.6	0.7	0.5	0.5	1.5	0.5	0.3	3.1
80-84	0.6	0.7	1.1	0.9	1.0	0.8	0.7	0.7	0.8	0.8	0.2	0.2	0.3	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.3	0.3	0.2	0.7	0.2	0.1	1.9
85+	0.2	0.3	0.4	0.3	0.4	0.3	0.3	0.2	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.3	0.0	0.0	0.7

Country Code for Space Diagram and Appendix A

Country

1. USSR
2. Canada
3. USA
4. France
5. Italy
6. Spain
7. Yugoslavia
8. Poland
9. Romania
10. United Kingdom
11. Egypt
12. South Africa
13. Turkey
14. China
15. Japan
16. South Korea
17. Burma
18. Indonesia (same as 21 in S.D.)
19. Philippines
20. Thailand
21. Bangladesh
22. India (same as 30 in S.D.)
23. Iran
24. Pakistan
25. Brazil
26. Columbia (same as 27 in S.D.)
27. Mexico
28. Argentina
29. Ethiopia
30. Nigeria
31. STAT (Stationary Population)