European and American Populations: Previous Forecasts and Present Reality (*)

I

1. - Eighteen years ago, the Economic and Financial Department of the League of Nations published a comprehensive study on population prospects for the period of 1940-70 for Europe and the Soviet Union (1). The work was carried out by a group of collaborators of the Office for Population Research of Princeton University under the direction of Frank W. Notestein.

This study sets out, clarifies and comments on the results of the forecasts of population trends in the various countries and on their breakdown by sex and age. Twenty years after the preparation of these calculations, it is interesting to make a comparison between the prospects as they appeared at that time and the facts as they are today. The exercise is particularly instructive because of the glaring divergences it reveals which in their turn confirm the familiar difficulty of making reliable longterm population forecasts and bear out the radical change in population trends in a good number of European countries.

The main purpose of the present note is to bring out the extent and nature of this change which could hardly have been foreseen on the eve of the First World War but which, ever since its appearance after that War, has attracted the attention of demographers and others and has been the subject of numerous studies. Its causes and consequences have been widely investigated, and it is not my intention to go into it once again, but merely to compare actual developments with those which might reasonably have been expected at that time.

(*) The Italian text of this article was published in the review *Giornale degli Economisti* e Annali di Economia (1961, Nos. 11-12; 1962, Nos. 5-6).

(1) *La population future de l'Europe et de l'Union Soviétique*, Geneva, 1944.

Notestein's collaborators: Irene B. Taeuber, Ansley J. Coale, Dudley Kirk and Louise K. Kiser, who were even then experienced demographers, subsequently made important contributions to demographic studies.

I must emphasize that, in pointing out the divergences between facts and forecasts, I am far from wishing, either openly or indirectly, to disparage the able demographers of Princeton. There is no contesting the difficulty of making population forecasts, and I myself, in making the point in a recent study (2), have explained that, for many practical purposes, such forecasts are nevertheless indispensable. Besides, if to make such estimates were a sin, it would ill become me, as an old sinner, to cast the first stone.

The authors of the forecasts in question were indeed well aware how risky an undertaking they were embarking upon, as is clear from the following passage from the introduction to their study:

" The purpose of this monograph is to examine the implications of these underlying processes and structures for the population of Europe and the U.S.S.R. in the postwar decades. From one point of view, such a study does not involve the prediction of future events, but only a statement of conclusions flowing from certain assumptions. This principle underlies all scientific analysis. The results tell us what will happen under certain conditions, but only under those conditions. They have broad predictive value only to the extent that the assumptions governing major determinants of the variable are valid. Owing to the complexity of factors affecting population change, population projections have predictive validity only as regards the general direction and magnitude of changes in large geographic areas. Neither this study, nor any other, can legitimately purport to predict the actual size and age composition of the population in a small area at any future date. Detailed projections, such as those of the present report, should be thought of as models illustrating the operation of general principles, rather than as precise forecasts. Their practical usefulness lies in the fact that they permit the segregation of those factors that are avowedly unpredictable from those that are either inevitable or broadly predictable in terms of reasonable inference. Such models afford the framework within which the basic problems of population change may be conceptualized ".

(2) In the volume *Economia della popolazione*, section 180 (Turin, UTET, 1960).

2. - The population projections in the volume in question were worked out on the basis of the situation in 1940 and on hypotheses as to the probable course of the death-rate and of fertility. These hypotheses in their turn were based on the trends observed up to that date in each country and on the experience of other countries which were further advanced in their demographic evolution. It was deliberately decided not to take any account of the possible effects of international migrations owing to the marked difficulty of making any prediction in their regard.

No real technical objection can be raised to the methods followed. Yet, owing to the very nature of the problem, the conclusions proved to be generally very wide of the mark — as will be seen from the data in Table I. That table covers nine European countries, the boundaries of eight of which have remained unaffected or have been only slightly modified from the population point of view by the Second World War. As regards the ninth country (Italy), see the explanations below.

For five of these countries — England and Wales, Sweden, Belgium, France and Switzerland — the forecast was that the population would drop between 1940 and 1959 to extents ranging from 1.4 per cent (Sweden and Belgium) to a maximum of 5.1 per cent (France). As it was, there has been an increase in all these countries from 8.9 per cent in Belgium to 24.2 per cent in Switzerland. These increases are due only in small part to net immigration (in the case of France, Switzerland, Sweden and Belgium) while in England and Wales emigration was higher than immigration.

In three other countries — Denmark, Holland and Portugal — increases were anticipated varying from a minimum of 6.2 per cent (Denmark) to a maximum of 14.9 per cent (Portugal). The actual increases were far larger. The smallest was in Denmark (18.2 per cent) and the largest in Holland (28.4 per cent). It should be noted that in Portugal emigration was well above immigration.

The same is true of Italy. For that country, I have rectified the forecasts, taking account of an overestimate of the population at the beginning of 1940 and of the losses of territory and inhabitants sanctioned by the peace treaties. According to the calculation thus amended, the population within the present frontiers should have risen from 43,600,000 at the beginning of 1940 to 48,300,000 at the beginning of 1960, or by 10.8 per cent. As it was, the population

increased to 49,200,000, or by 12.8 per cent, despite the extensive emigration and war casualties which, in France, England and Wales, and, to a lesser extent, in Belgium and Holland, contributed to a reduction in the increase in population (3).

TABLE I

COMPARISON BETWEEN THE POPULATION FORECAST AND ACTUAL POPULATION

(thousands of inhabitants)

Country	Population			Variation			
	1 Jan. 1940	1 July 1959 (*)		Forecast		Actual figures	
	A	F	A	In absolute figures	%	In absolute figures	%
England and Wales	41,660	40,390	45,504	— 1,270	— 3.0	+ 3,844	+ 9.2
Sweden	6,330	6,239	7,415	— 91	— 1.4	+ 1,085	+ 17.1
Denmark	3,820	4,058	4,515	+ 238	+ 6.2	+ 695	+ 18.2
Holland	8,840	9,953	11,348	+ 1,113	+ 12.6	+ 2,508	+ 28.4
Belgium	8,310	8,193	9,053	— 117	— 1.4	+ 743	+ 8.9
France	41,200	38,095	45,097	— 2,105	— 5.1	+ 3,897	+ 9.5
Switzerland	4,220	4,157	5,240	— 63	— 1.5	+ 1,020	+ 24.2
Italy	43,600	48,300	49,200	+ 4,700	+ 10.8	+ 5,600	+ 12.8
Portugal	7,620	8,755	9,053	+ 1,135	+ 14.9	+ 1,433	+ 18.8

(*) F = Forecast, A = Actual figures. For Sweden, Denmark and Belgium, 1 July 1958; for Holland and Italy 1 Jan. 1960. For this table and for the later ones, the data for the years 1958-60 are taken from the *Annuaire démographique* of the United Nations, and estimates and calculations are based thereon.

The contrast between forecast and actual variations in most of the countries concerned shows that the predictions were not even able to provide the general orientation which they had set out to furnish.

In all the countries in Table I, the number of inhabitants in 1959 was in varying degrees above the forecasts. The figure for Switzerland was 26.1 per cent, for Sweden 18.8 per cent, for France 15.4 per cent, for Holland 13.7 per cent, for England and Wales 12.7 per cent, for Denmark 11.3 per cent, for Belgium 10.5

(3) In preparing the population projections commented on here, the authors did not take any account — because of the obvious impossibility of making a reliable estimate — of the deaths of fighting men or of civilians because of the war then raging.

per cent, for Portugal 3.4 per cent and for Italy 1.9 per cent. The surpluses in countries which suffered severe war casualties or a heavy drain from emigration are particularly noteworthy.

3. - Since the forecasts of the Princeton demographers leave out of account population movements in the form of migrations, the difference between their forecasts and their base data represents the natural increase of population.

The comparison between this forecast and the actual natural increase should make it possible to measure the exact extent of their error by eliminating the influence of migration. But the gaps in the registration of births, deaths and migrations during the war and immediately after (4) make it impossible to determine with any degree of accuracy the natural increase during the whole period under review.

We can, however, make a correct and useful comparison between actual and predicted natural increase if we confine the exercise to the ten years running from 1950 to 1959 during which the disturbing effects of the war and its aftermath were no longer operative.

The distinction between the two component parts of population increase — natural increase and migration — is effected for the latter period in Table II, thus enabling us to compare actual and predicted natural increase. This table includes a tenth country — Germany, which for obvious reasons does not appear in Table I.

In all ten countries under consideration, there was, in the ten years 1950 to 1959, a surplus of births over deaths, while for six of them a minus had been forecast, and for the other four a far lower surplus than actually occurred.

The widest gap between forecast and reality was in the case of England and Wales (forecasts —1,300,000, as against an actual +1,815,000), in France (—1,300,000 against +2,883,000) and in Germany (—200,000 against +3.432,000). But, even in less populous

(4) In some places, the regular registration of births, deaths and migrations was interrupted, and in others the records were lost. In the belligerent countries, many deaths in combat, from warlike acts and genocide were not registered. In these countries themselves and in those invaded, moreover, deaths abroad of nationals deported were not registered. In both cases, there was no registration of deaths abroad of nationals who had taken refuge there, which has not helped to diminish the apparent gap between births and deaths in the countries giving them shelter.

countries — Belgium, Sweden and Switzerland — there is a relatively sharp contrast, though smaller in absolute terms.

TABLE II

VARIATIONS IN POPULATION (TOTAL, NATURAL INCREASE, MIGRATION), IN THE TEN YEARS FROM 1950 TO 1959
(thousands of inhabitants)

Country	Actual population		Increase during decade	Difference between births and deaths		Difference between immigrants and emigrants
	1 Jan. 1950	1 Jan. 1960		Forecast	Actual	
England and Wales	43,903	45,634	1,731	— 1,300	+ 1,815	— 84
Sweden	9,985	7,467	482	— 160	+ 383	+ 99
Denmark	4,251	4,563	312	+ 50	+ 365	— 53
Holland	10,035	11,413	1,378	+ 400	+ 1,510	— 132
Belgium	8,627	9,129	502	— 180	+ 422	+ 80
Germany (*)	68,227	72,560	4,333	— 200	+ 3,432	+ 901
France	41,568	45,319	3,751	— 1,300	+ 2,883	+ 868
Switzerland	4,667	5,264	597	— 110	+ 369	+ 228
Italy	46,455	49,219	2,764	+ 1,900	+ 4,053	— 1,289
Portugal	8,369	9,089	720	+ 490	+ 1,074	— 354

(*) Data for the two German republics taken together and of both sectors of Berlin.

In Italy and Portugal, the actual surplus of births was more than twice as much as predicted; in Holland, it was almost four times as much, and in Denmark over seven times.

To sum up, in the ten countries in Table II, for the decade in question, there was a total surplus of 16,306,000 births as compared with a forecast of 410,000.

As will be seen from the last column of Table II, the rise in population was swollen by immigration in five of the ten countries (Germany, France, Switzerland, Sweden and Belgium), while it was slowed down by emigration in the other five. In the ten countries taken as a whole, there was a net balance of immigration of 264,000, or not even 1.6 per cent of a population increase of 16,570,000.

In other words, the error in the prediction is due almost entirely to the high rate of natural increase which was the only factor considered in the forecasts.

4. - To understand why the forecasts were so far out, we must examine the breakdown by age in the various populations in question. Thus, data up to the beginning of 1960 are available only

for Holland. For the other seven countries in Table III, the data go up to mid-1959 (England and Wales, France, Switzerland and Portugal) or to mid-1958 (Sweden, Denmark and Belgium). This table does not include Germany in view of the postwar changes in frontiers, or Italy because of the lack of data on the breakdown by age of the present population after 1951.

The data are arranged in five-year groups up to but not including the twenty-fifth birthday and by ten-year groups from 25 to 84. Those over 84 are lumped together.

One has only to glance at the table to see that there is one factor common to the population forecasts for all the countries in question — the fact that the first three age groups have been seriously underestimated.

For the first age group, the underestimate ranges from 27.3 per cent in the case of Portugal to 53.7 for Switzerland (where there are 432,000 children of from 0 to 4 against a forecast of 200,000. In five of the eight countries, the error is over 40 per cent.

In the second age group, the underestimate varies from 23.2 per cent for Portugal to 45 per cent for Switzerland, and it is over 35 per cent for five countries.

In the third age group, the underestimate stretches from 12.7 per cent for Portugal to 44 per cent for Sweden, and in six countries it is over 30 per cent.

So far the forecasts were based on hypotheses about future fertility and death-rates. The gap between forecast and reality shows that the birth-rate in all the countries concerned was expected to fall continually and rapidly. There has either not been such a fall, or it has been much more gradual, as we will see.

The figures for Holland refer to the beginning of 1960. In all other cases, the data for the fourth age group cover persons who were born by the beginning of 1940, most of them being born in that year or in the immediately succeeding years. For some, the forecast depends only on the assumed death-rate, but for the others it also depends on the assumed fertility, as in the earlier age groups. For the period immediately preceding the one for which data on fertility were available, the relevant forecasts are less badly out. Nevertheless, there are still underestimates, from 3.5 per cent in the case of Portugal to 26.9 per cent for Switzerland. Only for Belgium does the forecast slightly exceed the actual figure (by 2.4 per cent).

TABLE III

COMPARISON BY AGE GROUP BETWEEN FORECAST AND ACTUAL POPULATION
(thousands of inhabitants)

Age at last birthday	England and Wales (1 July 1959)				Sweden (1 July 1958)			
	Population		Difference between forecast and actual figures		Population		Difference between forecast and actual figures	
	Forecast	Actual figures	In absolute figures	%	Forecast	Actual figures	In absolute figures	%
0 to 4	1,897	3,452	— 1,555	— 45.0	284	528	— 244	— 46.2
5 to 9	2,103	3,282	— 1,179	— 35.9	318	564	— 246	— 43.6
10 to 14	2,349	3,654	— 1,305	— 35.7	357	638	— 281	— 44.0
15 to 19	2,586	2,962	— 376	— 12.7	397	507	— 110	— 21.7
20 to 24	2,746	2,898	— 152	— 5.2	419	439	— 20	— 4.6
25 to 34	5,781	5,908	— 127	— 2.1	877	952	— 75	— 7.9
35 to 44	6,282	6,302	— 20	— 0.3	1,018	1,084	— 66	— 6.1
45 to 54	6,322	6,469	— 147	— 2.3	989	1,041	— 52	— 5.0
55 to 64	5,145	5,208	— 63	— 1.2	782	819	— 37	— 4.5
65 to 74	3,421	3,453	— 32	— 0.9	523	551	— 28	— 5.1
75 to 84	1,522	1,633	— 111	— 6.8	234	250	— 16	— 6.4
85 and upwards	236	283	— 47	— 16.6	41	42	— 1	— 2.4
All ages	*40,390*	*45,504*	*— 5,114*	*— 11.2*	*6,239*	*7,415*	*— 1,176*	*— 15.9*

Age at last birthday	Denmark (1 July 1958)				Holland (1 January 1960)			
	Population		Difference between forecast and actual figures		Population		Difference between forecast and actual figures	
	Forecast	Actual figures	In absolute figures	%	Forecast	Actual figures	In absolute figures	%
0 to 4	234	371	— 137	— 36.9	623	1,144	— 521	— 45.5
5 to 9	254	377	— 123	— 32.6	659	1,109	— 450	— 40.6
10 to 14	277	432	— 155	— 35.9	697	1,155	— 458	— 39.7
15 to 19	298	339	— 41	— 12.1	747	893	— 146	— 16.3
20 to 24	302	291	+ 11	+ 3.8	822	795	+ 27	+ 3.4
25 to 34	604	574	+ 30	+ 5.2	1,602	1,531	+ 71	+ 4.6
35 to 44	624	613	+ 11	+ 1.8	1,505	1,424	+ 81	+ 5.7
45 to 54	584	590	— 6	— 1.0	1,328	1,278	+ 50	+ 3.9
55 to 64	453	465	— 12	— 2.6	1,019	1,015	+ 4	+ 0.4
65 to 74	288	305	— 17	— 5.6	637	663	— 26	— 3.9
75 to 84	121	136	— 15	— 11.0	270	293	— 23	— 7.8
85 and upwards	19	22	— 3	— 13.6	44	48	— 4	— 8.3
All ages	*4,058*	*4,515*	*— 457*	*— 10.1*	*9,953*	*11,348*	*— 1,395*	*— 12.3*

(continued on page 340)

(*continued from page 339*)

Age at last birthday	Belgium (1 July 1958)				France (1 July 1959)			
	Population		Difference between forecast and actual figures		Population		Difference between forecast and actual figures	
	Forecast	Actual figures	In absolute figures	%	Forecast	Actual figures	In absolute figures	%
0 to 4	447	730	— 283	— 38.8	2,176	3,967	— 1,791	— 45.1
5 to 9	477	699	— 222	— 31.5	2,309	3,985	— 1,676	— 42.1
10 to 14	511	655	— 144	— 22.0	2,390	3,762	— 1,372	— 36.5
15 to 19	545	532	+ 13	+ 2.4	2,478	2,724	— 246	— 9.0
20 to 24	578	583	— 5	— 0.9	2,729	2,998	— 269	— 9.0
25 to 34	1,235	1,317	— 82	— 6.2	6,326	6,496	— 170	— 2.6
35 to 44	1,098	1,126	— 28	— 2.5	5,196	5,063	+ 133	+ 2.6
45 to 54	1,231	1,261	— 30	— 2.4	5,624	5,856	— 232	— 4.0
55 to 64	1,066	1,085	— 19	— 1.8	5,035	5,026	+ 9	+ 0.2
65 to 74	674	692	— 18	— 2.6	3,183	3,304	— 121	— 3.7
75 to 84	292	323	— 31	— 9.6	1,435	1,639	— 204	— 12.4
85 and upwards	39	50	— 11	— 22.0	214	277	— 63	— 22.7
All ages	*8,193*	*9,053*	*— 860*	*— 9.5*	*39,095*	*45,097*	*— 6,002*	*— 13.3*

Age at last birthday	Switzerland (1 July 1959)				Portugal (1 July 1959)			
	Population		Difference between forecast and actual figures		Population		Difference between forecast and actual figures	
	Forecast	Actual figures	In absolute figures	%	Forecast	Actual figures	In absolute figures	%
0 to 4	200	432	— 232	— 53.7	674	927	— 253	— 27.3
5 to 9	221	402	— 181	— 45.0	679	884	— 205	— 23.2
10 to 14	246	422	— 176	— 41.7	702	804	— 102	— 12.7
15 to 19	275	376	— 101	— 26.9	736	763	— 27	— 3.5
20 to 24	299	356	— 57	— 16.0	776	755	+ 21	+ 2.8
25 to 34	619	761	— 142	— 18.7	1,426	1,419	+ 7	+ 0.5
35 to 44	633	687	— 54	— 7.9	1,243	1,092	+ 151	+ 13.8
45 to 54	660	705	— 45	— 6.4	1,081	1,006	+ 75	+ 7.5
55 to 64	528	567	— 39	— 6.9	735	727	+ 8	+ 1.1
65 to 74	322	350	— 28	— 8.0	472	473	— 1	— 0.2
75 to 84	136	159	— 23	— 14.5	231	203	+ 28	+ 13.8
85 and upwards	18	23	— 5	— 21.7				
All ages	*4,157*	*5,240*	*— 1,083*	*— 20.7*	*8,755*	*9,053*	*— 298*	*— 3.3*

From the age of 20 on, the forecasts depend exclusively on the assumed death-rate, whereas the actual figures also reflect the effects of migration which are generally negligible in the case of children and adolescents.

Mainly owing to emigration, the forecast for persons of over 20 is 5.1 per cent above the actual figure in the case of Portugal, and there is a slight disparity in the same sense in Holland (0.3 per cent). In the other countries, the forecast for adults is below the real figure owing to a fall in the death-rate, which was above the rate anticipated, and in some cases owing to immigration. This latter factor helps to explain the underestimate in the number of adults — 10.9 per cent in Switzerland, 3.5 per cent in Belgium and 3.0 per cent in France (despite the high wartime death-rate). In England and Wales, too, where there was a net emigration, the number of inhabitants of over 20 was 2.2 per cent lower than the actual figure. In Denmark, the two numbers are almost identical.

The marked underestimate for people of advanced age is specially noteworthy, for wartime casualties and migration affected them only slightly. Only in Portugal does the forecast for people over 75 exceed the real numbers — by 3.8 per cent. In all other countries, it is lower. The difference is 15.4 per cent in Switzerland, 13.9 per cent in France, 11.4 per cent in Denmark, 11.3 per cent in Belgium, 8.2 per cent in England and Wales, 7.9 per cent in Holland and 5.8 per cent in Switzerland.

It is clear, therefore, that, while the birth-rate has not in fact generally followed the forecast, the death-rate has continued to fall — often more sharply than anticipated.

5. - The underestimates in the forecast of the number of children from 0 to 14 mainly reflect, as already observed, errors in the forecasts of fertility, and only to a secondary degree errors in the forecasts for the death-rate. Hence the differences in Table IV between forecasts and actual figures for children between the ages of 0 and 14 provide reliable data on the gulf between actual and anticipated fertility.

It emerges from these comparisons that the number of inhabitants forecast for the first three age groups has remained below the actual figure to an extent that ranges from 21.4 per cent for

Portugal to 46.9 per cent for Switzerland. In four of the eight countries, the underestimate is over 40 per cent and in other three, it is over 30 per cent (5).

TABLE IV

COMPARISON BETWEEN THE FORECAST AND ACTUAL POPULATION OF CHILDREN BETWEEN 0 AND 14

(thousands of inhabitants)

Country	Date	Population		Difference between forecast and actual figures	
		Forecast	Actual figures	In absolute figures	%
England and Wales	1 July 1959	6,349	10,388	— 4,039	— *38.9*
Sweden	1 July 1958	959	1,730	— 771	— *44.6*
Denmark	1 July 1958	765	1,180	— 415	— *35.2*
Holland	1 Jan. 1960	1,979	3,408	— 1,429	— *41.9*
Belgium	1 July 1958	1,435	2,084	— 649	— *31.1*
France	1 July 1959	6,875	11,714	— 4,839	— *41.3*
Switzerland	1 July 1959	667	1,256	— 589	— *46.9*
Portugal	1 July 1959	2,055	2,615	— 560	— *21.4*

6. - How was it possible to make such serious errors in forecasting the number of births? The implicit reply is contained in the comparisons in Table V between the birth-rate in the first five years of this century and in the five years preceding the Second World War. This table also includes Germany and Italy.

In all the ten countries covered by the table, the birth-rate dropped sharply from 1901-05 to 1935-39. The fall had been as much as 46 per cent in England and Wales, 45 per cent in Switzerland, 44 per cent in Sweden and Belgium, 43 per cent in Germany, 38 per cent in Denmark, 36 per cent in Holland, 29 per cent in Italy, 24 per cent in France (where the starting point was already low) and 16 per cent in Portugal. The main factor responsible for this change was the spread of birth control, and the

(5) In Germany, too, the number forecast — 12,843,000 inhabitants between 0 and 14 — is 2,301,000, or 15.2 per cent, less than the actual number of 15,144,000 on 1 July 1959.

demographers who prepared the forecasts felt justified in assuming that this tendency would become even more marked.

TABLE V

AVERAGE ANNUAL RATES FOR BIRTHS, DEATHS AND NATURAL INCREASE PER THOUSANDS OF INHABITANTS (*)

Country	Birth-rate			Death-rate			Natural increase		
	1901-05	1935-39	1955-59	1901-05	1935-39	1955-59	1901-05	1935-39	1955-59
England and Wales	28.1	14.9	15.9	16.0	12.0	11.6	12.1	2.9	4.3
Sweden	26.1	14.5	14.5	15.5	11.7	9.6	10.6	2.8	4.9
Denmark	29.0	17.9	16.8	14.8	10.6	9.1	14.2	7.3	7.7
Holland	31.5	20.3	21.2	16.1	8.7	7.6	15.4	11.6	13.6
Belgium	27.7	15.6	17.0	17.0	13.2	12.0	10.7	2.4	5.0
Germany (**)	34.3	19.4	16.4	19.9	11.9	11.5	14.4	7.5	4.9
France	21.2	15.1	18.4	19.6	15.6	11.9	1.6	— 0.5	6.5
Switzerland	27.8	15.4	17.5	17.5	11.6	9.9	10.3	3.8	7.6
Italy	32.6	23.2	17.7	22.0	13.9	9.4	10.6	9.3	8.3
Portugal	32.2	27.2	23.5	20.1	15.9	11.2	12.1	11.3	12.3

(*) The data for the period 1901-05 are taken from the *Statistique internationale du mouvement de la population* (Vol. II, p. 4, Paris, 1913) compiled and published by the STATISTIQUE GENERALE DE LA FRANCE.

(**) Data for both German republics and for the two sectors of Berlin.

As it was, the birth-rate in 1955-59 rose, as will be seen from Table V, to levels slightly above those for 1935-39 in England and Wales, in Holland, Belgium, France and Switzerland. It remained constant in Sweden, and it fell, though less than anticipated, in Denmark, Germany, Italy and Portugal. In six out of the ten countries, therefore, the downward trend in the birth-rate has been arrested, and for some of them it has even seemed (though this may be a premature impression) to be showing signs of rising again. This is the most striking and most unforeseen phenomenon of the postwar period for a large number of European countries which do not, however, include Germany or Italy where the birth-rate has recently sunk below the 1935-39 levels (6).

(6) In some countries, the excess of actual births over the forecast is due in part to the excess of women of childbearing age over the numbers forecast. But this factor has been a

7. - The death-rate had also fallen between 1901-05 and 1935-39 in all ten countries in Table V, and the very low levels to which it had dropped in some of them (for example, to below 9 per 1,000 in Holland) gave grounds for expecting that further progress would be achieved in the others. This progress has in fact taken place, and has been even more substantial than had generally been expected.

In 1901-05, the death-rates ranged from 22 per 1,000 in Italy to 14.8 in Denmark. Even in 1935-39, the maximum had fallen to 15.9 (in Portugal) and the minimum to 8.7 (in Holland). In 1955-59, the maximum was 12 per 1,000 (Belgium) which was distinctly lower than the minimum half a century earlier, and the minimum was down to 7.6 (Holland).

8. - As emerges from Table V, the rate of natural increase had fallen between 1901-05 and 1935-39 in all ten countries, since in all of them the fall in the birth-rate was smaller than that in the death-rate.

Whereas in 1901-05 nine of these countries had a rate of natural increase of over 10 per 1,000, in 1935-39 this figure had fallen in seven of them. In the tenth, France, the low positive value had been replaced by a slight negative one.

In 1955-59, in eight of the ten countries the rate of natural increase had risen to a level above that of 1935-39. The most impressive change was in France, where the figure of 6.5 per thousand, however modest, is four times higher than that for 1901-05.

In Italy and Germany, on the contrary, the rate of increase fell even further between 1935-39 and 1955-59, although less than anticipated.

The comparison between the average annual rates of natural increase forecast and the actual figures brings out the difference between the trend deduced from past experience and what actually took place.

secondary one, since the excess of women of 15 to 49 years of age was only 2.3 per cent in Belgium, 2.7 in England and Wales, 2.8 in Germany, 6 in Sweden and 10.8 in Switzerland. In the other countries, on the contrary, the actual number was slightly under the forecast: by 0.4 per cent in Denmark and Portugal, 0.5 in France and 3.1 in Holland. There are no data for Italy.

Country	Rate of natural increase	
	Forecast	Actual
England and Wales	— 4.0	+ 4.3
France	— 3.6	+ 6.5
Switzerland	— 3.4	+ 7.6
Sweden	— 3.2	+ 4.9
Belgium	— 2.7	+ 5.0
Germany	— 1.1	+ 4.9
Denmark	+ 0.0	+ 7.7
Italy	+ 3.3	+ 8.3
Holland	+ 3.5	+ 13.6
Portugal	+ 5.3	+ 12.3

In most of the countries, there was a positive increase and not a negative one, and in the others the positive increase was higher than predicted.

9. - These modifications in population trends have given rise, as we have seen, to great differences between predictions and actual figures as regards the age structure of the population. These differences are shown in absolute figures in Tables III and IV. On the basis of the data in the former table, we have, in Table VI, calculated the three main age groups as a percentage of total population, comparing the position in 1940 with the forecast and the actual data for 1959, or an approximate date, for eight countries.

According to the forecasts, the precentage of the age group 0 to 14, which in 1940 varied between a maximum of 30.9 in Portugal and a minimum of 20.8 per cent in Sweden, should have fallen in all countries — to 23.5 per cent in Portugal and 15.4 in Sweden, and to values between these two figures in the rest.

In reality, the proportion of this age group increased in seven out of the eight countries, with a maximum of 30 per cent in Holland and a minimum of 22.8 per cent in England and Wales, and it dropped slightly — to 28.9 per cent — only in Portugal (7).

(7) In Germany, too, despite the continuing fall in the birth-rate, the percentage between the ages of 0 and 14 dropped from only 23.2 per cent in 1940 to 20.9 per cent in 1959, whereas the anticipated drop was 17.6 per cent.

TABLE VI

COMPARISON BETWEEN THE PERCENTAGE-WISE BREAKDOWN FORECAST AND ACTUAL BREAKDOWN BY MAIN AGE GROUPS

Country	Date	F or A (*)	Population aged			Total population
			0 to 14	15 to 64	65 and upwards	
England and Wales	1 Jan. 1940	A	21.07	69.93	9.00	100
	1 July 1959	F	15.72	71.46	12.82	100
	»	A	22.83	65.37	11.80	100
Sweden . . .	1 Jan. 1940	A	20.76	69.79	9.45	100
	1 July 1958	F	15.37	71.84	12.79	100
	»	A	23.33	65.30	11.37	100
Denmark	1 Jan. 1940	A	24.24	67.97	7.79	100
	1 July 1958	F	18.85	70.60	10.55	100
	»	A	26.14	63.61	10.25	100
Holland	1 Jan. 1940	A	28.09	64.97	6.94	100
	1 Jan. 1960	F	19.89	70.56	9.55	100
	»	A	30.03	61.12	8.85	100
Belgium	1 Jan. 1940	A	22.48	68.50	9.02	100
	1 July 1958	F	17.51	70.22	12.27	100
	»	A	23.02	65.22	11.76	100
France	1 Jan. 1940	A	23.02	66.74	10.24	100
	1 July 1959	F	17.59	70.05	12.36	100
	»	A	25.98	62.45	11.57	100
Switzerland . . .	1 Jan. 1940	A	22.44	69.45	8.11	100
	1 July 1959	F	16.05	72.50	11.45	100
	»	A	23.97	65.88	10.15	100
Portugal	1 Jan. 1940	A	30.93	62.50	6.57	100
	1 July 1959	F	23.47	68.50	8.03	100
	»	A	28.88	63.65	7.47	100

(*) F=Forecast, A=Actual figures.

These disparities between forecasts and actual outturn in the main reflect the wide divergences between forecasts and actual trends in the birth-rate which have been thrown into relief by the data in Tables III, IV and V.

The underestimates to be found in the 0 to 14 age group are to some extent offset by the overestimates in the forecasts for the 65 and upwards group, although the fall in the death-rate was higher than anticipated. These percentages, which varied in 1940 from 10.2 in France to 6.6 in Portugal, should, according to the forecasts, have increased in all countries, reaching a maximum of 12.8 in England and Wales and in Sweden, a minimum of 8.0 in Portugal, and values between these two figures in the other countries.

In actual fact, the percentage of old people has increased in all the countries, but to a smaller degree than anticipated. It reached a maximum of 11.8 per cent in England and Wales and in Belgium, and a minimum of 7.5 in Portugal (8).

The percentage of men and women of working age (from 15 to 64) has fallen instead of rising, as had been expected, in seven of the eight countries. In these, it varied in 1940 from 69.9 per cent in England and Wales to 65 per cent in Holland. It was expected to rise about 1960 to a maximum of 72.5 per cent in Switzerland and to a minimum of 70 per cent in France. In fact, the maximum has fallen to 65.9 per cent (Switzerland) and the minimum to 61.1 per cent (Holland). For France and for England and Wales, the fall may in part be attributed to the heavy losses in the generations which fought in the Second World War, but in the case of France these were to some extent offset by considerable immigration. Only in the eighth country (Portugal) did the percentage of inhabitants between 15 and 64 increase slightly — from 62.5 per cent in 1940 to 63.7 per cent in 1959 (as compared with the forecast of 68.5 per cent) (9).

Contrary to expectations, in seven of the eight countries in Table VI and also in Germany there has been a fall in the percentage of those best able to take an active part in economic life whereas there has been an increase in the proportion of those who are less able or totally unable to do so because of their age. As a result, the burden on the former group of maintaining, in whole or in part, the second group has become much heavier, instead of lighter as had been anticipated. This increase is illustrated by the data in Table VII.

(8) In Germany, the proportion of those of 65 and above increased from 7.9 per cent in 1940 to 11.4 per cent in 1959, so that, at the latter date, it coincided almost exactly with the forecast (11.3 per cent).

(9) In Germany, the proportion of the age group 15 to 64, which was 68.9 per cent in 1940 and should have risen to 71.1 per cent in 1959, dropped in fact to 67.7 per cent, in part because of the serious wartime losses.

TABLE VII

COMPARISON BETWEEN THE FORECAST AND THE ACTUAL PROPORTION OF INHABITANTS BETWEEN THE AGES OF 0 AND 14 AND OF 65 AND UPWARDS TO THOSE BETWEEN 15 AND 64

Country	Inhabitants between 0 and 14 and of 65 and upwards as a percentage of those between 15 and 64		
	1 January 1940 Actual figures	1 July 1959 (*)	
		Forecast	Actual figures
England and Wales	43	40	53
Sweden	43	39	53
Denmark	47	42	57
Holland	54	42	64
Belgium	46	42	53
France	50	43	60
Switzerland	44	38	52
Portugal	60	46	57

(*) For Sweden, Denmark and Belgium, 1 July 1958; for Holland, 1 Jan. 1960.

In Holland, the proportion of less active or inactive units because of their age to every 100 fully active economic units has gone up from 54 to 64 instead of falling to 42 as had been forecast. In France, it rose from 50 to 60, instead of falling to 43. Analogous, if less marked divergences are to be met with for Denmark, Sweden, Switzerland, England and Wales and Belgium (10). Only in Portugal is there a drop from 60 to 57, and even then it is much less than the anticipated figure of 46.

As an inevitable consequence mainly of the much higher birth-rate than anticipated and, to a much smaller degree, of the fact that the death-rate is lower than expected, the average burden of maintaining the non-working or less active part of the population on every unit of the working part of the community has increased and not dropped in most of the countries under examination.

11. - The data and brief comments set out so far show how far the recent curve of the birth-rate in Europe has diverged from the forecasts of twenty years ago which seemed so well founded at that

(10) Also in Germany, where a drop had been forecast of from 45 to 41 per cent, there was an increase — to 48 per cent.

time. They also show that the age structure of the population, which is known to exercise a wide and considerable influence on economic life, has often altered in the opposite direction from that suggested by the forecasts, and has only conformed to the predictions in a few cases, and even then to a smaller extent than anticipated.

The inquiries into the factors responsible for the suspension of the fall of the birth-rate in a number of countries have given rise to exhaustive and heated discussions, but these have not led to anything like agreement, possibly because different trends have been noted in circumstances which are apparently analogous, and *vice versa*. And the other circumstances which have given rise to these differences and analogies do not lend themselves to observation.

It would be most interesting to go into this question, but such an analysis would go beyond the bounds of the present note which merely sets out to show the disparity between the forecasts on population made in 1940 for 1970 and the actual developments up to the present time. The moral of this essay is, of course, that it is extremely dangerous to extrapolate existing population trends to a future period.

II

If we now move from Europe to America, it may be asked whether the recent American " population explosion " was foreseen by the experts some five years ahead.

I will divide my reply into two parts, paying special attention to the United States. And, of the numerous population forecasts for that country, I will examine only those formulated by three distinguished demographers.

R. Pearl, in his admirable *Studies in Human Biology* (published in 1924), tried to forecast future developments in the population of various countries by means of a method which was completely different from that subsequently adopted for the forecasts examined in Part I of my article. Having noticed that a given type of interpolation function (the " logistic " curve) was very suitable for the representation of past population developments, he tried to deduce future developments from it by means of extrapolation.

Basing his work, for the United States, on the censuses from 1790 to 1910, the last of which had recorded 76 million inhabitants, Pearl forecast a progressively slower increase which would bring

the number of inhabitants to 148.7 millions in 1950 and to 159.2 in 1960. In fact, 150.7 million inhabitants were recorded in 1950, (and, up to that point, there was no great divergence between reality and forecast), and 178.5 million in 1960 (excluding the new States of Alaska and Hawai), which marks a sudden and substantial increase over the forecast. Instead of the anticipated rise of 10.5 million inhabitants between 1950 and 1960, the figure was 27.8 millions, or almost thrice as much. And about nine tenths of this rise was due to the excess of births over deaths.

The substantial difference between fact and forecast, in other words, reflects the rise in the natural increase of the population. In the ten years between the two censuses, the birth-rate, which had sunk to 17-18 per thousand inhabitants about 1930, went up again to 24.5 per 1,000, and the death-rate, which at that time was about 11 per thousand, fell to 9.5 per thousand. Thus, the annual rate of natural increase, which had fallen to 6-7 per thousand, had soared to 15.

(Pearl's method proved to be deceptive for other countries as well. In some cases, it led to over-estimates. For England and Wales, the forecast for 1960 was 51.8 millions, and the actual population 45.9; for Germany, the forecast gave 114 millions against an actual 72.8. In other cases, Pearl underestimated the increase. For Italy he forecast 41.8 millions against the real figure of 49.4, and for Japan 78 millions against a real figure of 93.2).

The forecast given by L. J. Dublin and A. J. Lotka was even further out, although made ten years later, i.e. in 1936, in the classical work *Length of Life*. Taking as their starting point the population of 122.8 millions recorded in 1930 and adopting the hypothesis of a progressive fall in the birth-rate and of a decline followed by a moderate increase in the death-rate, they forecast 133.8 millions in 1950 and 146.5 millions for 1960. The first of these figures turned out to be 12.4 millions below the actual population and 32 millions lower in the case of the second one. The increase between 1950 and 1960, which had been put at only 8.2 millions, was thrice as much, since it was as high as 27.8 millions.

As regards Latin America, until a few years ago the necessary bases were not available for a serious effort to forecast population increases. The censuses were few and far between, and not very reliable. And the statistics of births and deaths showed considerable gaps. Only in very recent times has it been possible to make forecasts using scientific criteria, and, since the "population explosion" was now obviously under way, there was no surprise factor such as had led to the forecasting errors for the United States at an ealier date.

However, even the latests forecasts, effected with the best techniques, such as those prepared by the Population Branch of the United Nations, have often been lower than the actual figures.

In the monograph, *The Population of Central America 1950-1980*, published in 1950, that Branch made three forecasts for each country — maximum, medium and minimum. The results so far made available of the latest censuses of a number of Central American countries enable us to compare the population half-way through 1960, as calculated on the basis of the censuses themselves, with the estimates effected according to the various hypotheses:

Population at 1 July 1960 (in thousands)	Mexico	Salvador	Honduras	Panama
According to the census .	34,979	2,444	1,840	1,062
Maximum forecast . . .	34,119	2,468	1,851	1,068
Medium forecast . . .	33,279	2,409	1,808	1,043
Minimum forecast . . .	32,470	2,352	1,767	1,019

The actual increase is substantially above even the maximum forecast for Mexico, whereas it is fairly close to that estimate for the three small republics.

Similar forecasts for South America are to be found in the monograph, *The Population of South America, 1950-1980*, published in 1955 by the Population Branch of the United Nations. Here are a few comparisons on the same lines as those made for Central America:

Population at 1 July 1960 (in thousands)	Venezuela	Peru	Brazil	Chile	Argentina
According to the census	7,332	10,068	69,607	7,264	19,895
Maximum forecast . .	6,669	9,582	66,085	6,958	20,470
Medium forecast . .	6,669	9,582	66,085	6,867	20,036
Minimum forecast . .	6,509	9,498	64,532	6,822	19,602

The population of Argentina in 1960, calculated on the basis of the census, turns out to be just below the medium forecast and just above the minimum one.

But, for the other four countries, as for Mexico, even the maximum forecast is still below the actual figure. And this is where the result of the "explosion" appears, as can be seen more clearly by a comparison of the increases up to 1 July 1960 with those anticipated by the maximum forecast:

Increase over ten years (in thousands)	Mexico	Venezuela	Peru	Brazil	Chile
(a) According to the census .	9,147	2,358	2,535	17,631	1,595
(b) According to the maximum forecast	8,287	1,695	2,049	14,109	1,289
100 *a* : *b*	110	139	124	123	124

As will be seen, even the increase which the United Nations demographers had assumed to be the upper limit was exceeded by a generous margin. (The example brings out the subjective and non-objective character of the limits assigned to the alternative forecasts).

* * *

The case of Brazil gives me an opportunity of satisfying an enquirer who has jokingly reproached me with being discourteous to a number of able demographers by insisting on the mistakes made by them in their forecasts regarding the increase in the population of European countries.

As an act of penitence, and in accordance with the objectives of this note, I will set out a number of errors which I myself committed in forecasting the increase in the population of Brazil for 1950 to 1960.

Since the statistics on population movements show huge gaps (which cannot be made good) for the greater part of Brazil, when the results of the 1950 census were known, the Laboratory of the National Statistical Council, of which I was at that time Director, prepared estimates of the probable increase in the population of the various units of the Federation (States, Federal District, and Federal Territories) for the years after that census. In default of all other data, we assumed that, in each unit, the annual geometric mean rate of increase would be maintained which we had established for

the previous ten years by comparing the results of the 1940 and 1950 censuses.

For Brazil as a whole, the population forecast (66,302,000 inhabitants, which was the total for the data for the various units) is slightly higher than that corresponding to the maximum forecasts of the United Nations. However, it is 3,305,000 lower than the population calculated on the basis of the preliminary results of the 1960 census.

For the ten most populated States of Brazil, the population as calculated in this way is given in the table below, where the increases over the ten-year period are compared with the forecasts.

POPULATION OF A NUMBER OF STATES OF BRAZIL ON 1 JULY 1960 AND ACTUAL INCREASES AND FORECASTS FOR THE PREVIOUS TEN YEARS

State	Population on 1 July 1960 according to the census (in thousands)	Increase in ten-year period (in thousands)		100 (a) / (b)
		(a) Census	(b) Forecast	
Saõ Paulo	12,726	3,584	2,530	*142*
Minas Gerais	9,611	1,883	1,158	*163*
Bahia	5,876	1,041	1,152	*90*
Rio Grande do Sul . . .	5,344	1,180	1,079	*109*
Paraná	4,196	2,066	1,572	*131*
Pernambuco	4,059	663	912	*73*
Rio de Janeiro (*) . . .	3,338	1,040	569	*183*
Ceará	3,274	578	794	*73*
Guanabara (*)	3,244	866	843	*103*
Maranhao	2,444	861	455	*189*

(*) The City of Rio de Janeiro is not in the State of that name, but, with its surroundings, forms the State of Guanabara.

The fallaciousness of the forecasts is clear from the index numbers in the last column, which show that in two of the ten States the actual population increase was more than 80 per cent above that forecast, whereas in other two it was lower by over 25 per cent. Only in three of the ten States was the forecasting error as regards the increase within 10 per cent.

In this case, not only was the forecasting method cruder than those used in the other cases analysed above, but the variability of

the size and direction of the extensive internal migratory flows helped to make the results even less reliable (and in fact these flows were largely responsible for the increase in the population of the States of Rio de Janeiro and Paraná, while deflecting large numbers from Pernambuco and Ceará).

The present marked excess of actual increases over those forecast reflects the population " explosion " in Brazil where, in the ten years preceding the 1960 census, the annual geometric mean rate of increase in the population rose to 29.8 per thousand, compared with 23.8 for the previous decade.

The corresponding rates for the last decade for the most " explosive " countries amongst those examined here are as follows: Venezuela, 40; Mexico, 30.8; Honduras, 29.7; Panama and Peru, 29.4; Salvador, 27.8; Chile, 25.1.

The population increase in Venezuela, which has been exceptionally rapid, is due to a not inconsiderable, but modest extent to the excess of immigrants over emigrants; for Brazil, the corresponding increase is responsible for just over 2% of the total increase.

GIORGIO MORTARA

Rio de Janeiro.