How Was Life?
Global Well-being Since 1820

Chapter 2

Demographic trends since 1820

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The world population has grown from about 1 billion at the start of the 19th century to more than 7 billion today. This chapter describes how demographic systems rapidly changed around the world: mortality rates declined while fertility rates declined as well, albeit at lower and varying speeds. The first demographic transition took place in Western Europe and the Western Offshoots during the 19th century and had huge consequences for labour force participation, for the role of women, and for educational investment in children. Elsewhere the transition is still ongoing as new technologies in health and fertility control were introduced in the course of the 20th century, initiating a move away from high mortality and fertility rates to longer life expectancy and fewer children per women. Initially, this provided a demographic dividend facilitating economic growth, but soon this will turn into a demographic burden.

Introduction

Demographic trends are closely intertwined with developments in well-being. The potential for economic growth is strongly affected by the speed of population growth and the age distribution of the population. In turn, these factors result from changing rates of mortality, fertility and in- or out-migration. The global population grew from about 1 billion at the start of the 19th century to more than 7 billion today. How demographic trends and other factors have impacted on the global distribution of wealth and well-being is explained in-depth in subsequent chapters. This chapter intends to "set the stage" for this study by providing some insights into the major population trends at the world level over the past two centuries.

The first section presents the basic features of world population growth, while also discussing the limitations of the data used here. The global population expanded dramatically, but there were also major shifts in the relative share of the different regions. During the period 1820-2000, the rates of population growth – and sometimes even decline – differed strongly across regions, with important implications for economic growth. For the world as a whole, demographic change in this period is a story of declining mortality, resulting in increased life expectancy, and declining fertility. However, the world's regions display different timings and paces for these declines, implying that each region had its own trajectory of change. In the next section we summarise the mainstream interpretations of the demographic transition, to show how lives were affected by altering demographic patterns. We should hasten to add that, given the scale, the variation, and the complexity of the changes involved, a real consensus on the interpretation of the demographic transition is not within reach (e.g. Szreter, 2011). In the final section, we reflect on how major demographic trends, in past, present and future times, lead to "virtuous" or "vicious" cycles of social and economic development.

Data quality

The evidence presented in this chapter is based on a combination of two datasets. The world population dataset developed by Angus Maddison (1995; 2006; 2010) forms the foundation of the population data, and it is supplemented with the Clio-Infra dataset on total population. Maddison's population estimates (1995; 2006; 2010) stem from a broad variety of sources and have been updated multiple times in the period between 1995 and 2009. Specific sources for the annual estimates of 1820-1950 are described in the country notes of his 1995 and 2006 books. Appendix A in these works deals with population estimates and the quantitative analysis used to estimate onwards from 1820. He either gathers estimations for benchmark years, or calculates these by assembling evidence on changes in population. The bulk of the sources can be found in the 1995 work, *Monitoring the World Economy, 1820-1992*. His population estimates for the years before 1950 are based mainly on census material and the work of historical demographers. For instance, for China, his dataset from 1820 until 1930 is based on the work of Liu and Hwang (1979, p. 82) and for the period from 1933 to 1953 on Perkins (1969, p. 16), using interpolation to

create yearly estimates (Maddison 1995; 2006; 2007). The availability of pre-1950 data and estimates on Europe and the Western Offshoots are of the best quality, followed by those for Latin America and Asia, but the estimates on Africa are very weak.

The Clio-Infra dataset is developed by Klein Goldewijk, Beusen and Janssen (2010) as an essential part of the History Database of the Global Environment (HYDE 3.1). HYDE estimates historical population trends on the basis of a wide variety of statistical sources on varying administrative units. The historical population numbers of Maddison (2003), McEvedy and Jones (1978), Livi-Bacci (2007) and Denevan (1992) form the basis for the historical population estimates of various countries. These are supplemented with the sub-national population data of Populstat (Lahmeyer, personal correspondence), which allows constructing time-series for each province or state of every country in the world. Current administrative units were kept constant over time, meaning that every historical source was adjusted to match the current boundaries (e.g. by taking fractions of former larger empires). Country and regional totals were checked against other historical estimates at the global, regional or national level (Klein Goldewijk, Beusen and Janssen, 2010). Combining the original population dataset by Maddison with the augmented one by Klein Goldewijk, Beusen, and Janssen leads to a more complete set of population estimations for the period between the 1820s and the 1900s.

Population data underlie many other types of data used in this report; they are employed to calculate indicators such as GDP per capita and average years of education, and are often used as weights to determine the relative importance of countries within regions. For periods before the 18th century, demographic data are also regularly used as a basis for conjectures about economic development. In other words, population data provide a fundamental statistical input used for many measures of well-being and economic development. However, some population figures are under scholarly debate, and it is important to separate facts from inferences and everything in between.

The reliability of population estimates varies considerably across world regions and periods, creating some comparability issues. For some areas, such as Western Europe, parts of Eastern Europe and the Western Offshoots, there is an ample supply of quantitative data available of fairly good quality, and the areas are well researched (e.g. in the European Fertility Project, see Coale and Watkins, 1986). In general, population estimates after the 1820s are fairly accurate for European countries and the Western Offshoots, and are typically the product of statistical agencies and of research by economic historians. For regions such as Latin America, the Middle East and North Africa, East Asia and Eastern Europe, 19th century data are less readily available, yet they still provide a basis for reasonable quantitative estimations. Other areas, such as Sub-Saharan Africa before the 1950s, or South-Southeast Asia before the 1900s, suffer from a lack of sources, and there is a high degree of academic disagreement about actual population figures (Austin, 2008; Maddison, 2006; Manning, 2010). Table 2.1 provides an overview of the quality of the data for the different world regions for benchmark years between the 1820s and 2000s.

The difference in data availability can lead to an overemphasis of the Western demographic experience. To counter such a narrow perspective, Maddison (1995; 2006) and others made "educated guesses" about population estimates for regions with little data available. These data are classified as quality type 4 in Table 2.1 (and shown as dotted lines in Figure 2.2). Most notably, pre-1950s population estimates for Sub-Saharan Africa are in class 4: for this region, almost no sources are available before the 1850s, one of the exceptions being the estimates of a 17th century Jesuit scholar who, however, failed to

Table 2.1. **Quality of data on population by region and benchmark year, 1820-2008**

	Western Europe (WE)	Eastern Europe (EE)	Western Offshoots (WO)	Latin America and Caribbean (LA)	Sub-Saharan Africa (SSA)	Middle East and North Africa (MENA)	East Asia (EA)	South and South-East Asia (SSEA)
1820	2	3	2	4	4	4	3	4
1870	2	3	2	2	4	3	3	4
1913	2	2	2	2	4	3	3	3
1950	1	1	1	2	3	2	2	2
1973	1	1	1	1	1	1	1	1
2008	1	1	1	1	1	1	1	1

Note: 1. High quality; 2. Moderate quality: 3. Low quality; and 4. Estimates.
See the section on "Data Quality" in Chapter 1 for a description of the quality criteria.
Source: Clio-Infra, *www.clio-infra.eu*.

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provide the underpinnings of his estimation. Few new data about that period are available, and therefore new population figures for this region are generally the fruit of the increased sophistication of estimation methods. In the 1930s, the total population for the Sub-Saharan region was estimated as hovering around 95 to 100 million between 1650 and 1850 (Willcox, 1931; Carr-Saunders, 1936). Since then, a new generation of scholars has approached the population estimates with more precision, by projecting backwards from 1900 estimates, assuming fluctuations in population growth due to the "exogenous" effects of slave trade and imported diseases (Durand, 1977; McEvedy and Jones, 1978). Current population estimates for Sub-Saharan Africa are estimated both backwards (backward projection from the 1950s) as well as sideways (employing adjusted growth rates from countries such as India) to get a more plausible view of population growth in Sub-Saharan Africa in the period before the 1950s (Austin, 2008; Manning, 2010; Frankema and Jerven, 2013).[1]

Population estimates are relatively easy to come by when compared to other types of demographic indicators. Data on fertility rates and life expectancy at birth, which are also used in this chapter to describe the "demographic transition", are of a different quality than population estimates. For both variables, good quality data – type 1 data – are available only after 1950. Before then, reasonable estimates of total fertility rates and life expectancy at birth are available only for Western Europe, the Western Offshoots and, to a lesser extent, Eastern Europe and East Asia.

To measure mortality risks, this chapter relies on data on life expectancy at birth, or the average number of years a newborn child would live if he or she experienced the age-specific mortality rates observed in a given year (Bongaarts, 2009). The quality of the data on life expectancy is the same as in Chapter 6 of this volume, where the data are described in detail. A well-known indicator of fertility is the total fertility rate (TFR), or the total number of births a woman would have by the end of her reproductive years if she experienced the age-specific fertility rates of a given year. The data on fertility rates are difficult to classify, due to the different methods of estimating the underlying concept. The starting date for the computation of data on total fertility rates was 1800, and for many countries this benchmark is an educated guess in itself. The compilers of Gapminder's

fertility database estimated total fertility rates (TFR) in different ways: while UN data were used for the period after 1959, for the preceding period the main source for Western nations and their Offshoots was the Princeton Fertility Project. When age-specific data were unavailable to calculate TFR, crude birth rates (CBR) were converted using a conversion table developed by Bogue et al. (1993). If CBR were also not available, data for TFR in 1950-1955 were extrapolated backwards for those countries. This approach was applied only to countries whose fertility transition was still to come: in these cases, the "natural" fertility rate of 1950-1955 was assumed to be similar to that of 1800. For countries where the fertility transition had already occurred, earlier data were used to establish a "plateau" around which the TFR tends to fluctuate. Often, additional sources were used to estimate natural fertility. When both of the above options failed to deliver sensible results, two additional strategies were used: First, to use regional averages of neighbouring countries, sometimes with the addition of a few observations of the nation itself; and second, if extrapolations were impossible or assumptions failed a reasonableness test, countries were deleted from the database (Ajus, 2009, see Appendix 10). Table 2.2 provides our best effort at estimating the data quality for fertility for benchmark years between 1820 and 2000.

Table 2.2. **Quality of data on fertility rates by region and benchmark year, 1820-2008**

	Western Europe (WE)	Eastern Europe (EE)	Western Offshoots (WO)	Latin America and Caribbean (LA)	Sub-Saharan Africa (SSA)	Middle East and North Africa (MENA)	East Asia (EA)	South and South-East Asia (SSEA)
1820	3	4	3	4	4	4	4	4
1870	2	4	2	4	4	4	4	4
1913	2	3	2	4	4	4	3/4	4
1950	1	2	1	2	4	2	2	2
1973	1	1	1	1	2	1	1	1
2008	1	1	1	1	1	1	1	1

Note: 1. High quality; 2. Moderate quality: 3. Low quality; and 4. Estimates.
See the section on "Data Quality" in Chapter 1 for a description of the quality criteria.
Source: Gapminder, *http://www.gapminder.org/documentation/documentation/gapdoc008_v2.pdf*.
StatLink *http://dx.doi.org/10.1787/888933096635*

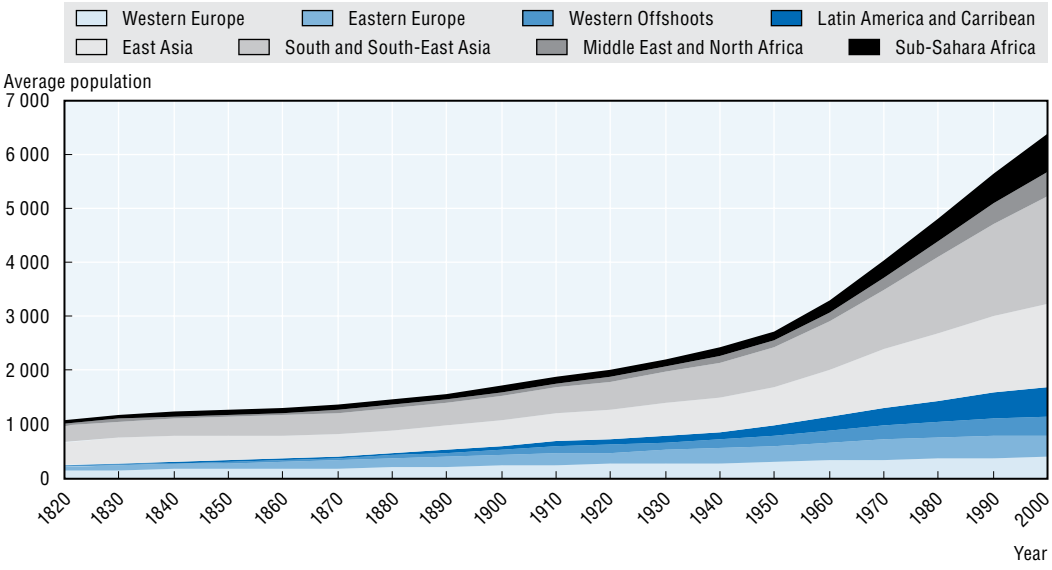
World population 1820-2000: trends and trajectories

From the beginning of the Common Era until the 18th century, the world population grew only very slowly, at an estimated 0.06% per year (Cleland, 2013). In the 18th and 19th centuries, the annual growth rates accelerated to 0.5%, mainly due to a slow decline in mortality in Europe and the Western Offshoots. Figure 2.1 shows how the world population, broken down by region, has grown between 1820 and 2010 (see also Tables 2.3 and 2.4). For a long time, the rate of population growth remained relatively modest, but it increased rapidly after 1950. Since the 1970s, the pace of population growth has slowed. Current forecasts are that the global population will keep on growing, at least until 2100, reaching an estimated total of 10.8 billion people (UN Statistics Division, 2013), more than ten times the population in 1800.

Figure 2.1 also shows the long-standing prominent shares of both East Asia and South and Southeast Asia in the total world population. The share of East Asia diminished after 1860, due to an increase in the shares of both Western Europe and its Offshoots and Eastern

Figure 2.1. **Total population by region, 1820-2000**

Millions of inhabitants



Note: For an assessment of data quality, see Table 2.1.
Source: Clio-Infra, *www.clio-infra.eu*.

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Table 2.3. **Total population by region, 1820-2010**

Millions of inhabitants

	Western Europe (WE)	Eastern Europe (EE)	Western Offshoots (WO)	Latin America and Caribbean (LA)	East Asia (EA)	South and South-East Asia (SSEA)	Middle East and North Africa (MENA)	Sub-Saharan Africa (SSA)	World
1820	140	85	13	23	421	294	42	74	1 091
1830	158	91	17	27	458	316	44	76	1 187
1840	170	101	22	31	461	330	47	79	1 241
1850	176	109	31	32	445	342	49	83	1 268
1860	187	121	41	39	419	362	51	87	1 307
1870	198	133	51	42	415	376	53	92	1 361
1880	212	150	64	49	429	405	59	97	1 466
1890	227	170	78	58	449	429	65	102	1 579
1900	247	190	94	70	476	457	71	108	1 713
1910	264	222	114	83	518	485	73	115	1 873
1920	267	222	132	98	563	519	82	126	2 009
1930	284	241	147	118	601	587	90	140	2 207
1940	296	268	162	144	643	647	101	156	2 417
1950	314	280	192	188	736	710	126	189	2 735
1960	339	332	226	247	871	885	164	247	3 312
1970	361	366	255	319	1 085	1 114	214	320	4 034
1980	372	397	282	398	1 251	1 392	290	423	4 805
1990	386	412	316	479	1 418	1 705	374	554	5 643
2000	397	407	349	551	1 525	2 010	450	703	6 392
2010	409	377	377	589	1 564	2 243	504	820	6 883

Note: For an assessment of data quality, see Table 2.1.
Source: Clio-Infra, *www.clio-infra.eu*.

StatLink http://dx.doi.org/10.1787/888933096654

Table 2.4. **Total population in selected countries, 1820-2010**

Thousands of inhabitants

	Western Europe (WE)							Eastern Europe (EE)		Western Offshoots (WO)			Latin America and Caribbean (LA)			Middle East and North Africa (MENA)		Sub-Saharan Africa (SSA)			East Asia (EA)		South and South-East Asia (SSEA)		
	GBR	NLD	FRA	DEU	ITA	ESP	SWE	POL	RUS	AUS	CAN	USA	MEX	BRA	ARG	EGY	TUR	KEN	NGA	ZAF	CHN	JPN	IND	IDN	THA
1820	18 916	2 437	31 901	25 666	20 473	12 389	2 495	10 427	28 123	274	1 096	11 019	7 308	4 479	534	4 247	10 074	2 935	23 764	966	373 980	30 374	208 916	16 256	4 034
1830	25 323	2 730	33 970	29 295	22 148	13 439	2 989	11 077	30 071	359	1 169	15 125	8 364	5 653	681	4 700	10 455	3 082	24 373	341	410 348	31 480	221 565	20 217	3 602
1840	27 586	3 009	35 589	32 464	23 615	14 362	3 272	12 000	35 621	492	1 697	20 197	8 700	6 862	870	5 100	10 815	3 236	24 998	301	412 000	31 814	230 657	21 961	3 802
1850	27 684	3 217	36 865	34 624	25 181	15 252	3 606	13 000	38 615	935	2 485	27 306	7 662	7 234	1 100	5 500	11 188	3 398	25 639	261	395 994	32 535	239 577	24 211	5 230
1860	29 984	3 442	37 933	37 620	26 904	15 893	4 042	14 933	44 361	1 524	3 369	35 612	9 371	9 310	1 420	4 898	11 574	3 568	26 297	746	368 369	33 751	248 161	27 163	4 603
1870	32 749	3 765	38 265	40 886	28 629	16 466	4 346	16 865	48 113	1 875	4 035	44 748	9 738	10 665	1 796	7 049	11 793	3 756	27 203	2 547	362 477	35 429	254 884	34 260	5 775
1880	35 892	4 256	39 608	45 083	30 484	17 275	4 652	19 860	55 393	2 600	4 633	56 237	10 984	12 840	2 719	6 398	12 235	3 954	28 141	2 410	373 368	38 209	267 137	38 204	5 804
1890	39 073	4 786	40 172	50 294	32 590	18 118	4 898	22 854	63 673	3 421	5 147	69 196	12 554	15 829	3 376	8 893	12 485	4 162	29 112	2 958	388 980	41 688	281 812	42 521	6 670
1900	42 817	5 507	40 852	58 217	34 888	19 119	5 272	24 750	71 523	3 990	6 130	83 434	14 292	19 827	5 591	10 795	12 740	4 381	30 116	4 126	410 244	46 512	292 440	47 298	7 753
1910	45 988	6 354	40 372	64 620	37 429	20 470	5 675	26 677	89 007	4 839	7 975	99 737	14 955	24 461	7 870	12 144	15 000	4 611	31 154	6 153	444 607	52 626	304 020	52 374	8 912
1920	45 171	7 309	40 255	62 932	38 962	22 193	6 019	26 055	81 797	5 880	9 521	115 013	15 770	30 076	10 193	13 933	14 212	4 941	32 452	6 849	479 600	59 319	318 590	57 886	10 840
1930	46 818	8 360	41 881	66 855	42 273	24 472	6 228	29 885	91 131	6 712	11 063	127 491	18 595	36 838	12 942	15 569	16 093	5 294	33 804	8 525	503 386	68 580	358 420	67 097	13 870
1940	49 089	9 324	40 116	68 425	45 487	26 702	6 622	25 221	112 849	7 395	12 445	140 223	23 345	45 781	15 325	17 862	18 953	5 672	35 213	10 341	531 267	76 885	385 790	77 746	17 140
1950	50 937	10 707	44 169	70 114	48 449	29 199	7 239	26 980	106 356	9 193	15 879	164 744	32 628	61 137	18 740	23 630	23 988	6 522	36 190	15 221	603 667	88 967	390 800	88 292	23 188
1960	54 071	12 197	49 317	75 058	51 765	32 007	7 712	31 043	125 422	11 342	19 887	192 499	44 605	82 093	22 111	29 913	31 593	9 448	47 530	19 693	714 953	98 414	480 300	105 057	31 663
1970	56 105	13 578	53 620	78 406	55 213	35 467	8 180	33 839	134 016	13 618	23 033	215 026	59 863	107 668	25 890	36 901	39 967	13 300	63 729	25 547	901 944	110 512	600 800	130 130	41 688
1980	56 676	14 482	56 366	78 080	56 648	38 416	8 367	36 949	143 363	15 637	25 882	237 482	75 888	135 984	30 468	49 186	50 345	19 436	84 268	33 562	1 045 764	120 227	748 200	162 009	50 853
1990	58 345	15 394	59 546	81 216	57 181	39 695	8 757	38 498	148 154	17 900	29 413	264 876	91 972	162 355	35 026	62 772	61 410	26 706	108 278	41 733	1 196 836	125 118	910 789	192 304	58 420
2000	60 255	16 300	62 566	82 363	58 008	40 270	8 980	38 580	143 623	19 992	32 087	292 989	104 960	186 420	38 826	76 142	71 593	34 071	134 650	46 986	1 295 198	127 278	1 074 611	216 177	63 709
2010	61 899	16 653	62 637	82 057	60 098	45 317	9 293	31 445	126 749	21 512	33 890	317 641	110 645	195 423	40 666	84 474	75 705	40 863	158 259	50 492	1 330 585	126 995	1 214 464	232 517	68 139

Note: For an assessment of data quality, see Table 2.1.
Source: Clio-Infra, *www.clio-infra.eu*.

StatLink http://dx.doi.org/10.1787/888933096673

Europe and the former Soviet Union. Since the 1970s, South and Southeast Asia, Latin America and the Caribbean and to some extent the Middle East and North Africa have claimed a larger share of the world population, mainly at the expense of Western Europe and East Asia. The population share of Sub-Saharan Africa is continuing to grow, despite the AIDS epidemic, frequent wars and famines. As we will discuss below, fertility rates in Sub-Saharan Africa have remained high until recently, whereas improvements in child health have contributed to continued population growth.

Over the past two centuries, the demographic experiences of the world's major regions have been very unequal, as can be seen in Figure 2.2. The figure presents decennial growth rates in percentages (see also Table 2.5). These growth rates are calculated on the basis of data of varying quality. Figure 2.2 provides some visual insight into the data quality by showing dotted lines instead of solids, in case of the lowest quality of data. This is when the rates are simply conjectures or "best (educated) guesses". In Figure 2.2, Western Europe appears as the only region with both stable and moderate population growth throughout the period. The growth curve for Eastern Europe and the Soviet Union was very erratic, reflecting the impact of the world wars and the economic and social crisis after the downfall of Communism. East Asia experienced a rate of population growth similar to that of Western Europe until the 1950s, with the exception of the 1850s and 1860s when the Taiping Rebellion took a large toll on the population of China (Maddison, 2007). Eastern Europe and the former Soviet Union, Western Europe and the Western

Table 2.5. **Population growth by region, 1820s-2000s**
Percentage growth per decade

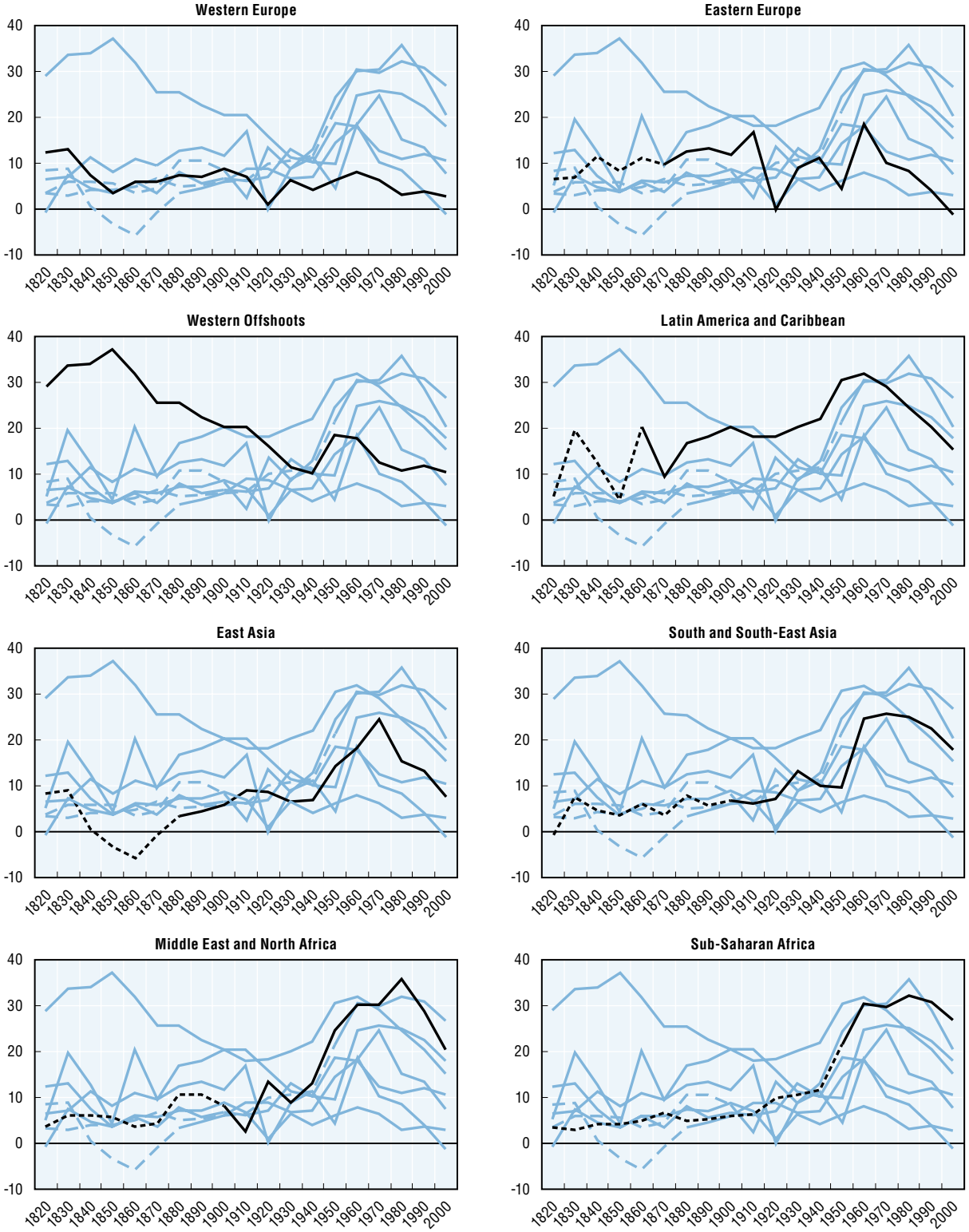
	Western Europe (WE)	Eastern Europe (EE)	Western Offshoots (WO)	Latin America and Caribbean (LA)	East Asia (EA)	South and South-East Asia (SSEA)	Middle East and North Africa (MENA)	Sub-Saharan Africa (SSA)	World
1820s	13.0	7.0	33.6	19.7	9.0	7.3	6.0	2.9	8.9
1830s	7.4	11.4	34.0	12.6	0.5	4.7	6.0	4.1	4.5
1840s	3.6	8.2	37.2	4.3	-3.3	3.6	5.7	4.1	2.2
1850s	6.1	11.1	31.9	20.3	-5.9	5.9	3.5	4.9	3.1
1860s	5.9	9.7	25.6	9.5	-0.9	3.6	4.4	6.6	4.1
1870s	7.3	12.5	25.5	16.9	3.3	7.9	10.6	5.0	7.7
1880s	7.1	13.3	22.5	18.0	4.6	5.7	10.7	5.3	7.7
1890s	8.8	11.8	20.3	20.4	6.0	6.7	8.3	5.9	8.5
1900s	6.9	16.9	20.3	18.1	8.9	6.1	2.4	6.3	9.3
1910s	1.0	0.0	15.9	18.3	8.7	7.0	13.5	9.9	7.3
1920s	6.4	8.8	11.4	20.2	6.7	13.1	8.8	10.7	9.9
1930s	4.1	11.2	10.2	22.0	7.0	10.1	12.9	11.5	9.5
1940s	6.3	4.4	18.6	30.6	14.5	9.7	24.5	21.4	13.2
1950s	8.0	18.5	17.9	31.8	18.3	24.7	30.1	30.5	21.1
1960s	6.3	10.2	12.5	29.0	24.6	25.8	30.3	29.8	21.8
1970s	3.1	8.4	10.8	24.6	15.3	25.0	35.7	32.1	19.1
1980s	3.7	4.0	11.9	20.4	13.3	22.4	28.9	30.9	17.4
1990s	2.9	-1.3	10.5	15.2	7.6	17.9	20.5	26.8	13.3
2000s	3.0	-7.3	8.1	6.8	2.6	11.6	12.1	16.7	7.7

Note: For an assessment of data quality see Table 2.1.
Source: Clio-Infra, *www.clio-infra.eu*.

StatLink http://dx.doi.org/10.1787/888933096692

Figure 2.2. **Population growth by region, 1820s-2000s**

Percentage growth per decade



Note: For an assessment of data quality, see Table 2.1. Dotted lines indicate quality 4 data (low quality: guestimates, conjectures).
Sources: Clio-Infra, *www.clio-infra.eu*.

StatLink http://dx.doi.org/10.1787/888933095533

Offshoots experienced modest population growth after the 1950s. In these regions, the modest "baby boom" after the 1940s was not sustained, and population growth had already receded by the 1960s. The Western Offshoots are the only area where population growth was extremely high in the 19th and early 20th century, mainly reflecting the impact of in-migration. Similar patterns can be found for Latin America and the Caribbean. Between 1846 and 1940, approximately 55 to 58 million people left Europe for the Western Offshoots and Latin America, thus contributing strongly to moderating the population growth rates of Western and Eastern Europe and elevating the rates in the Western Offshoots and later in Latin America and the Caribbean.

All the other regions represented in Figure 2.2 experienced their strongest population growth in the period between 1950 and 1990. The East Asian population continued to increase strongly until the 1970s, but the Chinese one-child policy introduced in 1979 strongly slowed this pace. The MENA countries, South and Southeast Asia and Sub-Saharan Africa stand out with relatively slow population growth until 1950, and then a very rapid increase with a peak around 1970. Latin America and the Caribbean started out with relatively high population growth rates in the late 19th and early 20th century, exhibited a population boom between the 1940s and 1960s, and then entered a phase of declining growth rates ahead of the other regions in the 1970s. In the MENA region and Sub-Saharan Africa, population growth continued longer than in either Asia or Latin America. With respect to timing, the Sub-Saharan Africa trend reflects the trends in Asia and Middle East, but with only a limited decline after 2000. Currently Africa's population is growing faster than in any other region.

Until recently, most scholarly attention has gone to the intercontinental migration from Europe to the Americas. But between 1846 and 1940, in the same period as this major migration towards the Americas, similar huge population movements occurred in Asia. About 50 million people moved from India and southern China to Southeast Asia, the southern Indian Ocean Rim, and the South Pacific. Another estimated 50 million people moved from northeast Asia and Russia to Manchuria, Siberia, central Asia and Japan (McKeown, 2004). As large parts of these movements took place within Asia, their impact on the Asian population trend is relatively limited. But this migration impacted the sub-regions of Asia very strongly. Until recently, these global migration streams largely bypassed Africa. Currently, there is a strong migration from South to North America, which contributed to lowering the population growth rates in the former while raising rates in the latter (Cleland, 2013), as reflected in Figure 2.2. Europe's low rate of growth would have been negative, if not for the increased immigration, including asylum seekers, after the late 1980s (European Communities, 2002). The family reunion of former guest workers from Turkey and Morocco also played a major role in the increase in immigration.

Demographic transitions

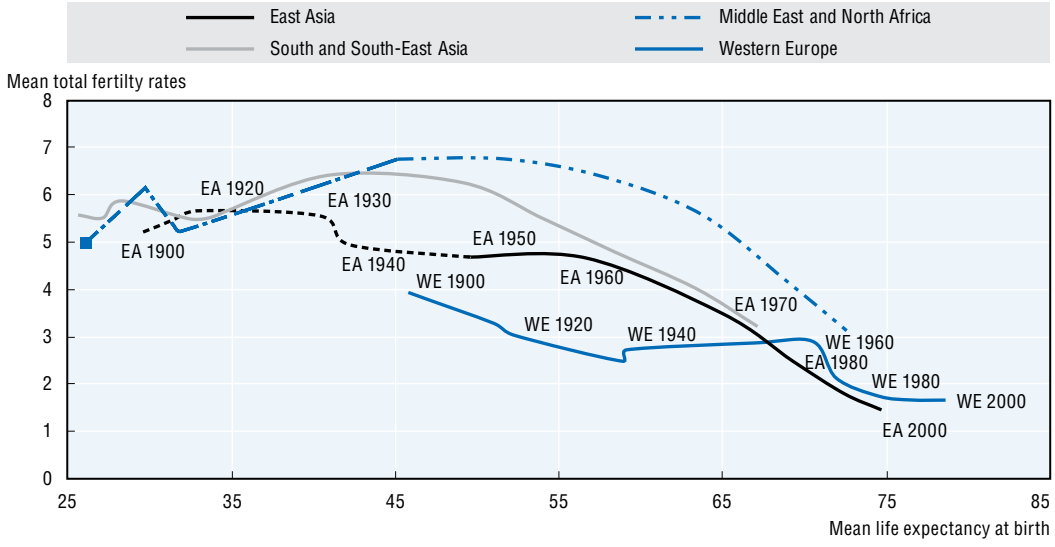
The growth of the world population is determined by birth and death rates, and thus to a large extent by changes in the individual risks of having children and of dying. Demographic change in the past two hundred years has been characterised by a decline in mortality rates, followed by a decline in fertility rates. The quicker the fertility decline followed the onset of mortality decline, the more population growth was held in check. Figure 2.3 plots the demographic trajectory of selected world regions between 1900 and 2000. In the figure, the dotted lines indicate lower quality data, and should be treated with caution. All world regions followed – to a lesser or greater extent – the development sketched above, i.e. an overall move from low to high life expectancy and from high to low

fertility rates, which implies a move from the upper left hand to the lower right hand corner of Figure 2.3. Greater distances between the labelled points indicate an increasing speed of change. Thus, in the earlier and more recent periods, life expectancy and fertility rates changed at a slower pace than in the period in-between. The example of East Asia shows how to trace the developments over time: for this region, the strongest changes occur after 1920, initially in the form of gains in life expectancy, but after 1960 also in combination with declining fertility rates. Figure 2.3 shows stark differences in how each region made this transition. In 1900 Western Europe had already started at a relatively low fertility level and relatively high life expectancy and has reached, by now, the highest life expectancy and lowest fertility rates. Apart from a brief period, its trajectory was not marked by increasing life expectancy running ahead of the fertility decline. A comparison between East Asia and Western Europe graphically illustrates the different speed at which the different fertility transitions took place. The space between the decennial observations is larger for East Asia than for Western Europe and the slope of the fertility decline between 1960 and 2000 is much steeper. In the MENA countries, there are periods when both life expectancy and fertility rates increased, a combination that ensured strong population growth. To a certain extent, these patterns are similar for the other regions.

Figure 2.3 highlights similar patterns for mortality and fertility rates. While some world regions may have experienced population growth longer than others, there is a trade-off between higher life expectancy and lower fertility rates. This historical and irreversible process has become known as the "demographic transition". Since the mid-19th century this transition has taken place everywhere in the world, albeit with strong regional differences in timing and consequences. In the process, several stages can be discerned. Already in

Figure 2.3. **Regional averages of life expectancy at birth and total fertility rates, 1900-2000**

Years and number of births per woman



Notes: Dotted lines indicate quality 4 data (low quality). For an assessment of data quality, see Table 2.2.
Sources: Life expectancy at birth: Clio-Infra, *www.clio-infra.eu*; total fertility rates: Gapminder: Children per woman (total fertility), *http://www.gapminder.org*.

StatLink http://dx.doi.org/10.1787/888933095552

the 18th century, mortality rates began to decline in a number of European countries and overseas territories. In some countries, notably France and the North American colonies as well as among the most advantaged groups in various countries (e.g. the aristocracy), the fertility rates also declined. In the 19th century these declines were briefly reversed when birth and death rates increased again. This upswing, whose drivers are still ill understood, formed the immediate precursor of rapid declines in mortality and fertility rates in most Western countries. At first, child mortality declined, followed by infant mortality. In these countries, weaker gains were also made in reducing adult mortality (Reher, 2011). In the first "wave" in Western Europe and its Offshoots, fertility rates began to decline shortly after the onset of mortality decline, with this decline mainly affecting older women once couples reached a desired family size. In most European regions, the onset of the decline (defined as a reduction of at least 10% in fertility from the previous decade) took place around 1900 (Coale and Watkins, 1986). In the second "wave" (1950s-1980s), developing countries – at first those with close ties to Europe – followed suit. However, these regions experienced a much larger gap between the start of the mortality decline and the start of the fertility decline, resulting in a relatively long period of strong population growth (Figure 2.2). Once begun, however, the declines were faster than in the "first wave" countries (Reher, 2004, p. 24).

The European fertility decline began in France in the 18th century, and then spread to other European countries in the 19th century. The pattern of this extension did not coincide neatly with that of industrialisation, urbanisation and rising living standards. The only factor that almost all European countries had in common was that the mortality decline preceded the fertility decline, which suggests that people responded to the burden of having larger families. Recent micro-level research has confirmed that 19th-century couples responded to the survival of their first-born children by ending their reproductive career, i.e. they stopped having additional children (Van Poppel et al., 2012; Reher and Sanz-Gimeno, 2007). Declines in infant and child mortality, in turn, were not strongly related to higher material well-being. A major factor in their decline was the amelioration of housing conditions and improved access to clean drinking water and milk in the late 19th century, especially in the cities (Costa and Steckel, 1997). Also of importance was the greater awareness of health risks due to better education in health and hygiene, especially of mothers (Reher, 2011; Mokyr and Stein, 1996).

Some European population groups were ahead of others in responding to new knowledge and lowering their fertility rates. The reason for this is that the ability and efficiency of couples to decide about their own procreation differed strongly from one socio-cultural group to another. According to Therborn (2004), agency, or the "sense of personal mastery", had always been stronger among the aristocracy than other groups. Also, rational (family) planning was more widespread among Protestants and Jews than Roman Catholics. Therborn also points out that the early fertility declines in France and North America followed experiences of revolutionary change, which expressed "personal mastery". More generally, the marriage pattern prevailing in Western Europe – as well as in North America – stimulated reproductive agency, characterised by the absence of arranged marriage, higher and similar ages at marriage for men and women, and the formation of a new household at marriage. Compared to couples in regions where co-residence in large and complex households was prevalent, European couples were themselves responsible for the impact of family size on the household's budget. For many centuries, the timing of marriage had been used to adjust procreation to economic circumstances. Within marriage, couples could to some extent "negotiate" whether, when and how they would delay or

forego the arrival of a next child. Research shows that the deliberate spacing of births to tide the family over difficult periods was a common practice (e.g. Bengtsson and Dribe, 2006; Dribe and Scalone, 2010). Research also indicates that couples always had a moderate target family size in mind, and that they used stopping – albeit with widely varying success rates – to reach that target. The "techniques" employed were basic: abstinence, withdrawal, and prolonged breastfeeding.

The first wave of (Western) fertility decline was not related to technological innovation; for a long time, rubber contraceptive devices remained associated with illicit sex and did not enter married couples' bedrooms (Szreter and Fisher, 2010). The rapid fertility decline experienced by European countries in the late 19th century thus resulted from the willingness and capacity of couples to adjust family size (by delaying marriage and by controlling birth within marriage), combined with the perception that larger families were becoming too costly. The latter factor resulted from the growing awareness that children were much more likely to survive. Moreover, the compulsory schooling introduced in most of Western Europe in the 1870s and 1880s increased the financial costs of children and strengthened couples' motivation to limit the size of their families (Therborn, 2004; Murtin, 2013). Finally, the potential financial "benefits" of children were curbed by laws against child labour. Compulsory schooling and child labour laws reflected a growing cultural appreciation of the child, who was to be kept away from the labour market for as long as possible (Zelizer, 1985; Cunningham, 1995).

In the second wave, in which the demographic transition spread beyond the Western countries, fertility rates responded much later. Why was this so? Several factors played a role. First, mortality decline was much less an intrinsic part of societal transformations (industrialisation, spread of mass education, rise of secular social institutions such as labour unions) than it had been in Europe (Reher, 2004). Instead, it resulted from "imported" new medicines and sanitary and health programmes, sometimes aggressively promoted by governments. Second, traditional family norms and practices implied a different response to the larger size of families. New technologies facilitated fertility limitation, yet its implementation did not fit traditional practices as smoothly. Unlike in Western Europe, the burden of children could be carried by extended households and clans. Also, people in southern and eastern Asia had long-standing traditions of "post-natal" birth control, i.e. the adjustment of family size to circumstances (through infanticide or adoption). In large parts of Africa as well, "excess" children could easily be moved to families of kin as "foster children" (Isiugo-Abanihe, 1985). In many cultures, an outspoken preference for sons also limited the motivation for birth control (Mason, 2001). Often, the position of women in the internal hierarchies in joint family households depended on the number of sons they had. At the same time, governments were eager to promote the Western model of the nuclear family, which was highly associated with modernity and development. Thornton (2005) has described how this "developmental idealism" became a major factor in the demographic change experienced by the developing world after the Second World War. When such policies were implemented, China being the prime example, family limitation could be implemented at a much more rapid pace than in the first wave, due to new technologies and a faster spread of knowledge about the matter. Finally, in many countries, the period of 1950-1980 was characterised by relatively rapid economic growth, which moderated the effect of growing population pressure. Children could be sent to the expanding cities, limiting the need for birth control (Reher, 2004).

"Classic" transition theory predicted that the world would move from one balanced, stable demographic system to another. However, there were strong fluctuations in vital rates in Western Europe and the Western Offshoots even in the early 20th century. These fluctuations have put in perspective the notion of a self-regulating demographic system, where moderate population growth was based on relatively small families. In the period between the First and Second World Wars, many Western countries already experienced below-replacement fertility rates. Contemporary commentators pointed at the remarkable increase of childless and one-child families, and blamed this on changing life styles (Van Bavel, 2010). At the time, most demographers expected the low fertility rates to last. In this context, the surge of birth rates in the 1950s came as a big surprise (a "birth quake"). Contrary to what is often assumed, the surge was not simply related to the postponement of marriages during the Second World War. In fact, in many Western countries the upward trend in fertility rates was already visible in the late 1930s or early 1940s. Moreover, the baby boom also took place in neutral countries such as Portugal and Sweden. So far, no convincing explanation has been given for this remarkable turn of events. Current research points towards the importance of lower opportunity costs of children for women. Post-war wages rose faster for men than for women, enlarging the gender gap, which stimulated the "breadwinner model" of women staying at home with children. Also, work opportunities for young women had deteriorated relative to older women who had found work during the war and held onto their jobs afterwards. In the 1960s, the retirement of these older women expanded the employment opportunities for younger women and heightened the opportunity costs of children (Van Bavel and Reher, 2013).

In retrospect, the 1940s and 1950s were the golden age of marriage and the breadwinner family in Europe and the Western Offshoots. Neither before nor afterwards had so many people followed a similar life course pattern, determined by marrying, leaving the labour market (women) and having children. All this was to change rapidly in the 1960s: the contraceptive pill decoupled sex from procreation, the sexual revolution decoupled sex from marriage, and the second feminist wave challenged traditional role models. Life courses rapidly lost their predictability, as marriage lost its function as the major initiation to adulthood and social respectability. An increasing part of the population chose to live alone, unmarried couples started to cohabit – initially as a first step towards marriage, but increasingly replacing marriage altogether – and marriages and consensual unions tended to end in separation more often. Furthermore, couples increasingly postponed the advent of children and opted for a very small or childless family. Not surprisingly, fertility rates have gone down once again to sub-replacement levels, and only very recently have there been signs of recovery in some European countries.

These sweeping changes in marriage and the family have been labelled the "second demographic transition". The cause is believed to be a change in the value structure of Western societies, and increasingly in non-Western ones too. The standard of living attained in the 1960s and afterwards has, for the first time in human history, created the opportunity to fulfil "post-materialist" needs, such as recognition, freedom of expression, and self-fulfilment (Lesthaeghe, 2010). Self-fulfilment also implies weaker commitment to lasting relationships, which is reflected in delays in family formation, an increase in living alone and divorce rates, higher cohabitation and fewer children. According to Lesthaeghe and other demographers, this is a truly new transition, not just the next stage of the first demographic transition. In this perspective, while the first transition was triggered by the

desire of parents to give (a smaller number of) children better opportunities, the second transition is solely the result of a desire for self-fulfilment.

However, many recent global demographic changes, in particular the strong decline of fertility rates, cannot be interpreted solely as the global spread of Western-style individualism. In various regions, such as the former Soviet countries, the rise in cohabitation and the decline in fertility levels have been linked to the economic and social crises of the 1990s. Also, in developing and developed countries alike, traditional norms of kin obligations still constrain the decision-making of individuals and couples (e.g. Ochiai, 2011). In Italy, for instance, the prolonged economic dependence of youth on the older generation has led them to postpone parenthood (Dalla Zuanna, 2001). It has also been suggested that the discrepancy between a labour market that offers women greater opportunities and the traditional gender roles of women in the family may have contributed to strong declines in fertility rates in countries such as Italy and Spain (Kertzer et al., 2009; McDonald, 2000). The demographic transition seems far from completed, and global convergence towards a "Western" demographic model, if it ever occurs, is likely to be a protracted process (Wilson, 2011).

Implications of demographic change

Demographic trends are often described as the consequences of social, economic and cultural changes. However, there is increasing evidence that demography itself has played a major and partly autonomous role in the societal transformations of the past centuries. The differential impact of demographic trends explains to a large extent the persistent divergence of the economic fortunes of the developed and developing countries.

As we have seen, the first wave of the demographic transition is closely linked to the "modernisation" (e.g. improvements in health and education, increased individual "agency") of 19th-century western societies. However, the transition is also believed to have strongly stimulated progress by itself and to have set in motion a "virtuous cycle" of economic and social change (Reher, 2011). First, the transition changed the age structure of society. Initially, when infant and child mortality declined and fertility rates increased, the share of young people in the total population increased, adding to the burden on the working population. However, once fertility rates declined, the "youth bulge" did not become bigger: rather, it worked its way up in the population pyramid and added to the productive labour force. Thus began a period with decreasing dependency ratios – known as the "demographic dividend" – which may have supported economic growth. Of course, in time members of this age group will reach retirement and contribute to increasing old-age dependency ratios. Yet, their life-cycle savings, which they accumulated during the period of economic growth, may amount to a "second demographic dividend" mitigating the negative impact of an ageing population. Most authors underscore that the contribution of the demographic dividend to economic development depends on the ability of the economy to absorb the surplus of working-age population into the productive labour force. The time frame of this dividend – the "window of opportunity" – matters for the likelihood that countries will succeed in productively incorporating this surplus labour (Reher, 2011).

Second, reproduction became much more efficient. High fertility rates and high infant and child mortality meant that women had to spend large parts of their life-time in pregnancy and child care. With declining child mortality, the same number of children

could be raised with a much lower investment of women's time. This meant women had more time to join the labour market. As women joined the labour market, the number of dependents to earners in the household decreased, with positive effects on the amount of economic resources available per household member. Third, children gained as well, in terms of health and education, from the increased parental time and care. Growing confidence in children's survival also meant that investment in children became more secure, which could stimulate parents to make a trade-off from a high quantity of children with low amounts of human capital, to a smaller quantity of children with a higher human capital stock. According to Reher (2011), parents' growing demand for education was an important factor in the spread of mass education, which added to the virtuous cycle of economic growth. The opportunity for upward social mobility is also part of the incentive structure of modern, industrial society. Greater chances of children from small families to rise on the social ladder (e.g. Van Bavel, 2006) may have induced other couples to keep their families small as well. Fourth, the rising population pressure fuelled by the earlier and stronger decline of mortality than of fertility was relieved through migration. Emigration opened up niches for those who stayed and stimulated the economies of the native countries through remittances. Moreover, a sizeable number of migrants returned, and brought their savings and human capital back to their native economies. Fifth, the decline of adult mortality implied that people could expect to live longer periods in relatively good health. This meant that more people could make realistic "life plans", adding to their "sense of personal mastery". Adult life expectancy improved due to the retreat of infectious diseases, better health provisions, and – in time – the lasting impact of the better care and resources they received as children in smaller families. Finally, the demographic transition may have contributed to the democratisation of countries in the 19th and 20th centuries. The decline in fertility rates – by lowering the speed of population growth, changing women's lives, and shifting the age structure towards adults – was associated with a greater likelihood that autocratic regimes are challenged as well as with greater political stability (Dyson, 2012).

By stimulating low dependency ratios, women's labour market participation, migration, human capital, social mobility, agency and even democracy, the demographic transition can be seen as part and parcel of a "virtuous cycle" of beneficial economic and social developments. Yet whether this cycle is similarly virtuous in the developing world remains to be seen. In the second wave in which the demographic transition spread to the developing world, positive effects occurred to a much more limited extent, if at all. One reason is the gap between the decline in mortality and the decline in fertility. In fact, some regions experienced an increase in fertility rates, and in some of them vital rates were high to begin with. The strong decline in mortality thus led to strong population growth and a relatively large youth bulge. Contrary to the first wave, mass emigration offers limited relief, as host countries have put up many barriers to immigration. The rapid decline of fertility and mortality rates also means that the second wave countries are heading toward strong population ageing in the near future. The shorter period of the demographic dividend implies a smaller period for redirecting resources to alleviate the shock of the future increase in old-age dependants (Pison, 2009). Reher (2011) has demonstrated this by estimating for a sample of countries the "window of opportunity" defined as the difference between the year when tolerable and even beneficial population growth sets in and the year when ageing becomes a major problem. In first wave countries, this time period was comfortably long: in Reher's example, 119 years in Sweden and 104 in Spain. In second wave countries in the sample, the period is much shorter: from 38 years in China to a

mere 11 years in Morocco. Instead of benefiting from the demographic transition, it is more likely that the mismatch between rapid population growth and available resource adds to the burdens borne by developing countries, further exacerbating inequality in well-being within and between countries.

Priorities for future research

In demographic terms, the world is facing an uncertain future. In several areas, the decline of fertility below the replacement level is showing no sign of abating, resulting in net population decline. Population ageing is posing economic challenges to societies worldwide. For instance, governments are contemplating scenarios in which costly nursing homes are replaced by extended families. In some countries, this may fit with traditional norms and practices, but in others this may lead to a misfit between family institutions and policy-making. Demographic pressure, inequality and economic stagnation, coupled with ever-expanding communication and transport infrastructures, will continue to fuel the stream of migrants from poor to rich countries. Demographic forecasting is at the heart of policy-making. To improve the quality of forecasts, we will also have to work on our understanding of the past. Insight into the complex (cultural, economic and institutional) settings in which our predecessors were triggered to alter their family composition may still help in calibrating scenarios for the future.

Patterns of demographic change share strong similarities worldwide. Population growth is governed by the dynamics of mortality and fertility rates. Globally, the shift from high fertility rates and low life expectancy towards low fertility rates and high life expectancy has occurred in all the world's regions. Yet the speed and implications of these transitions are different and depend on the region-specific context. Not only does this add to existing inequalities in economic growth and well-being, but it also makes it harder to predict future demographic outcomes.

Note

1. The arguments for comparing Indian and African growth rates are discussed in Frankema and Jerven (2013), pp. 20-23. We note that these are preliminary estimations, and they have therefore not been added to the population dataset used.

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