The Economist

MEGACHANGE

The world in 2050

Edited by

Daniel Franklin
with
John Andrews

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Contributors

Barbara Beck is *The Economist*'s special-reports editor.

Geoffrey Carr is *The Economist*'s science and technology editor.

Philip Coggan is the Buttonwood columnist and capital-markets editor of *The Economist*. He is the author of *The Economist Guide to Hedge Funds* and, most recently, *Paper Promises: Money, Debt and the New World Order*.

Simon Cox is *The Economist*'s Asia economics edtior, based in Hong Kong.

Tim Cross is a science correspondent at *The Economist*.

Kenneth Cukier is *The Economist*'s data editor. Previously he was the newspaper's Japan business and finance correspondent, based in Tokyo.

Martin Giles is *The Economist*'s US technology correspondent, based in San Francisco. He has covered business for the newspaper from New York, Paris and London.

Anthony Gottlieb is a New York-based writer. A former executive editor of *The Economist*, he is the author of *The Dream of Reason: A History of Philosophy from the Greeks to the Renaissance*.

Robert Lane Greene is *The Economist*'s professional-services correspondent, based in New York. He also edits "Johnson", *The Economist*'s blog on language, and is the author of *You Are What You Speak: Grammar Grouches, Language Laws, and the Politics of Identity*.

Charlotte Howard is *The Economist*'s health-care correspondent, based in New York. She was previously the newspaper's Midwest correspondent, based in Chicago.

Laza Kekic heads the Economist Intelligence Unit's regional team of analysts covering central and eastern Europe. He is also director of the EIU's Country Forecasting Service.

Edward Lucas edits *The Economist*'s International section. A former Moscow correspondent, he is the author of *The New Cold War: How the Kremlin Menaces Russia and the West* and, most recently, *Deception*, a book on east-west espionage.

Zanny Minton Beddoes is *The Economist*'s economics editor, based in Washington, DC.

Oliver Morton is *The Economist*'s briefings editor and was previously energy and environment editor. He is the author of *Eating the Sun: How Plants Power the Planet* and *Mapping Mars: Science, Imagination and the Birth of a World.*

John Parker is *The Economist*'s globalisation editor. His previous roles include bureau chief in Washington, Moscow and Brussels.

Matt Ridley is a former science and technology editor, Washington bureau chief and United States editor of *The Economist.* He is the author of several books, including, most recently, *The Rational Optimist: How Prosperity Evolves.*

Ludwig Siegele is *The Economist*'s online business editor. He was previously the newspaper's London-based technology editor.

Matthew Symonds is *The Economist*'s defence and security editor. His previous roles with the newspaper include industry editor and political editor.

Paul Wallace is *The Economist*'s European economics editor. He is the author of *Agequake: Riding the Demographic Rollercoaster Shaking Business, Finance and our World.*

Adrian Wooldridge is *The Economist*'s management editor and Schumpeter columnist. He is co-author of several books and, most

recently, the author of *Masters of Management: How the Business Gurus and Their Ideas Have Changed the World – for Better and for Worse.*

The editors

Daniel Franklin is executive editor and business-affairs editor of *The Economist*. He is also the editor of *The Economist*'s annual publication on the year ahead, *The World in....*

John Andrews has written for *The Economist* for more than 30 years and is deputy editor of *The World in ....* He is the author of *The Economist Book of Isms.*

Introduction: meet megachange

Daniel Franklin

IT WAS 250,000 YEARS BEFORE the world's population reached 1 billion, around 1800. But it took only a dozen years for mankind to add its latest billion, passing 7 billion in October 2011, by the United Nations' official count. This is megachange: change on a grand scale, happening at remarkable speed. It is all around us. Technology is spreading astonishingly fast – think of the internet, mobile phones and the oceans of information now captured on computers or transmitted via social networks such as Facebook and Twitter. The global economy is tilting towards Asia in front of our eyes. All this is having a deep impact on people's lives, businesses' strategies, countries' politics and the planet's prospects.

One of the twin aims of this book is to identify and explore the great trends that are transforming the world, in everything from its health to its wealth. The idea is to cut through the usual clutter, topic by topic. What emerges with refreshing clarity is the big picture, the helicopter view.

The other aim is to look into the future, at how these developments might shape the world in 2050. This is, on the face of it, absurdly ambitious. History is littered with prophecies that turned out to be utterly wrong, as Dan Gardner damningly documents in his book *Future Babble*. "It is as certain as anything in politics can be, that the frontiers of our modern national states are finally drawn," wrote a British journalist, H.N. Brailsford, in 1914. "My own belief is that there will be no more wars among the six Great Powers." Soon afterwards the first world war broke out. "I expect to see the stock market a good deal higher within a few months," forecast Irving Fisher, an American economist, a week before the 1929 crash.

How can anyone know what the future holds? It is hard enough to predict what the weather will be like tomorrow, let alone in four decades' time. By then, the world will have witnessed successive flocks of "black swans", as Nassim Taleb, a writer on randomness, calls unpredictable developments.

Yet it is still worth having a guess. Looking ahead to 2050 is, strangely enough, easier than predicting what will happen next week or next year. Even Taleb is happy to peer a generation or so ahead: over such a period, he reasons, "anything fragile today will be broken". To return to the analogy of the weather, the forecast for next month is unlikely to be terribly reliable; but it would be downright irresponsible not to ask how weather patterns might change by 2050.

Besides, some pretty important aspects of the coming decades can be forecast with a fair degree of confidence. Take demography: though not quite destiny, it comes pretty close. It is an excellent starting point for thinking about the future. Indeed, it is where this book begins, with John Parker's magisterial overview of population trends.

Those trends reach into many of the other topics tackled in these pages. The 20 chapters, each written by a journalist from *The Economist* or a member of its extended family, cover a wide range of subjects, grouped into four broad categories: people, the planet, the economy and knowledge. Running through all of them are not only the theme of megachange but also a number of shared ideas about the future (including an appropriate humility about the fallibility of forecasts).

2050 vision

First, the contributors take more or less the same approach: to look ahead, you have first to look back. This helps to provide a clear idea of the nature and scale of change. It also gives a sense of the momentum behind it.

But that momentum may meet resistance. Hence a second common thread: a willingness to envisage disruption down the road, not simply a straight extrapolation of the past into the future. Nothing might seem more certain than continued destruction of the environment, yet Matt Ridley looks forward to a period of extensive

ecological restoration and Oliver Morton explores the profound shifts that could follow from an alternative, risk-management way of thinking about climate change. Despite the flowering of faith in recent times, Anthony Gottlieb argues that religion will eventually weaken in the developing world. Charlotte Howard expects revolutions in genomics and health-care delivery to alter the dynamics of disease. Disruptive social change will flow from rapid development in the emerging world and, as Barbara Beck describes, from the rise in education and opportunities for women. Edward Lucas predicts that, strangely, over the next four decades democracy will advance in authoritarian countries but retreat in free ones.

As for economic matters, the rise in inequality in the rich world now seems relentless, yet it may well go into reverse in the coming decades, reckons Zanny Minton Beddoes. On current trends, states will become ever more bloated because of the rising costs of providing health care and pensions, but Paul Wallace expects reforms will eventually make states smarter and fitter. China's stunning surge is now taken for granted year after year, but by 2050, says Simon Cox, its annual growth rate will be around 2.5%.

That said, the rise of Asia in general, and China in particular, is a third strand that runs through much of this book. A great shift towards the East is taking place. This really is a case of back to the future: as Laza Kekic points out, by 2050 Asia will account for more than half the world economy, which is what its share was back in 1820 and for centuries before that. This will profoundly affect everything from the environment to the balance of military power and the centre of gravity of the global economy. Yet don't expect China to dominate everything by 2050. Mandarin, reckons Robert Lane Greene in his chapter on culture, will not replace English as a world language. Nor will Chinese scientists lead the world, believes Geoffrey Carr – or at least not unless China's political system changes to accept the sort of liberal intellectual environment that allows science to flourish.

Fourth, the authors tend to paint a picture of progress, in contrast to much of the predictions industry, which likes to wallow in gloom. Not that they see the future through rose-tinted crystal balls; far from it. They see enormous challenges ahead, from managing climate change and controlling conflicts over scarce resources such as water

to feeding 9 billion people by 2050 and coping with the multitude of new security threats described by Matthew Symonds in his chapter on the future of war. Yet the pages that follow are, on the whole, optimistic. Or, at least, confident that with the right policies progress is possible on most fronts.

In other words, there is every chance that the world in 2050 will be richer, healthier, more connected, more sustainable, more productive, more innovative, better educated, with less inequality between rich and poor and between men and women, and with more opportunity for billions of people. The world will certainly be more urban (nearly 70% of its population will live in towns and cities, compared with just over half today), considerably older (the median age will rise from 29 to 38) and more African (roughly half of the planet's extra 2.3 billion people will be in Africa). Much of this change will come with wrenching upheaval. But as Adrian Wooldridge concludes, in contemplating the future of business: "The storms of creative destruction are blowing us to a better place."

New technologies will help – some as yet unimaginable but others already coming into view. Manufacturing may be revolutionised by "additive" techniques or three-dimensional printing that will make it routine to produce your own car parts. Medical miracles are likely to come from genetically targeted drugs, vaccines that do not need refrigeration during transport and stem cells that grow new tissues. Biology and robotics could combine to make it possible to revitalise paralysed limbs. As the boundaries between the real and virtual worlds blur, learning could be democratised by near-universal access to virtual Oxbridges and Harvards. Science fiction could even become 2050 fact: the rebirth of an extinct species is a distinct possibility. What's more, according to Tim Cross, the discovery of alien life is a pretty good bet.

These are just some of the possibilities to look forward to, and they point to one other thing these chapters have in common. They are brimming with (often counter-intuitive) ideas and data: myriad glimpses of a future that many will find surprising. By 2050, for example, France will be overtaking Germany in population, China's population will on average be older not only than America's but even than Europe's, while a booming Muslim Middle East could be reaping

the economic benefits of a "demographic dividend". Nearly 400m Nigerians will be well on the way towards outnumbering Americans – and Nigeria could by then be one of the few big emerging markets to be growing at the sort of pace now associated with the BRICs (Brazil, Russia, India and China).

At a strategic level, NATO by 2050 may have gone out of business as a serious defensive coalition, and drones will have replaced manned aircraft for the majority of missions. Among the sciences, biology will rule, in fertile collaboration with nanoscience and information science. In the markets, the world will have witnessed more than one cycle of the sort described by Philip Coggan. For individuals, having your genome sequenced may be as common as having a blood test today. Learning a foreign language could be a little-used skill, almost as outdated as calligraphy, thanks to progress in computer translation. Individual intelligence will routinely be supplemented by collective intelligence, suggests Martin Giles, as a result of constant connectivity to social networks. Indeed, Kenneth Cukier argues, ubiquitous computing – chips in everything – will bring about the biggest change in how people live over the next four decades. In a world in which telecommunication has in effect killed distance, will physical location still matter? More than you might imagine, argues Ludwig Siegele.

All this is why the chapters that follow will stimulate and provoke a wide variety of readers. Corporate strategists, government policymakers and students of everything from biosciences to business will find rich pickings here. More broadly, this book will fascinate anyone with an interest in seeing today's news in its deeper context and with a curiosity about the possible news of the future.

That future does not have to be nearly as grim as prophets of doom would have you believe. Despite the many perils ahead and the undoubted difficulties of adjusting to megachange, the world in 2050 may not be such a bad place. If you are not convinced, turn to the final chapter, on predictions and progress. It will brighten your day, if not your decades.

PART 1

People and relationships

The dynamics of demography, health and culture

1 Not quite destiny

John Parker

The population of the world is certain to increase – but is the world prepared for the consequences?

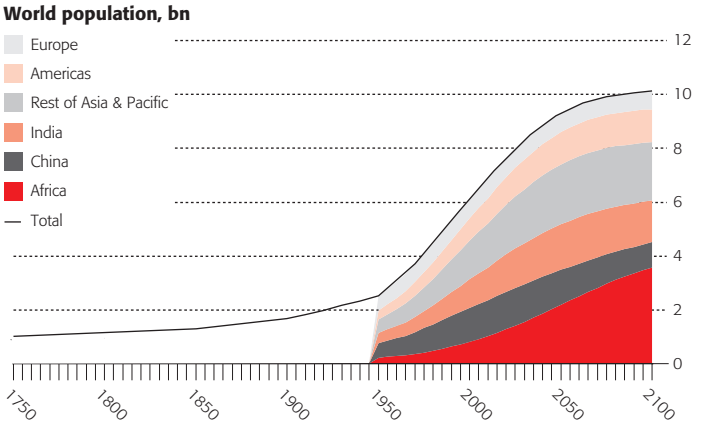
ON OCTOBER 31ST 2011, the world celebrated – if that is the term – the birth of its seven-billionth living person. The United Nations had declared that day to be the one on which the global population would reach 7 billion and happy parents and publicity-seeking governments rushed to claim the title for a particular newborn: Nargis Kumar, for example, born at 7.25am local time in Mall village, in India's largest state of Uttar Pradesh, or Danica May Camacho, born at the stroke of midnight in Manila.

Adnan Nevic, who had been born in the Bosnian capital of Sarajevo on October 12th 1999, was then two weeks past his 12th birthday. He had been declared the six-billionth living person and the dozen-year interval between his birth and that of baby Nargis and baby Diana was the shortest-equal on record – equal, that is, to the time that it took for the global population to rise from 5 billion to 6 billion between 1987 and 1999.

On this measure, the world's population is increasing faster than it has ever done in human history. It took 250,000 years to reach 1 billion, more than a century after that to reach 2 billion (in 1927) and 33 years more to reach 3 billion. By 2050, the world will have over 9 billion people in it and the number will still be rising (see Figure 1.1).

The growth in certain countries has been and will continue to be astounding. Nigeria in 1970 had 57m people. By 2050, unless its fertility rate falls unexpectedly fast, it will have 389m – almost the population of the United States then. Tanzania is growing faster still,

FIG 1.1 **People power**



Source: UN

from 14m in 1970 to 139m in 2050. By 2100, they will be the third- and fifth-most-populous places on Earth.

Conversely, some national populations that are now among the world's largest will have hit their peak and be in decline. Russia's numbers have been falling since 1995. Japan's peaked at 126m in 2010. China's will peak at 1.4 billion in 2025, declining thereafter. Even India's population – the largest in the world in 2050 – is nearer its maximum size than most people realise: its peak, when it reaches 1.7 billion, will occur around 2060, declining thereafter.

Different growth rates will shift the weight of population living in different parts of the world. Asia will remain the most populous continent, with just over half the planet's people. But that is a significant drop from 2000, when two-thirds of mankind lived there. In 2000, sub-Saharan Africa and Europe had roughly the same number of people. By 2050, Africa will be almost three times Europe's size. Of the 2.3 billion increase in the world's population between 2010 and 2050, about half will be in Africa.

The global population in 2050 will be considerably older, as well as larger (see Figure 1.2). The segment aged over 65 will more than

Projections: how much salt to be added?

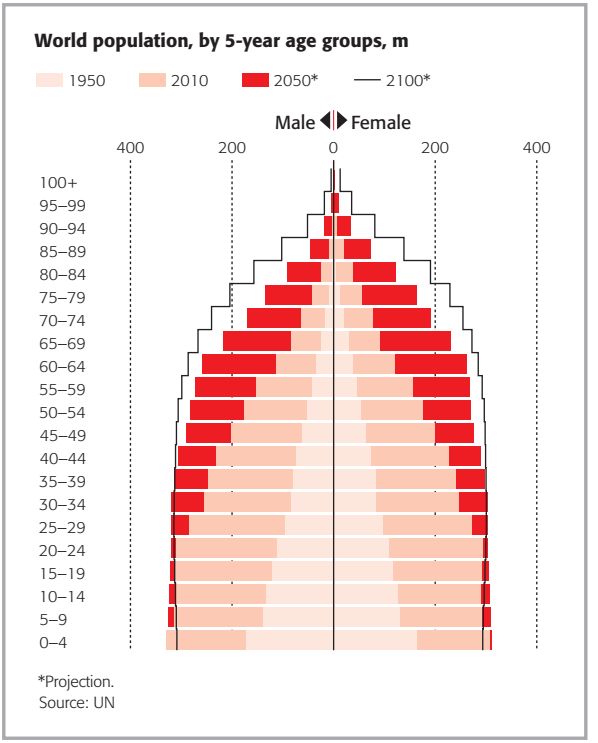
The population projections in this chapter come from the United Nations' population division, using the median forecasts published in 2011. They assume a continuation of the demographic trends of the past few decades. Unless the trends veer off unexpectedly, the projections for 2050 have a reasonable chance of accuracy. However, small differences in assumptions can have a big impact when compounded over many decades. The UN's high variant – which assumes higher fertility rates – projects population numbers about 12% above these figures. The low-variant projections are 8% below. Projections beyond about 2050 need to be taken with a bigger amount of salt.

double, from under 8% of the total in 2010 to over 16% in 2050. The so-called median age (the age at which exactly half the population is older and half younger) will rise by a full nine years in 2010–50, to 38, an increase that is unprecedented in terms of size and speed. In rich countries, many people will have a life expectancy of 100.

This older, larger population will also be much more urbanised (see Figure 1.3). Half the world's people lived in cities in 2010. By 2050 the share will be close to 70% and the cities of the world will contain about 6.5 billion people, the size of the whole world in 2005. Even by 2025, there will probably be 30 megacities of 10m people or more (in 1950 there were just two, the New York–Newark metropolitan area and Tokyo – see Figure 1.4). But the fastest growth will be in cities of 10m or fewer residents. McKinsey, a consultancy, reckons more than 400 such cities will lead growth in developing countries.

These trends will have the most profound effects both on people's family lives (mostly for the better) and also on their economic circumstances (not always for the better). In 1950 the world contained two distinct groups of countries in terms of life expectancy and family size: rich and poor. People in poor countries had much shorter life expectancies (only 37 years on average) and much larger families, often with six or more children. By 2050 there will still be

FIG 1.2 **Ever older**



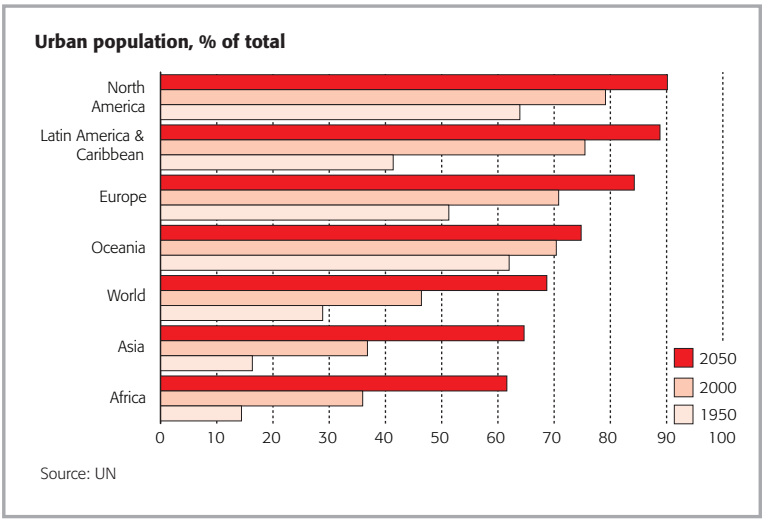
rich and poor countries, but in terms of life expectancy and family size there will no longer be two distinct groups. The world will have converged, with two-child families and life expectancies over 70 the near-universal norm.

This will transform what governments do and impose big new demands on public services. And it will change everything from business innovation and financial markets to the balance of power between the world's two most populous nations.

Comte and Malthus

Demography is destiny, said Auguste Comte, a French philosopher. But there is a big difference between demography meaning changes

FIG 1.3 **Going to town**



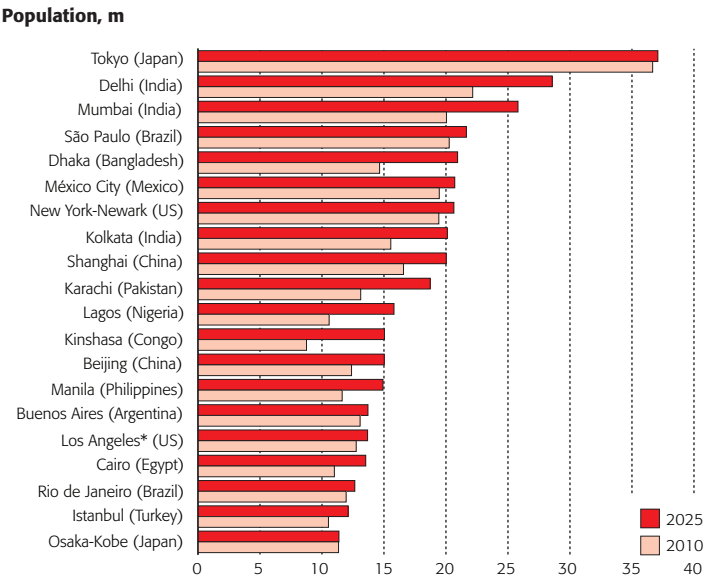
in the overall size of the population and demography in the sense of changes in the constituent parts of the whole – in the relative age and size of population groups, for example.

For many people, the important questions about population concern those overall numbers. Will the world be able to feed 9 billion mouths in 2050? Will the presence of so many people exceed the "carrying capacity" of the fragile Earth, and contribute to environmental degradation and planet-wrecking climate change? Will so many billions, jostling together cheek by jowl, go to war more frequently and deepen the bitter well of violence? These questions go to the core of the Malthusian worry that there are simply too many people – and the more people there will be in 2050, the worse off the world will become.

Yet, counter-intuitive though it may seem, these are not mainly demographic matters, and at a global level, trends in the overall size of the population will have variable effects. In some ways, Malthusian concerns are a distraction.

Consider the link between population and political violence. It seems intuitively plausible to think that the more people there are,

FIG 1.4 **A league of megacities**



*Los Angeles-Long Beach-Santa Ana
Source: UN

the more likely they will be to come into conflict. This is especially true when the numbers of young men are growing, or when groups of people are competing for a fixed or scarce resource, such as water.

In some areas where population growth is exceptionally rapid, local conflicts do indeed seem likely. West Africa is one such. The Sahel and the waters of the Niger river are likely to come under extreme pressure. Pakistan and the Indus valley is another. Pakistan's population is likely to grow from 175m in 2010 to 275m by 2050 – and the water table in its main farming area, the Punjab, is disappearing rapidly. This could produce conflict directly, for control of scarce land or water, or indirectly, through migration and the spread of refugees. In 2008 there were just over 200m people living outside their place of birth, according to the International Organisation for Migration, making up 3% of the world's population. That number

had doubled in the previous decade, and will rise further as people seek to leave poor, teeming countries for greener pastures.

But there is a difference between worrisome local conflicts and what is happening on a global scale. The world's population rose from 3 billion to 7 billion in the 50 years to 2010 (and the number of sovereign states increased almost as dramatically). But the number of wars between states fell during that period; the number of civil wars rose and then fell; and the number of deaths in battle fell from 20 per 100,000 people per year in the late 1940s to just 0.7 per 100,000 in the late 2000s, less than the homicide rate of the most peaceful societies.

This pattern of violence does not seem to have been influenced by the relentless pressure of population. Moreover, though the number of migrants rose in the first decade of the 21st century, the number of refugees or internally displaced people remained steady at around 10m. Indeed, the share of the migrant population which is most vulnerable to violence actually fell by half in 2000–10. What seems to have made a difference to levels of global violence is the decline in the number of post-colonial wars, the ending of cold-war conflicts and, possibly, the growth in the number and strength of international peacekeepers. If – obviously a big if – these trends were to continue, there seems no reason why a larger population in 2050 would necessarily be associated with greater levels of violence.

Something similar could be said about environmental damage. Almost all scientists accept that profound planet-wide changes have occurred: to the climate, to biodiversity, to levels of acidity in the oceans and to the nitrogen cycle (the process of converting nitrogen into its various forms). And human activity is overwhelmingly to blame. But it does not automatically follow that the more people there are, the worse all these forms of environmental damage will get. That depends on where and how people live.

In 2005 America and Australia each emitted almost 20 tonnes of carbon dioxide per person. In contrast, more than 60 countries – including the vast majority of African ones – emitted less than 1 tonne per person. The richest 7% of the world's population produce 50% of carbon emissions; the poorest 50% of the population produce 7% of the carbon. If these patterns remain unchanged, a doubling in the population of poorer countries would have a relatively minor

impact on climate change, compared with the likely 30% rise in the population of the United States. To put it another way, stopping one American being born will have 20 times the environmental impact of stopping one birth in Africa.

Most of the world's population growth in the next 40 years will occur in countries that make the smallest contribution to greenhouse-gas emissions and will not automatically produce a big rise in carbon emissions or chemical pollution. It depends on how people live. If they become as energy-dependent as Americans or Australians, their growth will have huge environmental consequences. If not, the impact of growth will be smaller (though still large, given that poor countries have every intention of becoming richer and consuming more). Either way, how much fast-growing countries contribute to global warming will depend more on the pattern of economic growth than on patterns of population.

Population growth itself does make a bigger difference in a third area: food. Even people with the smallest carbon footprints have to eat. All things being equal, it will be harder to feed 9 billion than 8 billion. The extra numbers will create more competition for food and, all things again being equal, push prices up. Because there will be more people around in 2050, and because their appetite for meat will rise as they get richer and move to cities (ie, because meat becomes more affordable), the world will need to grow around 70% more food in the decades to 2050. Still, to put that into context, 70% is considerably less than the increase in global agricultural output that took place during the previous four decades, when cereal output went up 250%. The total amount of food needed by the growing population should, in theory, be a solvable problem.

Again, the more intractable constraints lie in other areas: slowdown of growth in agricultural yields after 1990 (yield has traditionally been seen as the main measure of success in farming); a scarcity of new farmland ready to be taken under the plough; chronic water shortages and the overuse of fertilisers; and climate change, which will tend to reduce yields almost everywhere, in many places by a third or more. All these mean there would be a problem feeding the world in 2050 anyway, even if the population were growing more slowly. The good news is that solutions exist (without draconian population

controls): in more efficient use of water and other inputs; in better crop selection through genetic marking; in waste reduction; and so on. Such measures will have a bigger impact on feeding the world than moderating the growth in the world's population.

The implications of population size, then, are not as severe as Malthusians urge. But that does not mean population does not matter. It is relative changes – the growth of one section of the population compared with another, the average age and average family size – more than the absolute number of people that will make the difference.

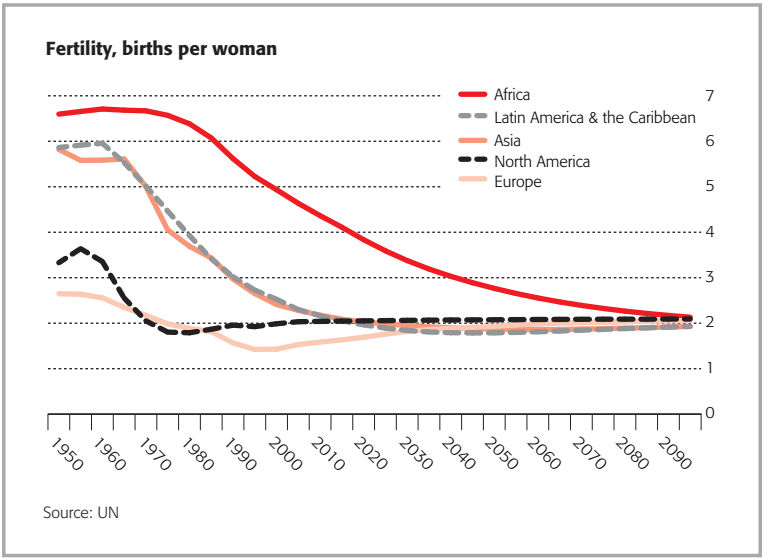
Falling fertility

Of these relative changes, falling fertility is by far the most important. In 2050 the world's total fertility rate – roughly, the number of children a woman can expect to have during her childbearing years – will fall to 2.1. That is the "replacement rate" of fertility, at which a population exactly reproduces itself. The precise replacement rate varies somewhat from place to place, depending on infant mortality. It is somewhat higher in poor countries. But 2.1 is usually taken to be a magic number, the rate that causes a country's population to slow down and eventually to stabilise. This will probably be the first time in human history that the global rate is 2.1 or below. In all previous generations, when the population was stagnant or falling, the fertility rate was high, but balanced, or negated by, an even higher mortality rate.

A rate of 2.1 would represent a staggering fall. In 1970 the total fertility rate was 4.45 and the typical family in the world had four or five children. In 2010 the rate had plummeted to 2.45 (see Figure 1.5). Almost half the world's population – 3.2 billion out of 7 billion – were then living in countries where the rate was 2.1. By 2050 almost all nations outside Africa will be living at or below 2.1 and even many African ones will be around their replacement rates (which, because of infant mortality, may be higher than 2.1).

After 2050, the rate of population growth slows right down and begins to dwindle to zero. Even in 2010, the countries with below-replacement fertility included not just those well-known for low demographic growth, such as Japan and Russia, but those more usually associated with fast-rising populations, such as Brazil, Tunisia

FIG 1.5 **The family way**



and Thailand. Some of the fertility declines have been staggering: Bangladesh's rate halved between 1980 and 2000; Iran's fell from 7 in 1984 to just 1.9 in 2006.

The fertility decline is likely to decelerate in future as it falls towards 2.1. In countries where it has long been below that – such as in northern Europe – fertility has already begun to bounce back; the rise will continue as people rediscover the joys of larger families. In parts of Africa, the fall in fertility has not been as marked as in other continents at comparable stages of wealth. But big declines will continue in other places: Brazil's fertility rate will dip to 1.7 in 2050; Ethiopia's, now 3.9, will fall to 1.9.

The fertility fall will release wave upon wave of demographic change. Most obviously, it will cause the world's population growth to slow right down. The rate of increase has been falling for a long time – peak growth was as far back as 1965–70, when it went slightly over 2% a year for the only time in modern history. But changes in the number of babies in one generation take another generation or more to show up in the overall numbers. The lag is about 20 years.

Because of this demographic inertia, the number of extra people in the world continued to rise for two decades after 1965–70, peaking in the late 1980s, when the overall population was rising each year by almost 90m people. The growth rate stayed relatively high after 1970, dropping sharply only in the 1990s as the impact of lower fertility began to be felt. So the number of extra people in the world will only now begin to slow down drastically. The annual increment, almost 78m in 2010–15, will fall to 52m in the late 2030s and to about 30m in the mid-2050s, only a third of what it was in the late 1980s. By that time, the rate of the world's annual population growth will be below 0.5% for the first time since about 1800. The huge and relentless increase in global numbers that began in Europe at the start of the Industrial Revolution and spread to every corner of the world will be over.

Cashing the demographic dividend

Lower fertility profoundly alters the balance between different age groups within a population. To simplify a good deal, a fall in fertility sends a generational bulge surging through a population, leaving a trail of changes in its wake. The generation in question is the one before declining fertility really begins to bite, which in Europe and America means what is commonly called the baby-boom generation, born between 1946 and 1964.

At the start, when the "bulge" generation is in its childhood, countries need to invest heavily in education and the other resources that children need. Typically, this is a period in a country's life with large families: lots of children scamper around but there are few grandparents (because they had been born at a time when life expectancy was lower). It is frequently – not always – a period when women stay at home to look after their family. That defines the situation in Europe in the 1950s, in East Asia in the 1970s and in Africa now.

But as the select generation grows up, it enters the labour force and, for about 40 years – an adult working life – a country benefits from a "demographic dividend". During this period there are relatively few children (because of the fall in fertility); relatively

few older people (because of higher mortality earlier on); and lots of economically active adults (including, now, many women, who enter the labour force in large numbers). This is a period of smaller families, rising incomes and larger middle classes, of rapidly rising life expectancy and of big social change, including higher divorce rates, later marriage, more single-person households and (in some countries, at least) greater middle-class pressure on authoritarian rule. This was the situation in Europe in what the French term the "*trente glorieuses*" (1945–75) and in much of East Asia in 1980–2000.

After that, though, the golden generation turns silver and retires. Now, the dividend becomes a liability. There are disproportionately more old people needing the support of the smaller generation that is behind them. Moreover, if – as sometimes happens – the fertility rate has begun to rise again after a long period of below-replacement levels, the post-baby-boom generation faces a double burden: more pensioners to provide for and more grandchildren to raise and educate. This is a period in which populations start to fall, parts of a country are abandoned and the concerns of the aged grow in significance. This will be the situation in Europe and America in 2010–40, and in East Asia in 2030–50.

These generational shifts will have big economic consequences in the next four decades. Demography anyway has a large influence upon economic growth, because the presence of a large number of working-age adults increases the labour force, keeps wages relatively low, boosts savings and increases demand for new goods and services.

But this demographic dividend does not automatically generate growth. The question is whether the country can put a growing labour force to productive use. In the 1980s Latin America and East Asia had similar demographic patterns. East Asia enjoyed an economic miracle and Latin America experienced a "lost decade". But the dividend does make growth possible, and where a country or region can take advantage, contributes greatly to it. One study calculated that a third of East Asia's GDP growth in 1965–95 came from its favourable demography, notably the bulge in the labour force. And demographic contributions were not confined to East Asia. In the decade 2000–10, America's GDP rose about 3% a year, of which its increasing population contributed one percentage point.

Demography is likely to be a drag on growth in future, stronger in some places than in others. In East Asia, in 2010–20, demographic factors can be expected to contribute only about one percentage point to annual GDP growth, half the amount they contributed in 1995–2005, according to calculations by the Reserve Bank of Australia. In America, their annual contribution will be just 0.5 points of GDP (compared with 1.3 points before). In Japan they will be a drag on growth of about one point each year and in Germany the drag will be almost half a point (ie, because of demographic change, national output will be almost half a percentage point lower than it would otherwise have been).

This drag will get worse as time goes on. In the 40 years to 2010 the world as a whole reaped a demographic dividend thanks especially to developments in the rich world and East Asia. In 1970 there were 75 dependants (children and people over 65) for every 100 adults of working age in the world. In 2010 the number of dependants had dropped to 52 – a measure of the greater share of working people in the world and a primary source of growth. This helped boost economies, especially in China, where, under the influence of the one-child policy, the dependency ratio reached an unprecedentedly low level of 38 (in other words, the working-age population was not far short of double the size of the rest of the population). But by 2050 the world's "dependency rate" will have turned around and be back up to 58. This is not a huge reversal. The deterioration in 2010–50 will be only about a quarter of the improvement that took place in 1970–2010 (a six-point worsening compared with a 23-point gain). So the demographic "losses" over the next 40 years will be mild compared with the gains of the previous 40. Nevertheless, there will be losses for the first time. And in some countries and regions, the reversal will be dramatic.

Young, middle-aged and old

In the 40 years to 2010 every main region and country in the world except Japan saw an improvement in the ratio between working adults and the rest of the population. Some of the improvements were small, such as in Africa, where it was just six points, mainly

France v Germany

France's fear of its larger eastern neighbour has been one of the unspoken motivators of European politics for 100 years. When Napoleon dispatched his armies throughout the continent, France was Europe's most populous country, and able to recruit more young soldiers than anyone else. But German unification and declining French fertility in the 19th century changed that, so by 1918, at the Treaty of Versailles, the French prime minister, Georges Clemenceau, was worrying that "one can put all the clauses one wants in a treaty, one can take all the guns out of Germany, one can do whatever one likes, France will be lost because there will be no more Frenchmen." Between 1870 and 1945, France fought three wars to restrict German power and, after 1945, set up what became the European Union to contain the central European giant.

But over the next half-century, the balance will change, and France will become larger. As recently as 2000, Germany's population was 23m bigger than France's – 82m compared with 59m. Even now it is 20m larger. But with France's fertility rising and Germany's stuck at far below replacement levels, the French population is climbing, Germany's is falling, and the two will cross over just after 2050, according to the UN's projections. By 2060 the German population will have fallen to 72m, but France's will number 74m. By 2100 France will have 10m more people than its neighbour.

What the EU will look like then is anyone's guess. But if it is still driven by French fear of western Europe's most populous country, then the Anglo-French relationship will replace the Franco-German one as the thing to watch: in 2050 Britain's population will (briefly) overtake France's.

because of high fertility and so the large number of dependent children. Others were huge, such as in South-East Asia and North Africa, whose dependency ratios fell by 40 points. But even "ageing"

Europe and America ended the period with fewer people dependent on the working population.

That will change in 2010–50. Then, the world will become divided into three categories. The first will be the beneficiaries of continued demographic improvement: India, sub-Saharan Africa, and the Middle East and north Africa. Their dependency ratios will continue to fall, their median age, at less than 40 in 2050, will remain below the global average and they will have a large, cheap labour force.

In Africa and the Middle East, this will raise the stakes: more young workers will produce either more growth or – if they do not find work – more instability. Africa is already starting to show something like the demographic improvement that underpinned the economic transformation of East Asia in the 1980s and 1990s. Whether its public institutions are as competent and its policies as outward-looking as in East Asia remains to be seen.

The Middle East is slowly shaking off its youth bulge as the children of earlier periods of high fertility move into the workforce. The early stages of this process played an important role in the revolutionary tumult of the "Arab spring" of 2011. The process will continue in 2010–50 and prove a big challenge to the winners of the Arab spring, whether they be new regimes or old. Few economies with vast oil earnings have yet managed to generate large numbers of jobs. But Middle Eastern countries have certain advantages that East Asian ones did not have when they began their period of economic take-off. Educational levels in the Middle East are higher than they had been in Asia; elements of the middle class are already in place; and the educational gap between men and women is narrower. The emerging demographic dividend opens up the possibility – however unlikely it might seem today – that the Muslim Middle East will boom in the decades to 2050.

India should also see its growth continue. Its dependency ratio will continue to improve. It did not reap the same demographic dividend as China in 1970–2010 (it cut its total dependency ratio by 25 points compared with China's 39). But India's demographic patterns will be more favourable to growth than China's in the next four decades, when China's dependency rate will rise by 26 points and India's will fall by seven. This means the period of low-wage

manufacturing and services will last much longer in India. In 2050 children and old people will still number less than half the working-age population, whereas in China they will be two-thirds of it. This does not necessarily mean India will outstrip China economically. India still has huge drawbacks: mass adult illiteracy (it is on its way to becoming the first society with equal numbers of university graduates and illiterate people); disproportionate numbers of young men (the result of a traditional preference for sons meeting a modern desire for small families and easily available sex-identification technology); and highly skewed demographic trends between north and south – the north being poor, illiterate and more populous, and the south richer, more entrepreneurial and with below-replacement fertility. Still, China's problems are even worse. In the perennial struggle between the two giants to outdo each other, demography seems to be on India's side.

The second group influenced by demographic change will consist of those countries that see only a modest deterioration in their dependency ratios (20 points or fewer) and a rise in the median age to between 40 and 48. These include the United States, Latin America and South-East Asia. America's demographic profile has long been more stable than Europe's, thanks to relatively higher fertility in the 1980s and 1990s (contributed to by, but not solely the result of, Latino immigrants). Its dependency rate was slightly higher than Europe's in 1970; in 2010 the two sides of the Atlantic had similar rates but, assuming American fertility remains relatively high, the United States will have a dependency nearly ten points lower (ie, better) than Europe's in 2050.

The big losers from the demographic patterns of 2010–50 will be Europe, Japan – and China. The share of the old-age population in Japan has long been the biggest in the world and it is getting bigger. Japan's dependency rate will deteriorate by a staggering 40 points in 2010–50. By 2050 the country will have almost as many dependants as working-age adults. No society has seen such a thing before. Japan will then be the oldest society ever known, with a median age of 52.3 (ie, half the population will be aged over 52). Europe's dependency will not rise as far but it will still be the next highest (and there will be little difference between western and eastern Europe).

It is far from clear how these countries will react. It seems plausible to think that, just as working-age adults tend to be associated with greater business risk, more innovation, more new-household formation and higher savings and equity ownership, so older societies will be more risk-averse in business and asset ownership (preferring government bonds to equities, for instance). But there is no certainty about that.

Nor is it clear how these countries will bear the burden of ageing. Even large and sustained increases in fertility would fail to reverse the ageing trends for at least two decades. Extremely large migration flows would help both by providing younger workers to look after pensioners and by increasing – for a while – the fertility rate (immigrants from countries with high fertility tend to have larger families for a while, but eventually, the immigrants' family patterns tend to match their host country's). This would require large and painful shifts in social attitudes. But at least these countries' level of income gives them some room for manoeuvre.

Far more constrained is China. With fertility artificially suppressed by the one-child policy, it is ageing at an unprecedented rate. China's median age rose from 22 years in 1980 (characteristic of a developing country) to 36 in 2010 (characteristic of a rich one). China will be older than America in 2020 and older than Europe in 2040. This will bring to an end its period of cheap-labour manufacturing. The Chinese are right to worry that they will get old before they get rich.

They also face massive problems of sexual imbalance because the one-child policy, a traditional preference for sons and sex-selective abortion have combined to produce a generation of what the Chinese call "bare branches": unattached young men. In 2025 there will be 97m men in their 20s (and therefore of marriageable age) but only 80m young women, a worse ratio even than India's. But scrapping the one-child policy may be ineffectual: social support for small families and low fertility have become entrenched and may persist. So China is likely to starting importing large numbers of young women as brides for its "bare branches" (as richer Asian countries have already done). Because China is so huge, the migration of young women would have to take place in huge numbers. This would be extremely disruptive to family life elsewhere – and even then could not plug the sexual gap caused by generations of gendercide. Demography itself

has a good claim to being the biggest problem the Communist Party will face in the next 40 years.

Yet even this is not the biggest change that China, East Asia, the Middle East and much of the developing world will face because of demography. Emerging markets have benefited from the sort of dividend that changed Europe and America generations before. These countries have emulated – and will catch up with – the West in terms of income, family size, education and the formation of a middle class. Most of them say they want to keep their traditions of filial piety and family order unsullied by contact with Western values, Western mores and the trends that accompanied greater wealth in America and Europe, such as divorce, single-parent families and a greater stress on individual freedom of expression. Yet it is hard to see how they can stop these things from happening. In some of Asia's largest cities a quarter of women in their early 30s have never been married – an astonishing rejection of tradition in societies where the vast majority of adults always used to get married, often very young. Hundreds of millions of young Asians have migrated to cities or foreign countries, leaving their children to be brought up by grandparents, not within the confines of the immediate nuclear family as was always the case in the past. Such trends will probably accelerate in future.

If you look at the changing size of the world's population, then, the picture is one of growing stability and a return to the flat population growth of the 17th and 18th centuries. Below that statistical surface, though, tensions are growing, the traditions of family life and the balance between generations are shifting, and societies are being churned up in ways never seen in the more static pre-modern world. In the decades to 2050 these changing demographic patterns will, perhaps more than anything else, shape how the world changes – politically, economically and socially.