Trends Shaping Education 2019

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BETTER POLICIES FOR BETTER LIVES

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Foreword

Trends Shaping Education 2019 is designed to support long-term strategic thinking in education. It provides an overview of key economic, social, demographic and technological trends and raises pertinent questions about their impact on education. This book fills an important need: decision makers and practitioners in education often have only anecdotal or local information on the megatrends that play out in their context; too often they do not have solid facts in front of them, especially about trends.

Using trends to think about the future requires robust international sources of data, including the OECD, the World Bank and the United Nations. The work is aimed at policy makers, researchers, educational leaders, administrators and teachers. It will also be of interest to students and the wider public, including parents.

The first edition of this book was published in 2008 and subsequent editions appeared in 2010, 2013 and 2016. This 2019 edition features new chapters on ageing, modern cultures and security. It updates and extends the interactions between the trends, links to education and futures-thinking. Unlike previous editions, which had specific chapters on technology, this edition incorporates technology across all the chapters, an acknowledgement that it has now become thoroughly integrated into our daily life.

The process of identifying and compiling relevant trends and data on such disparate subjects is necessarily a collaborative one, and this volume benefits enormously from the support and suggestions of a number of different individuals and institutions. The authors thank the Flemish Ministry of Education for consistently supporting this work since its inception. Jeroen Backs and his dedicated team made possible an expert workshop in 2018, which helped strengthen our work and the content of the publication. Enormous thanks also to the dedicated, dynamic and multidisciplinary group of experts who took part in that Brussels meeting: Queralt Capsada, Bernhard Chabera, Patrick Deboosere, Ruby Gropas, Jan Germen Janmaat, Siv Hilde Lindstrom, Candy Lugaz, Eamonn Noonan, Petra Packalen and Micheline Scheys.

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Executive summary

Did you ever wonder whether education has a role to play in preparing our societies for an age of artificial intelligence? Or what the impact of climate change might be on our schools, families and communities?

Trends Shaping Education 2019 explores major economic, political, social and technological trends affecting the future of education, from early childhood through to lifelong learning. It aims to inform strategic thinking and stimulate reflection on the challenges facing education, and conversely, the potential of education to influence these trends.

Examining the future of education in the context of global mega-trends is necessary to help education deliver on its mission of supporting individuals to develop as persons, citizens and professionals. In a complex and quickly changing world, this might require the reorganisation of formal and informal learning environments, and reimagining education content and delivery. In an ageing world, these changes are likely to apply not just to basic education but to lifelong learning as well.

But connecting education to mega-trends is not straightforward. The future is inherently unpredictable, because it is always in the making. Long-term strategic thinking in education thus needs to consider both the set of trends and the possible ways they might evolve in the future. This edition profiles "big picture", system-level trends before homing in on the more "micro" level of individuals and families. Technology, once a specific section, has now become so intertwined with modern life that it appears in all chapters.

Shifting global gravity

The global balance of economic power is shifting towards Asia, with giant economies emerging in China and India. Globalisation facilitates the emergence of transnational networks and trade. Human mobility across borders has increased with more affordable transport and communications. The accompanying economic growth has lifted many people out of poverty, resulting in an expansion of the global middle class. Yet globalisation also brings new challenges: growing consumption, unsustainable use of resources and, for some, a feeling of being left behind.

All of these trends are projected to continue in the near- and medium-term. Education has an important role to play in equipping students with the skills needed to succeed in the global future. It can also play a role in combatting climate change and inequality, the most urgent issues of our time. But it cannot act alone, and more work must be done in order to help make the next phase of globalisation work for all.

Public matters: Citizenship and democracy

A well-functioning democracy relies on the civic knowledge and skills of its citizens, as well as their direct engagement in public matters. Yet in many countries, key measures of

civic participation such as voter turnout have fallen throughout the last half century. Rising inequality within countries and an increasing gap between rural and urban areas creates challenges in terms of life opportunities and access to services. And although digitalisation has increased our access to information, there is no guarantee that online search results are accurate. In fact, the ubiquity of social media platforms has made it easier to disseminate inaccuracies and outright lies, and there is a growing concern about the algorithms and echo chambers that only confirm prior beliefs.

These elements combine and connect with worries about declining trust and growing political and social unrest. There is an important role for education to play in improving civic and social participation and fostering democratic citizenship. However, difficult questions remain. Key questions for the future include how we strike a fair balance between all parties in a diverse society, and what this means for fostering social cohesion and trust.

Security in a risky world

Security of person is a basic right guaranteed by the 1948 Universal Declaration of Human Rights. Although on average OECD countries have benefited from fewer armed conflicts on their soil, growing affluence, safer roads and more effective medicines, we are now facing ever more complex security challenges. Climate change brings rising sea levels and more frequent extreme weather events. In an increasingly connected world, networks of terrorists pose a threat in many countries, including cyber space. A great deal of sensitive and confidential data is stored on servers all around the world, and data theft and leaks have significant economic, social and political consequences. Who controls what data – individuals, firms or governments – is also a matter of debate.

Threats to our safety can be personal as well as societal. Many people feel less secure about their finances and their work. And despite safer streets and reductions in crime rates, reports of perceived risk are increasing. Families and communities are concerned about the safety of their children. Education can play a role in helping understand, prevent and mitigate security risks. It can also help students distinguish between perceived versus actual risks, build resilience and better prepare citizens to withstand adversity.

Living longer, living better

Our societies are ageing. The likelihood of living another decade or two after the conventional retirement age raises profound questions about the nature of this phase of our lives. Healthier seniors are living and working longer. They also tend to be relatively richer, on average, creating a "silver market" for products and services aimed at their specific needs. However, there are risks as well. Chronic diseases, such as diabetes and dementia, are becoming more prevalent, and shrinking social circles increase the potential for loneliness. Digitalisation can help address many of the risks linked to increased frailty and dependency, but it also opens up new threats of Internet fraud targeted specifically at the elderly.

These trends invite reflection about how education, so often seen as primarily for the young, can benefit older adults. What is the best way to promote a culture of learning throughout life? How can this be extended to not only be life*long*, but life*wide*, touching on all aspects well-being more generally?

Modern cultures

We seem to live in a more individualistic world, with a declining sense of belonging to the traditional reference points of community, church or workplace. At the same time, the notion of a "network society" suggests that the sense of belonging is changing, not disappearing. Patterns of work and life are evolving as marriage rates decline, more women enter the workplace and more men play an active role in child-raising. Digital markets are making it easier for buyers and sellers to come together across time and space, as well as transforming what we mean by ownership, as we increasingly pay for access to goods (e.g. books, music) rather than buying them outright. We are also progressively looking at our consumption habits through the lens of sustainability and ethical choices, for example in the use of electric vehicles or other attempts to reduce our impact on the planet.

Education plays a crucial role in equipping people with the necessary skills, knowledge and attitudes to thrive in their modern personal and professional lives. As the world becomes increasingly digitalised, the education system must adapt and evolve to take advantage of the tools and strengths of new technologies while simultaneously addressing concerns about potential misuse, such as fraud, identity theft or cyberbullying.

Preparing for the future

Trends Shaping Education 2019 covers a rich array of topics related to globalisation, democracy and citizenship, security, ageing and modern cultures. Connecting these mega-trends to education is a means of broadening our horizons and informing the base of decision-making.

While using trends is one good way to think about the future, other foresight methods are also important. In this edition, the final page of each chapter presents plausible but unexpected ways in which current trends may evolve. This book is meant to challenge, to inspire, and, most of all, to help provide answers to the questions: "What does this trend mean for the future of my education system? And what can I do?"

Global mega-trends and the future of education

Education for a changing world

How can education keep pace with a changing world? We live on a very crowded planet. More and more people are being born and many of us are living longer. Economically, greater affluence has let to greater consumption, raising questions of how sustainable our current collective habits are for the environment and for society.

The unprecedented digital transformation of the global economy and society is likely to increase the complexity of the modern world, as well as the speed of change, largely because of increased connectivity and more educated individuals worldwide. These two elements – complexity and speed of change – mean that connecting education to the trends shaping the world we live in has never been so urgent.

"Urgent" is a call for action. But it is not necessarily negative, although certainly population growth and ageing societies, inequality, climate change and resource scarcity all compel us to focus on sustainability and the needs of future generations. Yet urgency also brings opportunity, and a window for action, as evidenced by the power of digitalisation to transform, connect and empower.

Examining the future of education in the context of global mega-trends has two main goals. First, it is necessary to better prepare education for the transformations underway in economic, social, and technological spheres. Education must evolve to continue to deliver on its mission of supporting individuals to develop as persons, citizens and professionals. It must remain relevant to continue to shape our children's identity and integration into society. In a complex and quickly changing world, this might require the reorganisation of formal and informal learning environments, and reimagining education content and delivery. In an ageing world, these changes are likely to apply not just to basic education but to lifelong learning as well.

Second, it is key to better understand how education can influence these trends. By providing the skills and competencies needed to operate in the modern world, education has the potential to influence the life outcomes of the most disadvantaged. It is a powerful tool to reduce inequity. It can help combat the increasing fragmentation and polarisation of our societies, and empower people and communities to take charge of their own civic processes and democratic institutions. Access to learning and knowledge not only opens doors to individual and collective opportunities, it has the potential to reshape the future of our global world.

But connecting education to mega-trends is not straightforward. The future is inherently unpredictable, because it is always in the making. Long-term strategic thinking in education thus needs to consider both the set of trends and the possible ways they might evolve in the future.

Trends and future-thinking

Opinions differ on historical developments and, even when there is agreement, the future is rarely just a smooth continuation of past patterns. Moreover, we do not know in advance which trends will continue and which will change course, or in what context. Sometimes, we can just be plain wrong.

> ***"We don't like their sound, and guitar music is on the way out".***
> *- Decca Recording Co, when rejecting the Beatles in 1962*

Similarly, it is not guaranteed that the trends that were important in the past or seem so now will remain influential; emerging trends, barely visible at the moment, may become crucially important in the future. For example, in 1932 Albert Einstein declared that:

> ***"There is not the slightest indication that nuclear energy will ever by obtainable. It would mean that the atom would have to be shattered at will".***
> *- Albert Einstein, in 1932*

In the absence of any concrete facts or evidence about the future, the only way to meaningfully understand the future is through dialogue. The future cannot be passively observed. It must be actively discussed in order to learn from it. These learnings can then be used to identify and agree upon actions for today.

Relevance, predictability and impact

The *Trends Shaping Education* series is designed to provide creative fuel for reflection on the long-term strategic future of education. It has been used in Ministries, international organisations, professional and student organisations and other civil society groups as part of strategic planning exercises. It has been integrated into teacher education curricula, used in classrooms by teachers, and sought after by school boards and parents for future-thinking exercises.

This work is most valuable when used as a tool and adapted to the specific context of the user. In order to do this, key questions include:

How relevant is this trend in my context?

Context matters. Ageing populations, for example, may be a bigger challenge in rural than in urban areas or concentrated in certain parts of the county or districts in a city. The impact of most trends will depend on geographical, historical, political or cultural circumstances.

How predictable is this trend?

Not all trends are created equal. Some trends, for instance those related to population growth or climate change, lend themselves easily to long-term planning. Others are less predictable, such trends in technology or youth culture. For these fast-changing trends, creating alternative scenarios of what would happen if a particular trend would develop in a certain way may well be more appropriate than simply using the trends alone.

What is the speed and impact of this trend?

Some trends develop slowly (global temperatures went up around 0.8˚C in the last 100 years) while other trends are more dynamic (the number of active Facebook users went from zero to one billion in eight years). Slow trends allow more time to think about what they mean and how to respond but they may also be relatively impervious to change. For example, climate change may be slow but its potential impact is enormous, possibly threatening life on our planet.

Can we influence this trend?

Even if trends are not predictable, it is often possible to influence them. Small individual steps from parents and peers can make a difference in rates of cyberbullying in schools, for example. Broader coordinated action from multiple players, including school boards and government, can change cyberbullying policies and regulatory frameworks. All of these elements are important to reduce the prevalence of this harmful trend.

Can we react to these trends?

Creating the flexibility to react to the unexpected is important. For example, emergency planning to handle extreme weather events in cities will include a variety of scenarios, each of which may or may not be deployed in the event of a major crisis. The key is to maintain flexibility and responsiveness even under unforeseen circumstances.

Are there other trends to take into account?

In a word: yes. The trends in this book are a snapshot of our changing world. To be useable, the book is necessarily brief, and there are certainly other trends that are just as important to consider. All four previous *Trends Shaping Education* publications present complementary trends that are still relevant, and we encourage our biggest fans to explore those too. Hint: if you are interested in cities and biotech, see the 2016 edition. If skills and well-being, the 2013 edition has a special section on this.

Finally

Connecting the mega-trends in this volume to education is a means of broadening our horizons and informing the base of decision-making. This book is meant to challenge, to inspire, and, most of all, to help provide answers to the questions: "What does this trend mean for my work? What can I do?"

A large body of CERI work has been founded on the need for educational decision-making to be better informed by evidence, by awareness of what is taking place in other places and at other times, and by the need to consider the bigger, long-term picture. This volume follows proudly in that tradition.

Chapter 1. Shifting global gravity

Our world is becoming more global and interconnected. Economic growth has lifted many people out of poverty, yet challenges remain, and education has an important role to play. This chapter explores these issues through five perspectives:

***Shifting economic power** – focuses on the dramatic economic growth of Asian countries and the resulting expansion of the global middle class.*

***A global marketplace** – looks at our increasingly intertwined markets, aided by rapidly expanding air transport and global exports of goods and services.*

***Mobility in a global world** – presents trends in international mobility, migration and remittances.*

***The e-planet** – highlights global consumption patterns and the growing problem of electronic waste.*

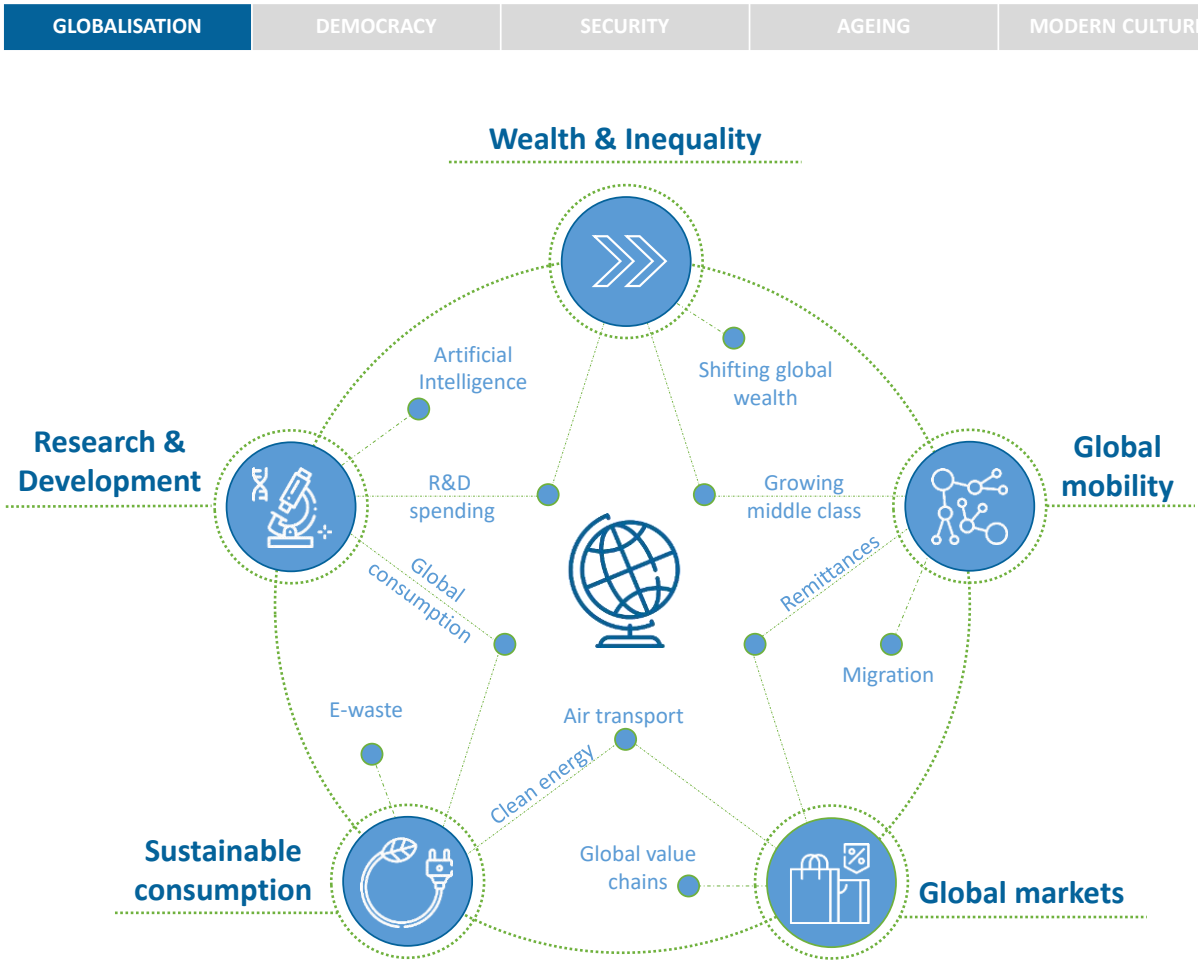
***New players, new game?** – illustrates the important role innovation plays in the knowledge economy, using examples from the clean energy sector and Artificial intelligence (AI).*

The global trends highlighted in this chapter are then linked to education. All of education is explored, from early childhood education and care to lifelong learning. The chapter ends with a look at how using different versions of the future can help us better prepare for the unknown.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

SHIFTING GLOBAL GRAVITY: A VISUAL OVERVIEW

The global balance of economic power is shifting, with giant economies emerging, notably China and India. Globalisation facilitates the emergence of transnational networks and the accompanying economic growth has lifted many people out of poverty, resulting in an expansion of the global middle class. Human mobility across borders has increased with more affordable transport and communications. Yet globalisation also brings new challenges: growing consumption, unsustainable use of resources, and a sense for some of being left behind. The challenge for countries lies in the ability to enhance joint efforts to counterbalance negative trends such as the widening gap between rich and poor.



Chapter highlights

The e-waste problem

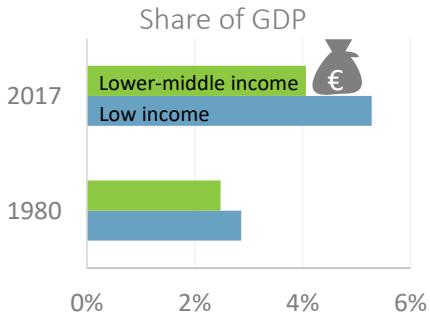
More than **44** million

metric tonnes of e-waste were generated in 2016. Equal to the weight of 4400 Eiffel Towers

Only 20% of this was recycled

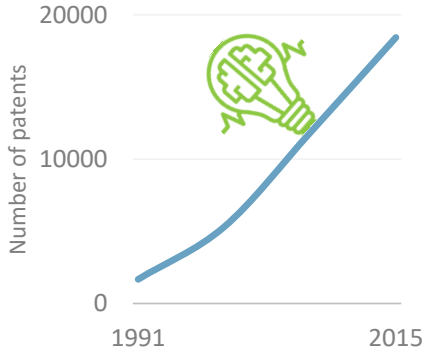
Mobility of money

Personal remittances became an important source of income for countries



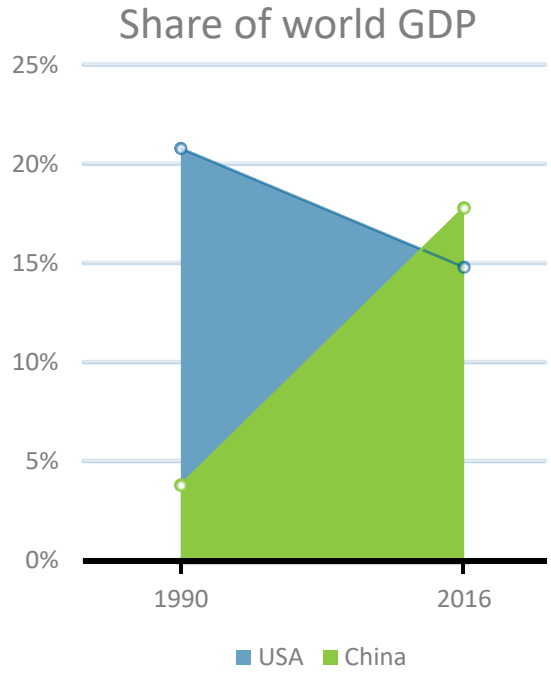
New frontiers of innovation

Artificial intelligence patents increased nearly 1000% in 15 years



Shift in economic power

China quadrupled its share of world GDP between 1990 and 2016, while the United States' share dropped from 21% to 15%



More mobility in a global world

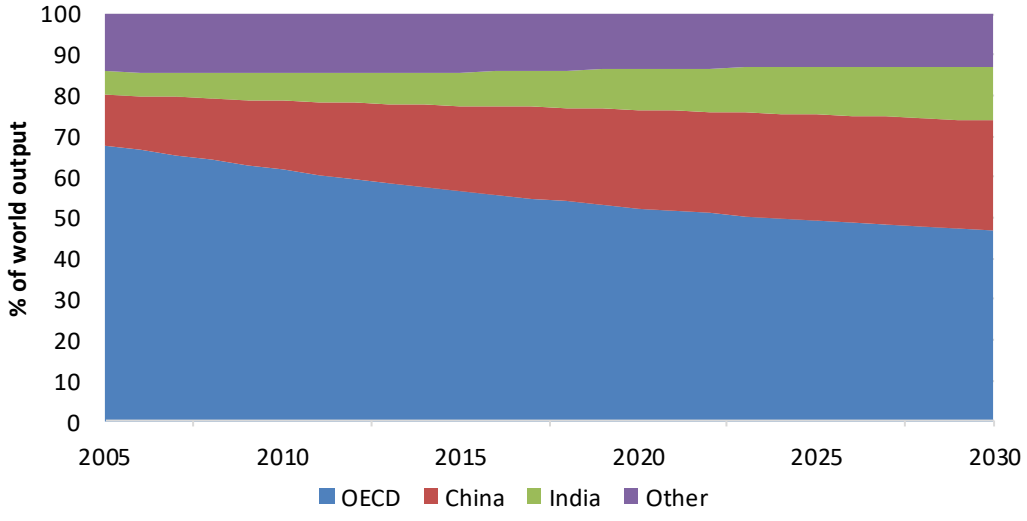
Air transport of passengers worldwide increased from just over 300m in 1970 to almost 3.7 billion in 2016

SHIFTING ECONOMIC POWER

The global economic centre of gravity is shifting, with economies such as China and India growing in economic importance. This shift has consequences for OECD countries in terms of jobs and wages, with increasing competition from Asia across the skill distribution. At the same time, the size of the Asian middle class is expanding rapidly. A growing middle class can boost economic growth through increased demand for goods and services. It may also put pressure on governments to deliver more and better public services, for example in education and health care. On the supply side, better education means more skilled workers, higher innovation potential and economic competitiveness in countries and regions.

Figure 1.1. China and India's share of the pie

Composition of world output (%) in USD at 2010 PPPs, 2005-2030



Note: World output is comprised of the aggregated real GDP of countries based on purchasing-power-parity (PPP), measured in current international dollars. 'World' refers to an aggregate of the 46 countries included in the long-term model, which today account for about 82% of world output (see StatLink for full information).

Source: Guillemette, Y. and D. Turner (2018), "The long view: Scenarios for the world economy to 2060", https://doi.org/10.1787/b4f4e03e-en.

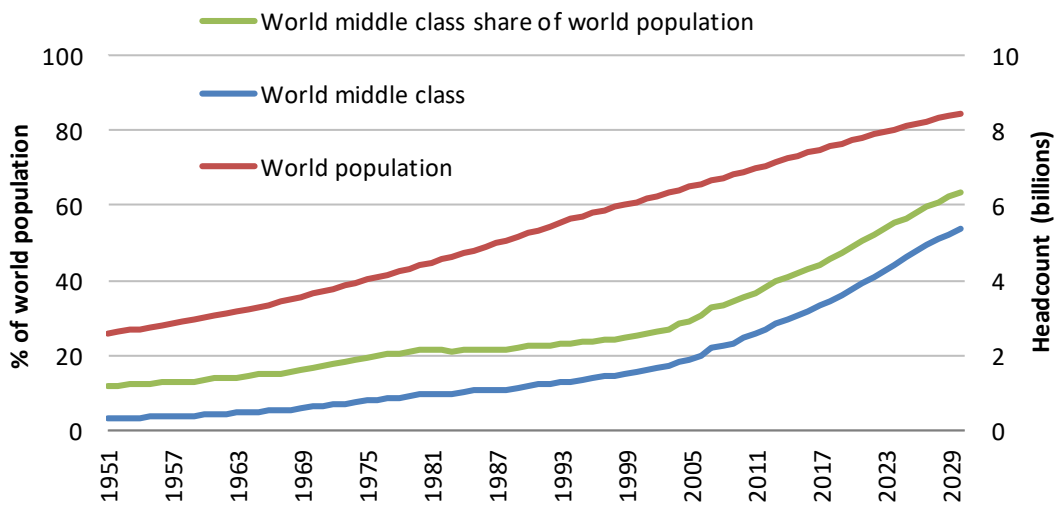
StatLink https://doi.org/10.1787/888933888241

The centre of the world's economy is shifting towards Asia. China and India have been among the fastest-growing economies in recent decades, making them two of the largest economies in the world today. Together they account for almost a quarter of world GDP. The speed of change has been dramatic: China increased its share of world GDP from almost 4% in 1990 to 18% in 2016, while India's share doubled from just over 3% to 7%. At the same time, the United States' share of world GDP dropped from 21% to 15% and Japan's share declined from 8% to 4%. The shift of economic power to Asia is clear and expected to continue.

Global economic growth has lifted hundreds of millions of people out of poverty, expanding of the global middle class (defined by those with a daily income between $10 and $100). Between 1961 and 2016, the world population almost tripled. The size of the middle class, however, increased more than tenfold, reaching about 3.2 billion people. This growth is expected to accelerate in the coming decades. In the next ten years, the majority of the world's population will consist of the middle class. This growth is largely driven by China and India: 90% of the next billion new entrants into the middle class are expected to come from Asia. In contrast, the European and North American middle class is stagnating.

Figure 1.2. The global middle class on the rise

Estimates of the size of the global middle class, percentage of the world population (left axis) and headcount (right axis), 1950-2030



Source: Kharas, H. (2017), "The unprecedented expansion of the global middle class, an update", www.brookings.edu. Kharas, H. (2010), "The emerging middle class in developing countries", www.oecd.org/dev/44457738.pdf.

StatLink https://doi.org/10.1787/888933888260

And education?

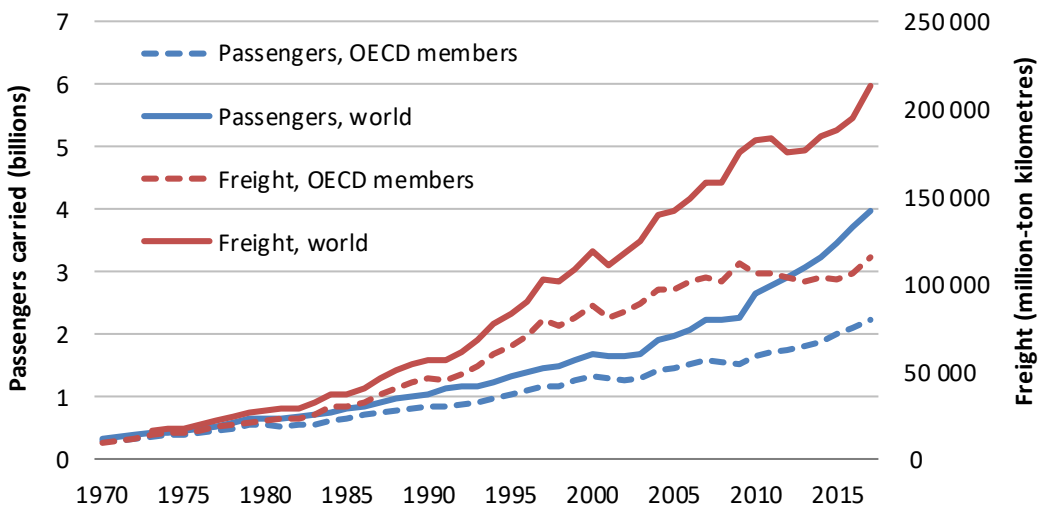
- Initial education and lifelong learning play a role in lifting people out of poverty by, for example, providing them with the right kinds of skills for the labour market. What can be done to improve this function of education? And what is the role of non-formal learning in this process?
- How can access to high quality education be assured despite growing differences in the socio-economic status? Is the answer different for higher education than early childhood education?
- Should schools and universities be aware of global labour market demands in order to prepare their students to work abroad and in multinational companies? In addition, what elements of inter-cultural sensitivity and co-operation can be taught?

A GLOBAL MARKETPLACE

Countries and economies are becoming more intertwined and interdependent as restrictions on global trade and labour flows decrease. Aided by more affordable international transport and digitalisation, the movement of goods and services along international supply chains reflects the global nature of economic markets and the mutually beneficial opportunities that come with it. Yet openness alone is not enough for the benefits of trade to materialise for everyone, and governments also need to act domestically to encourage opportunity, innovation, and competition. How can education systems help citizens contribute to fair and sustainable global economic governance? How can education help build the skills required in a global marketplace?

Figure 1.3. Ready for take-off?

Increasing air transport of people (left axis) and freight (right axis), 1970-2017



Source: World Bank (2018), "Air transport, passengers" and "Air transport, freight" (indicators), https://data.worldbank.org/.

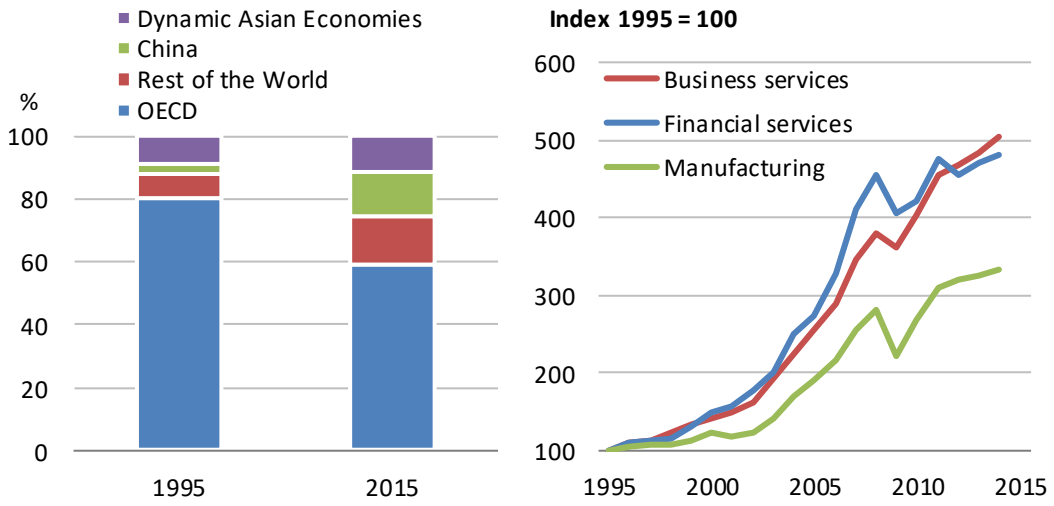
StatLink https://doi.org/10.1787/888933888279

Global mobility of people and goods is on the rise due to more affordable and accessible modes of transportation, especially air transport. Liberal air regulations and the rise of low cost carriers have facilitated the expansion of air networks. As a result, air transport of passengers worldwide has steadily increased from just over 300 million in 1970 to almost 4 billion in 2017. These numbers are expected to double by 2030 and quadruple by 2050, with the strongest growth coming from Asia. Air freight (shipment of goods by plane) has similarly increased by over twelve-fold since 1970. Although OECD countries still account for over half of all air transport, their share of the total has declined over time. Newly advanced economies, including those of Brazil, Russia, India and China, have contributed massively to the recent growth of air transport.

Global mobility is facilitated by the integration of trade systems worldwide. Many goods and services are designed, developed and delivered across borders through global value chains. While the cross-border movement of people does not account for a large share of services trade, it is essential for international business operations. As a result, many trade agreements today cover aspects that go beyond import tariffs to address essential issues such as human mobility and labour standards. Nevertheless, barriers to open trade remain, and international co-operation is required to ensure global trade rules are fair, transparent and respected. Policies at home are needed as well—including in education—to encourage innovation and job creation, and help all people benefit from the opportunities that trade openness brings.

Figure 1.4. Interconnected global trade

World's exports by origin (left) and type (right), 1995-2015



Note: Business services includes R&D, ICT, real estate and other business activities. Financial services includes financial intermediation, insurance, pension funding and other financial activities.

Source: OECD (2017), "Global trade, policies, and populism", www.oecd.org/tad/policynotes/Global-Trade-Policies-and-Populism.pdf.

StatLink https://doi.org/10.1787/888933888298

And education?

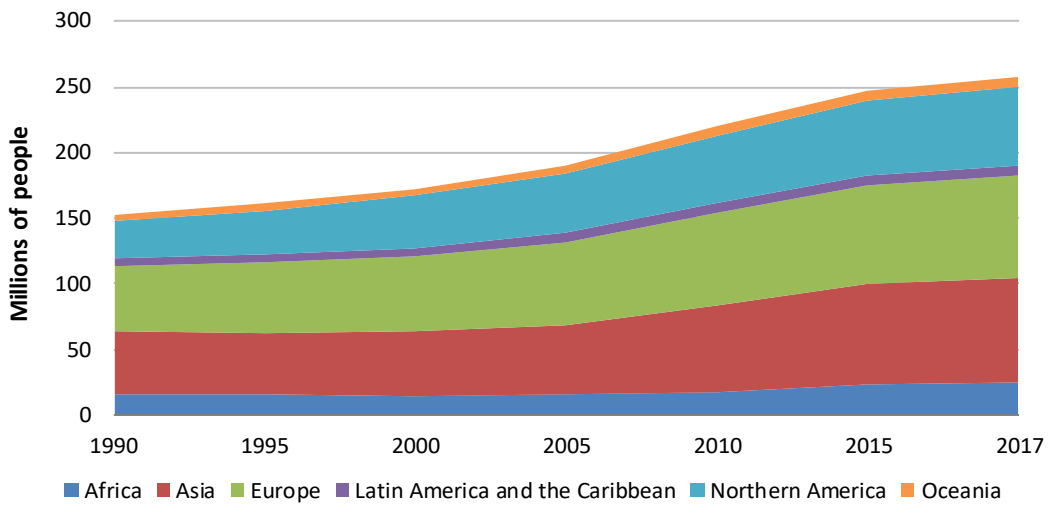
- Transferability of skills and experience is one of the big challenges for a diverse and mobile world. Are our educational and labour systems able to adequately recognise prior learning and qualifications?
- The world is becoming increasingly mobile and flexible. How well do initiatives such as online learning, MOOCs, and lifelong learning deliver on their promises? How can they be strengthened?
- Nowadays, migration is increasingly temporary or circular rather than permanent. What does this mean for teaching citizenship and identity? Can one be a global citizen with a national identity, or vice-versa?

MOBILITY IN A GLOBAL WORLD

Information technology and decreasing transport costs have facilitated the global mobility of people, goods and services. Human mobility supplies talent and ideas to both high- and low-skilled occupations, fostering knowledge transfer and economic opportunity. In addition, mobile workers are sending more money back to their birth countries, boosting those economies in the process. Yet increasing globalisation also brings new challenges. For education, greater mobility means more diversity in classrooms, as well as a more global market in higher education. Education has an important role to play in equipping students with the skills needed for a global future.

Figure 1.5. More people on the move

Estimates of international migrant stock by region of destination, 1990-2017



Note: Northern America includes Bermuda, Canada, Greenland, Saint Pierre and Miquelon, United States and Mexico.

Source: United Nations (2017), "International migrant stock: The 2017 revision", www.un.org/en/development/desa/population/migration/data/.

StatLink https://doi.org/10.1787/888933888317

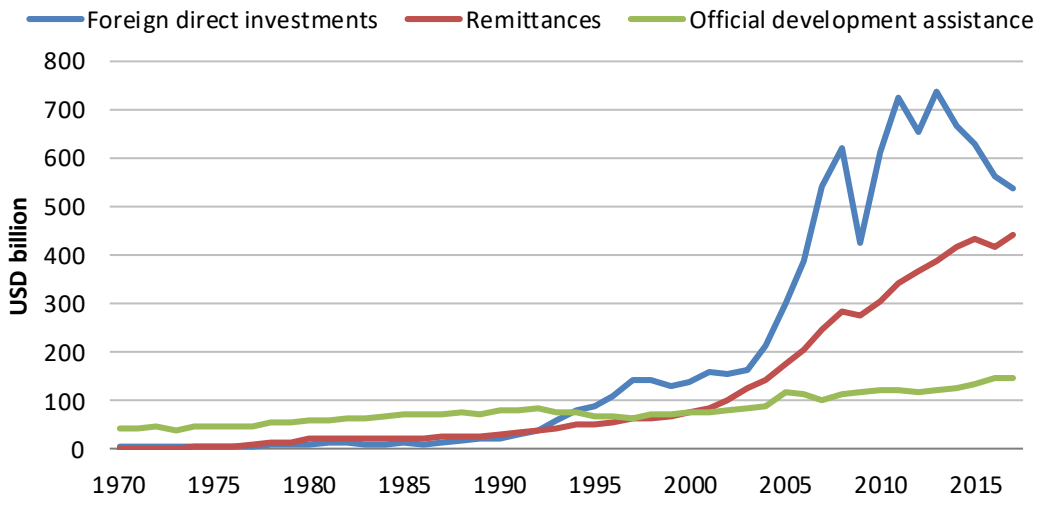
Between 1990 and 2017, the total number of international migrant stock grew from 153 to 258 million people, an increase of 69%. Today, international migrants account for just over 3% of the world's population. International human mobility is on the rise worldwide, with most migrations occurring between developing countries. Asia has replaced Europe as the most popular region of destination, attracting about 2 million migrants each year between 2000 and 2017 for Europe's 1.4 million. Over the 1990-2017 period, Asia added over 31 million international migrants, followed by Northern America (30 million) and Europe (29 million).

Increasing migration has been accompanied by growing remittance flows to low- and middle-income countries, amounting to 439 USD billion in 2017. Remittances

represent a large proportion of national income for low-income countries—about 5% of average GDP in 2017—and help people invest in education, business and reducing poverty overall. Over time, remittances have surpassed official development assistance (ODA). Now, the amount sent by remittances is over three times larger than official development aid. Innovations such as cryptocurrencies and blockchain technologies have the potential to improve the remittance environment by significantly reducing the cost and time of sending money internationally.

Figure 1.6. Sending money home

Remittances compared with other resource flows to developing countries, 1970-2017



Note: Data for low and middle-income countries used for Foreign Direct Investments (FDI) and remittances. ODA data refers to government aid of OECD Development Assistance Committee (DAC) countries, and excludes loans and credits for military purposes.

Source: World Bank (2018), "Foreign direct invesment, net inflows" and "Personal remittances, received" (indicators), https://data.worldbank.org/; and OECD (2018), "Net ODA" (indicator), https://doi.org/10.1787/33346549-en.

StatLink https://doi.org/10.1787/888933888336

And education?

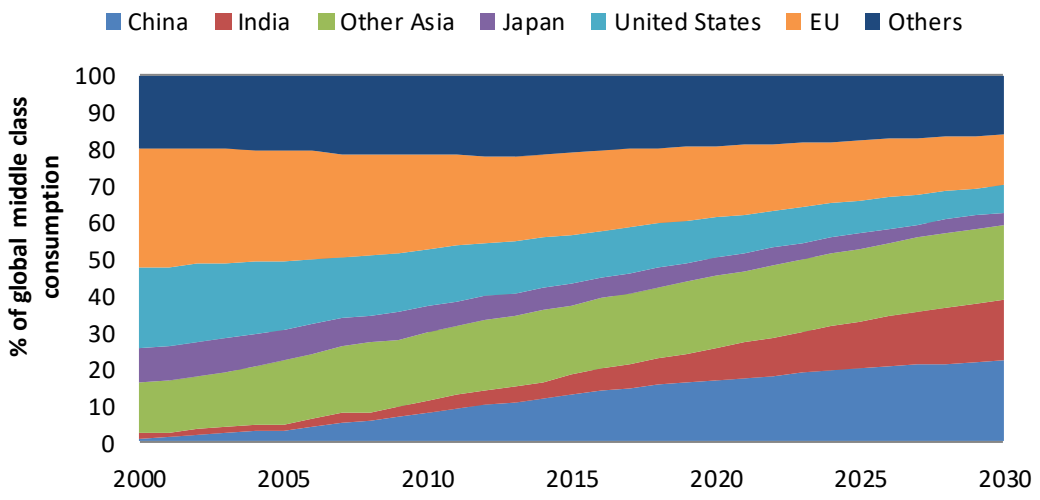
- How can education systems better serve students from various backgrounds, socio-economic classes and cultures? How can they better distribute their resources to aid students who need extra help?
- Do international students have a responsibility to return to their home countries to transfer knowledge back to their nations and peers? What role do OECD countries have in minimising brain drain?
- What responsibility do schools have in teaching the values of society? How can teachers be supported in this task?

THE e-PLANET

Technological revolutions have changed global consumption patterns. Declining production costs allow more people to afford electronics and participate in a digital world. However, rising consumption also has its downsides. For example, electronic products like smartphones and tablets become quickly outdated due to rapid technological advances, requiring ever-newer versions. This results in a rapid increase in electronic waste containing toxic materials that can be very damaging to the environment as well as human health. Emerging countries appear particularly vulnerable to the unsustainable cycle of production and consumption of electronic products. Education has a role to play in developing the skills needed for a sustainable future.

Figure 1.7. China and India consuming more

Shares of global middle class consumption, 2000-2030



Source: Kharas (2017), "The unprecedented expansion of the global middle class, an update", www.brookings.edu. Kharas (2010), "The emerging middle class in developing countries", www.oecd.org/dev/44457738.pdf.

StatLink https://doi.org/10.1787/888933888355

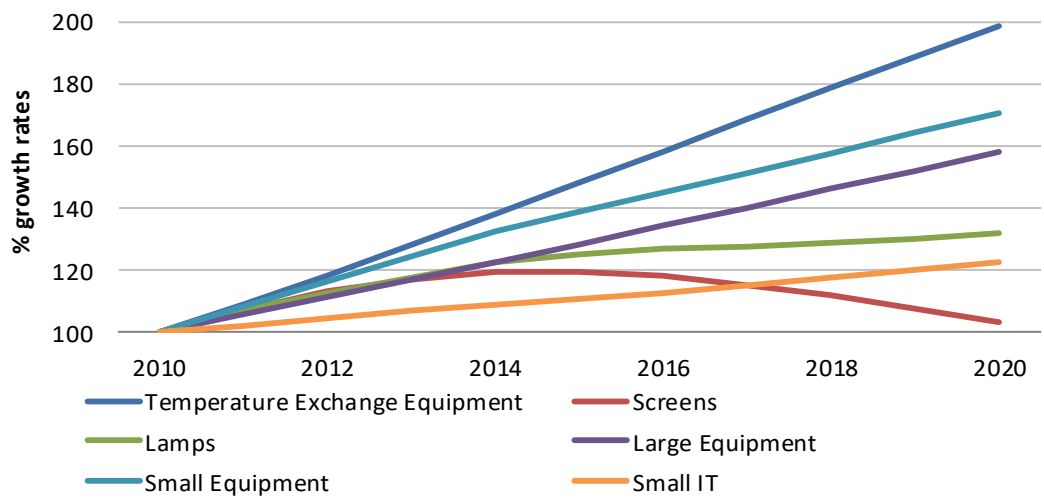
The geographical distribution of middle class consumption is changing. This growth is largely driven by China and India, where new entrants into the middle class use their rise in purchasing power to buy new commodities. Between 2000 and 2030, China's share of global middle class consumption is expected to increase from 1% to 22%, while India's share will rise from 1% to 17%. Consequently, as these are relative shares, a significant decrease is expected in the United States and, to a lesser extent, the European Union. The global middle class is an important driver of economic growth, accounting for one third of global consumption expenditures.

Global consumption of electronic equipment is on the rise. This has resulted in an alarming increase in e-waste, or discarded electronic devices. Waste from temperature

exchange equipment, such as refrigerators and air conditioners, is expected to almost double between 2010 and 2020. Only screen waste is likely to decline, as bulky screens are replaced by flat panel displays. E-waste can be damaging to the environment and health if not treated correctly. In 2016, the world generated almost 45 million metric tonnes of e-waste, of which only 20% was recycled through appropriate channels. Particularly emerging countries, which often function as dumping yards and informal recycling centres, appear to be vulnerable to the negative effects of poor e-waste management. These issues raise tough questions about potential tensions between research, innovation and sustainability. What is the role of education in addressing this?

Figure 1.8. World's fastest growing waste problem

E-waste volume growth rates in percentage by category, 2010-2020



Note: Large equipment includes washing machines, large printing machines and photovoltaic panels. Small equipment includes vacuum cleaners, microwaves, and calculators. Small IT includes phones, personal computers and printers.

Source: Baldé, C. et al. (2017), *The Global E-waste Monitor 2017: Quantities, Flows and Resources*, http://ewastemonitor.info/.

StatLink https://doi.org/10.1787/888933888374

And education?

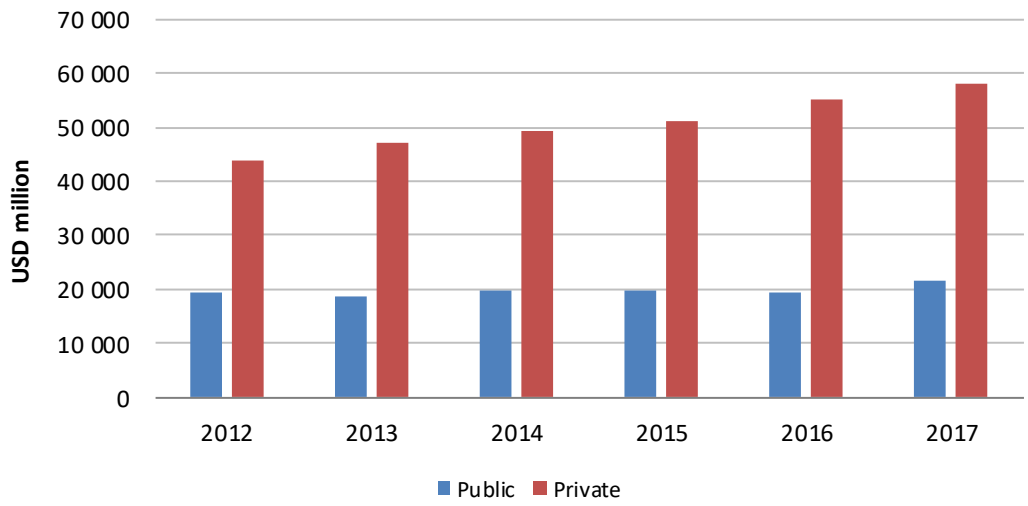
- Environmental challenges are fundamentally global in nature. How can education systems help countries to achieve the Sustainable Development Goals?
- Reducing the amount of e-waste being produced could require a change in behaviours as well as learning new skills. What kinds of skills (e.g., engineering, entrepreneurship, recycling, waste management etc.) could be useful?
- Consumption habits are key to sustainability. But, what happens when new and better products enter the market? Are we to keep outmoded equipment to limit e-waste? How should education address such trade-offs?

NEW PLAYERS, NEW GAME?

With more knowledge-intensive economies, research and development (R&D) capacity is a key policy and business priority. Improved technology works in a virtuous cycle with innovation in areas as diverse as renewable energies and artificial intelligence (AI). The challenge for countries lies in the ability to transform R&D into social and economic benefits. For education, students need to learn advanced skills and qualifications required to fully participate in more knowledge-intensive and faster changing labour markets, including social and emotional competence. There is also a question about partnerships and the role and responsibilities of the private sector.

Figure 1.9. Supporting clean energy technologies

Public and private spending on R&D, 2012-2017



Note: USD refers to 2017 US dollars. Clean energy includes nuclear as well as renewables, energy efficiency, electro-mobility and smart grids. Private sector figures based on corporate reporting.

Source: IEA (2018), *World Energy Investment*, https://doi.org/10.1787/9789264301351-en.

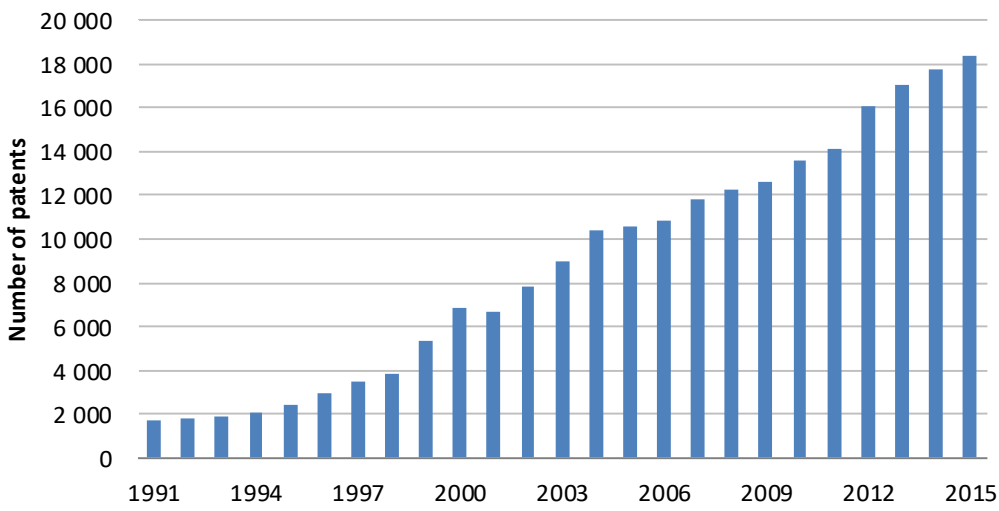
StatLink https://doi.org/10.1787/888933888393

Investment in clean energy innovation is an essential strategy to combat climate change as well as a savvy bet on a potentially expanding market. Private spending on low-carbon energy R&D has been steadily increasing, with the largest expenditures in Europe and Asia. In the public sector, spending increased by 13% in 2017, a change from stagnation and even decreases in recent years. Both of these sources of funding are important: across OECD countries, growth in R&D expenditure for all fields is largely driven by the private rather than the public sector, but they play different roles. Government R&D tends to focus on earlier-stage and collaborative research, whereas private sector spending includes substantial product development and problem solving, including for existing, commercialised technologies.

Artificial intelligence (AI) – the revolution of intelligent machines able to perform human-like cognitive tasks – is expected to become especially important in key sectors such as healthcare (cancer detection), transport (driverless cars) and the environment (smart energy consumption). The growth of AI technologies, measured by interventions patented in the top five intellectual property offices worldwide (IP5), increased yearly by an average of almost 11% between 1991 and 2015. Japan, Korea and the United States are the top filers in AI patents: together they contributed to over 62% of AI related patent applications between 2010 and 2015. China has also been increasingly focusing on this area. Education can ensure that students have the competences needed to compete in an innovative world.

Figure 1.10. The growth of AI technologies

Number of patents in artificial intelligence technologies, 1991-2015



Note: Data refer to the number of IP 5 patent families in AI (see StatLink for full information). *Source*: OECD (2017), *OECD Science, Technology and Industry Scoreboard 2017: The digital transformation*, http://dx.doi.org/10.1787/9789264268821-en.

StatLink https://doi.org/10.1787/888933888412

And education?

- Public funds are growing scarcer, potentially impacting R&D. Will decreases in government spending have an impact on national and international innovative capacity? What is the role of the public sector in supporting innovative research, and where will the funds come from?
- With the rise of artificial intelligence, big data and sophisticated search algorithms, do learners need to learn facts anymore? What consequences would there be if they would not?
- Increasing competition in global research fuels the push for countries to constantly innovate to maintain their competitive position. Does education foster and value the creativity necessary to be innovative?

SHIFTING GLOBAL GRAVITY AND EDUCATION: MOVING FORWARD

What are some of the ways global trends interact with education, and how can education affect these trends? Some answers are obvious and immediate, for example the impact of technology on learners, and conversely, the potential for educators to harness the possibility of technology. Others operate on a longer term, for example the need to establish awareness for sustainability and global connectedness.

Connecting education and globalisation

Global competence

- Supporting students' capacity to examine local, global and intercultural issues and developing their understanding and appreciation of the perspectives and world views of others
- Fostering the knowledge, skills, values and attitudes that encourage students to take action for collective well-being and sustainable development
- Providing opportunities to connect through open and appropriate multi-cultural interactions

Mobility

- Providing support and targeted skill development (e.g., language training) for recent arrivals, both students and parents
- Adapting the curriculum, instruction and assessment methods as well as organisational culture of educational settings to reflect cultural diversity
- Recognising prior learning and qualifications of migrants and refugees
- Fostering international mobility and collaboration of students, teachers and researchers

The knowledge economy

- Reinforcing R&D capacity by attracting and retaining top researchers in tertiary institutions and supporting their international networks
- Encouraging innovation in youth through strong science, technology and arts, teaching creativity and collaboration, and providing activities for young scientists and innovators
- Supporting partnerships between start-ups working with tertiary institutions and other innovation actors

Inequality

- Working to translate international education goals and aims to the national context, with the aim of making globalisation work for all
- Developing a national strategy to build and retain human capital through education and skill systems and addressing issues of brain drain
- Providing high-quality early childhood and care, especially for low-income households

Future thinking: preparing for uncertainty

Despite the best laid plans, the future is inherently unpredictable. This section explores some examples of uncertainties surrounding the trends discussed in this chapter.

SHOCKS & SURPRISES — Cutting communications?

- Much of the communication technology that supports our globalised world is made possible by undersea cables that connect countries and continents. These cables are not infallible, and could be severed by hostile governments or other actors. What if an attack on the undersea cables cut a number of countries off from the rest of the world?
- *What are some of the vulnerabilities of education systems that could be exposed if online communication was lost?*

CONTRADICTIONS — Artificial emotional intelligence?

- Automation of jobs is generally expected to primarily affect manual and routine tasks. As AI becomes increasingly capable, it is quite plausible that it could also take on many of our most human capabilities such as intuition, empathy, and creativity. But experts disagree on the number and quality of jobs that could be created, changed or made obsolete as a result of these developments.
- *What would humans still need to learn in such a world, if anything at all? How quickly would we be able to adjust amid an unknown level and pace of change?*

DISCONTINUITIES — Stateless digital citizenship?

- In a connected world, technologies such as digital payments and face recognition could support the development of personal digital identities, for which individuals and virtual communities could be in total control given their peer-to-peer nature. Is this a first step towards a truly borderless world? Could online communities start providing services traditionally provided by the state, such as education?
- *Will the 'public vs. private' education provision debate be stronger than ever in the context of rapid and drastic societal change?*

COMPLEXITY — Brain gain?

- As some countries grow in global influence, their rapidly improving education systems could have a considerable impact on the global markets for jobs, research, and innovation. This combined with increased geographic mobility could continue to shift the global centre of gravity for leading education and research.
- *Will students from OECD countries opt for studies in emerging-country universities in much greater numbers? What would it mean for students if global centres of excellence for research and innovation moved to very different places from today?*

FIND OUT MORE

Relevant sources

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Glossary

- **Artificial intelligence (AI)**: An advanced computer programming language aimed at enabling computers to emulate the human mode of reasoning.
- **Blockchain**: General-purpose distributed ledger technology that authenticates the ownership of assets, makes them traceable, and facilitates their digital transfer. It therefore allows direct trading of assets by providing trust in the transaction and reducing uncertainty (through its use of trustworthy self-executing code).
- **Cryptocurrencies**: A digital currency in which encryption techniques are used to regulate the generation of units of currency and verify the transfer of funds, operating independently of a central bank.
- **e-Waste (or electronic waste)**: All electrical and electronic equipment and components that have been discarded without the intent of re-using them.
- **Globalisation**: The widening, deepening and speeding up of connections across national borders. It is generally used to describe an increasing internationalisation of markets for goods and services, the means of production, financial systems, competition, corporations, technology and industries.
- **Global middle class**: Households with per capita income between 10 USD and 100 USD per person per day, adjusted for the purchasing power in each country as of 2005.
- **Global value chain**: The full range of activities that take place to bring a product from its conception to its end use and beyond. A value chain can include a single firm or be divided among different firms, can produce goods or services, and can be in a single geographical location or spread over wider areas (hence the term "global").
- **Greenhouse gases**: Greenhouse gases (for example, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_{20}), perfluorinated compounds (PFC) and sulfur hexafluoride (SF_6)) absorb energy from the sunlight that reaches the Earth's surface, slowing or preventing it from being released back into the atmosphere, causing the Earth's temperature to rise.
- **Gross domestic product (GDP)**: Standard measure of the value of the goods and services produced by a country. Gross means that no deduction has been made for the depreciation of machinery, buildings and other capital products used in production. Domestic means that it is production by the residents of the country. As many products in a country are used to produce other products, GDP is calculated by summing the value added for each product.
- **Gross national income (GNI)**: Previously known as gross national product (GNP), is the total domestic and foreign output claimed by residents of a country, consisting of gross domestic product (GDP), plus factor incomes earned by foreign residents, minus income earned in the domestic economy by non-residents.
- **International migrant stock:** The number of people born in a country other than that in which they live. It also includes refugees.
- **IP5:** The five largest intellectual property offices worldwide. The members of IP5 are: the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO) and the United States Patent and Trademark Office (USPTO).
- **Low-income country**: The World Bank defines low-income countries as countries whose gross national income (GNI) per capita is 995 USD or less in 2017. No OECD member country is categorised as a low-income country.
- **Middle-income country**: The World Bank defines middle-income countries as countries whose GNI per capita is more than 996 USD but less than 12 055 USD in 2017. The 3 896 USD GNI per capita threshold separates lower-middle-income and upper-

middle-income countries. Of the OECD members, Mexico and Turkey are classified as upper-middle-income economies.

- **Patent**: A right granted by a government to an inventor in exchange for the publication of the invention; it entitles the inventor to prevent any third party from using the invention in any way, for an agreed period.
- **Personal remittances**: Financial transfers usually sent by national or international migrants to support recipients from their country or region of origin. Remittances include the transfer of both cash and non-cash items through both formal and informal channels.
- **Purchasing power parity (PPP)**: Data shown in PPP terms is a different concept than data derived using market exchange rates. Because exchange rates do not always reflect international differences in relative prices, PPP rates provide a standard measure allowing the comparison of real price levels between countries.
- **Research and development (R&D)**: Research and creative work conducted by either the private and/or the public sector to develop new goods, techniques and services, and to increase the stock of knowledge and the use of this knowledge to devise new applications.
- **Sustainable Development Goals (SDGs):** The SDGs comprise 17 global goals set by the United Nations Development Programme. The SDGs build on the Millennium Development Goals and are part of the 2030 Agenda for Sustainable Development set out by the UN. They cover social, economic and ecological issues such as poverty, health, education, energy or environment.
- **Temperature exchange equipment**: Temperature exchange equipment is more commonly referred to as cooling and freezing equipment. Typical equipment includes refrigerators, freezers, air conditioners and heat pumps.

Chapter 2. Public matters

The nation-state is responsible for ensuring the well-being of its citizens. Education has an important role to play in improving civic and social participation and fostering democratic citizenship. This chapter explores these issues through five lenses:

Private vices, public benefits? *– focuses on the growing income gap and rising levels of tax avoidance.*

The rule of the people *– contrasts decreasing civic engagement in voting and the increasing importance of online news and media.*

The nation-state in a complex world *– looks at the role of the nation in both a global and local world, with the examples of referendums for secession and the growing interconnectedness of cities.*

Liberté, Egalité, Fraternité *– illustrates the important role governments can play in legislating for equality, using examples of immigrant minorities and gender quotas.*

Rurality in the 21st century *– highlights two challenges facing rural areas: a changing economic landscape and population shifts.*

The democracy trends highlighted in this chapter are then linked to education, from early childhood education and care to lifelong learning. The chapter ends with a look at how using different versions of the future can help us better prepare for the unknown.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

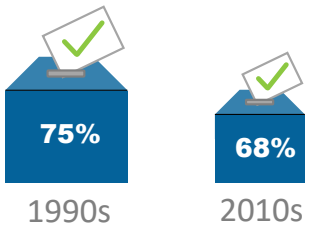
PUBLIC MATTERS: A VISUAL OVERVIEW

What is the role of the nation-state in a global world? A well-functioning democracy relies on the knowledge, skills and engagement of its citizens, yet in many countries traditional measures of civic participation, including voter turnout, have fallen throughout the last half century. Social media and online platforms provide new channels for citizen engagement, strengthening the power of citizen's initiatives, but they also make it easier to disseminate false information. At the same time, rising inequality within countries creates challenges in terms of life opportunities and access to services. These elements combine to increase worries about declining trust and growing political and social unrest. Education has an important role to play in improving civic and social participation and fostering democratic citizenship.

Chapter highlights

Voting turnout down

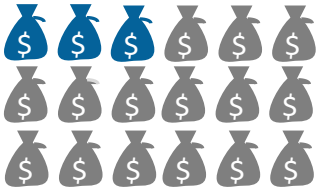
Average voter turnout in national parliamentary elections



Unfair taxation?

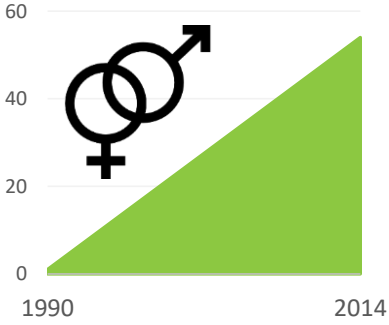
8.6 trillion

US dollars were held in tax havens globally in 2015. Almost 12% of world GDP



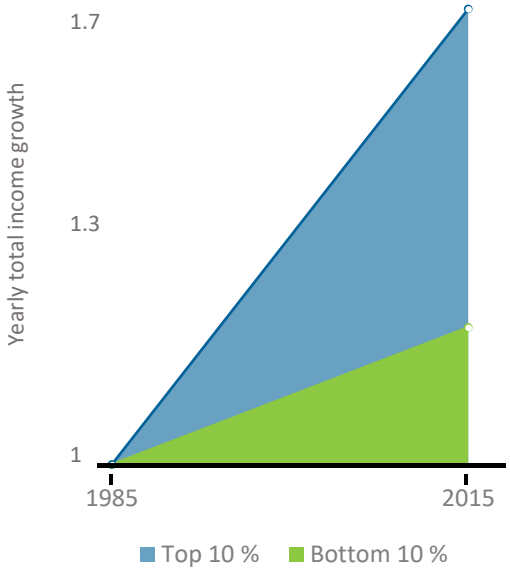
Legislating fairness

The number of countries with laws defining gender quotas in national legislatures worldwide increased from 1 in 1990 to 54 in 2014



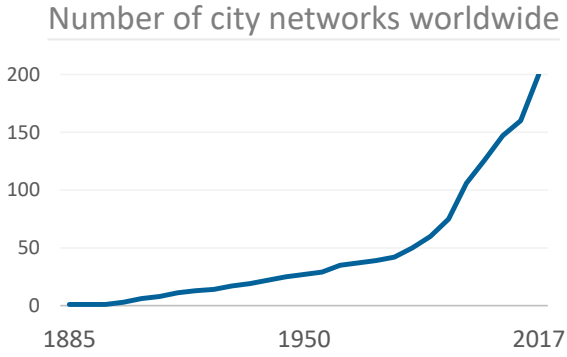
Increasing inequality

Year-on-year income growth shows an increasing divergence between the bottom 10% and the top 10%



Going (g)local

Cities increasingly working together on social, economic and environmental issues

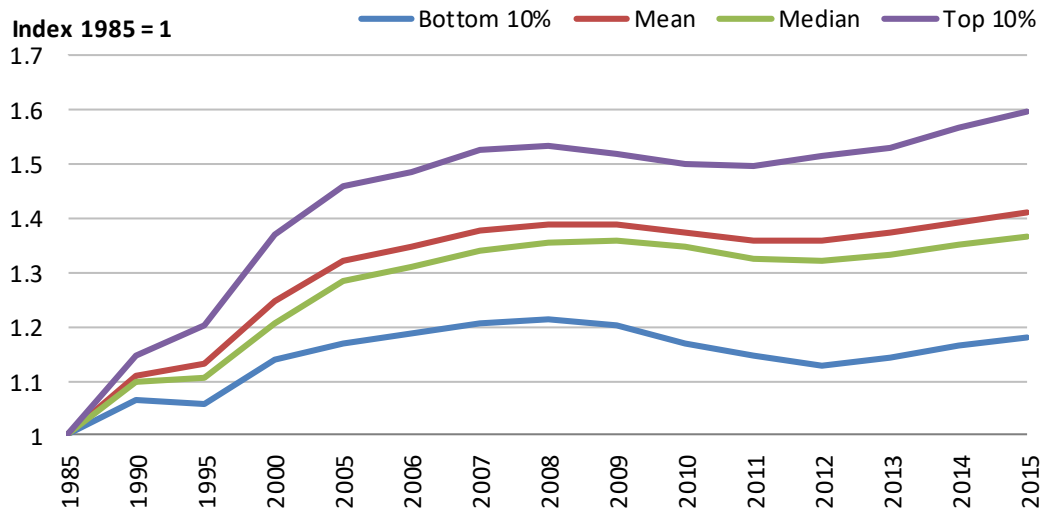


PRIVATE VICES, PUBLIC BENEFITS?

Globalisation has positively contributed to unprecedented economic growth. Yet not everyone has benefited equally, and income and wealth are becoming concentrated among the richest 10%. Economic inequality is worrisome: it can lead to inequality of opportunity, which in turn translates into large disparities in well-being and can lead to political and social unrest. Furthermore, while more people move around the world and live lives increasingly detached from national affiliations, the main regulatory frameworks and social safety nets still lie at the level of the nation-state. In this context, phenomena such as tax evasion and avoidance raise questions about whether transnational opportunities sometimes come at the expense of national solidarity. Top-notch education systems combine quality and equity, providing all students with basic skills while ensuring they have opportunities to develop their full potential.

Figure 2.1. Income gap continues to grow

Trends in real household incomes by percentile, OECD average, 1985-2015



Note: Income refers to real household disposable income. Some data points have been interpolated or use the value from the closest available year. OECD average refers to 17 countries (see StatLink for full information).

Source: OECD (2018), *A Broken Social Elevator? How to Promote Social Mobility*, https://doi.org/10.1787/9789264301085-en.

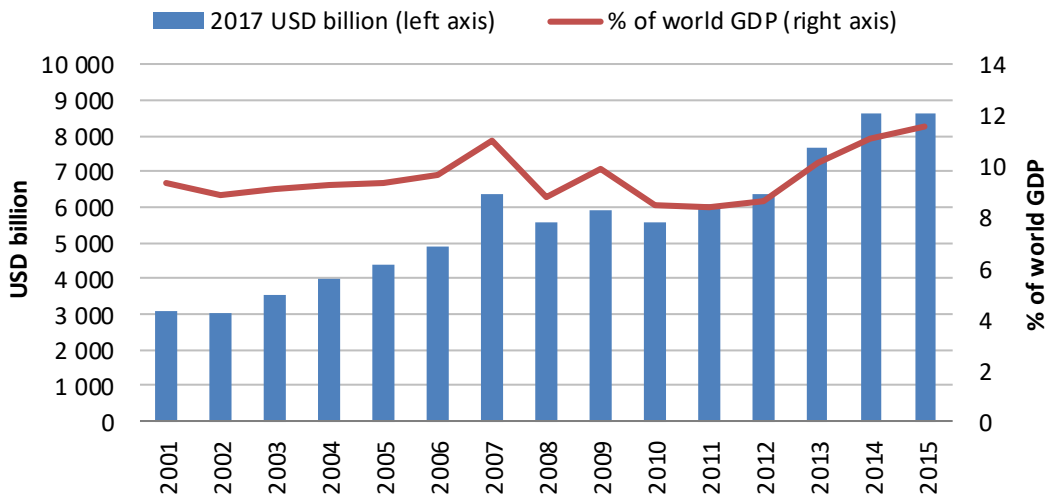
StatLink https://doi.org/10.1787/888933888431

Income grew worldwide between 1985 and 2015. The poorest saw large increases in income and many were lifted out of poverty during this time, particularly in China. Nevertheless, income gains at the top level of the distribution have been much more pronounced. In OECD countries, although income levels have grown for all households, today the richest 10% percent of the population earns about nine and a half times the income of the poorest 10%. Moreover, inequality is even more marked when it comes to wealth (which includes savings, investments, real estate, etc.) rather than just income. In 2016, the wealthiest 10% owned about half of the total wealth in OECD countries.

Digitalisation and financial innovation have made it easier to move funds overseas. In 2015, almost 9 trillion US dollars were held in tax havens globally, equivalent to almost 12% of world GDP. This was up from only 9% in 2001. However, large differences exist between countries and regions. In Scandinavia, global offshore wealth only accounts for a few percent of GDP. In Continental Europe, this is about 15%. In Russia, Gulf countries and some Latin American economies this figure reaches 60%. As most offshore wealth is owned by the world's richest people, tax evasion only enriches a small group of individuals. At the same time, revenue losses may have to be compensated for by higher taxes on lower-income households. Hence, while the impact of this trend varies across and within countries, it raises questions about the distribution of civic rights and duties across social groups as well as on the limits of national solidarity in a globalised economy.

Figure 2.2. Civic rights, civic duties?

The world's offshore household financial wealth, 2001-2015



Source: Alstadsæter, A., N. Johannesen, and G. Zucman (2017), "Who owns the wealth in tax havens? Macro evidence and implications for global inequality", http://gabriel-zucman.eu/offshore/.

StatLink https://doi.org/10.1787/888933888450

And education

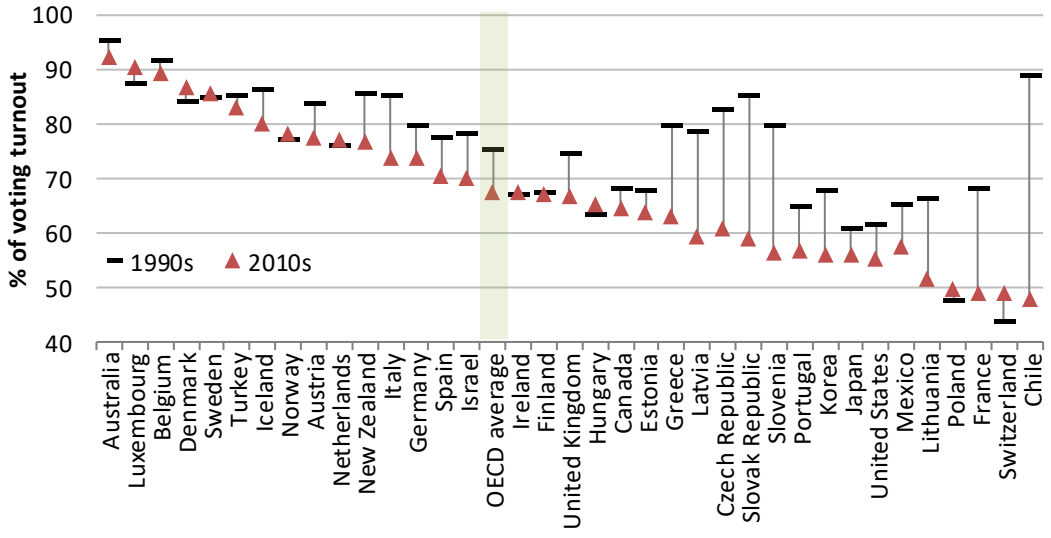
- Strategic investments in education can help reduce inequality. How can school resources be distributed to best serve those schools and families most in need? Do disadvantaged students have access to financial support for non-compulsory education?
- Access to high quality ECEC contributes to better academic performance later in life, yet not everyone benefits equally. How can the quality of ECEC be assured across all communities, even the most disadvantaged?
- There have been recent high-profile exposures of organised international tax avoidance (e.g., Panama Papers). Should financial literacy be rethought to focus not only on individual benefits but also on social good?

THE RULE OF THE PEOPLE

It has never been as easy to access information, express one's opinions and reach out to fellow citizens as it is in today's digital world. Yet key processes for democratic decision-making in our societies, such as voting, are declining. Additionally, even though the digital world has expanded opportunities for citizens to use their voice, this is no guarantee that they can access reliable and balanced information or have the willingness to listen to and compromise with others. What kind of civic virtues do modern democracies require? How can citizens sort fact from fiction in a digital society? These questions have implications for education, such as the role of schooling in the formation of civic and digital competence as well as that of society in the governance of schools.

Figure 2.3. Declining voter turnout in OECD countries

Change in average voting rates per decade in OECD countries, 1990s and 2010s



Note: Countries are ranked in descending order by the average voting rates for the period 2010-18, covering national parliamentary elections from 2010 to the latest year with data available. Voting in Australia, Belgium and Luxembourg is compulsory. Voting was compulsory in Chile until 2012.

Source: International IDEA (2018), *International Voter Turnout Database*, www.idea.int.

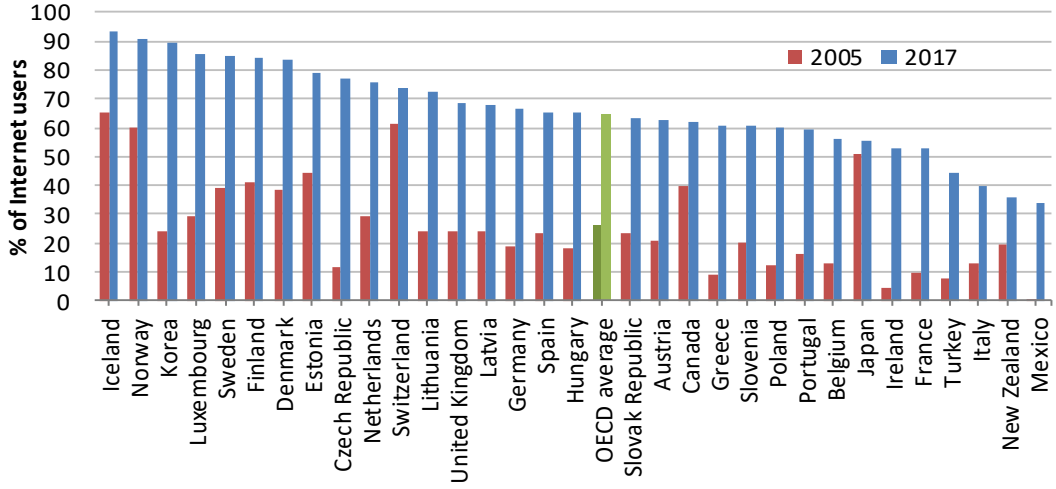
StatLink https://doi.org/10.1787/888933888469

Voter turnout in parliamentary elections is declining, from an average of 76% in the 1990s to 68% in 2010s. In some countries, this decline has been substantial, especially among the young. In the Czech and Slovak Republics and Slovenia, voting turnout is now over 20% lower than two decades ago; in Chile, where compulsory voting was abandoned in 2012, it is about 40% lower. Nordic countries are the noticeable exception to this trend. In Denmark, Finland, Norway and Sweden participation in elections has remained stable or even increased. Nevertheless, these trends are concerning. There are worries that they reflect a growing disaffection or apathy towards the political process and institutions, especially by the youngest citizens. If these trends continue, the interests of youth could be outweighed by those of older generations, who tend to vote more.

Digitalisation challenges traditional assumptions of civic participation and public deliberation. Over the last decade, the number of internet users reading or downloading the news online has increased by about 40% on average across OECD countries, reaching 65% of users in 2017. Access to information at lower or even no cost is doubtless a positive trend. However, the risks of misinformation and bias have also increased, and it can be difficult to understand the quality (and veracity) of what is presented. Search algorithms, which tailor their findings according to individual interests, and the growth of social networking platforms like Facebook and Twitter, mean that people are more likely to communicate in online echo chambers, associating with those who hold similar opinions and beliefs. Education can equip students with the critical thinking and civic (digital) skills they need to develop informed opinions and effectively engage in their community.

Figure 2.4. Reading the news online: Is this for real?

Individuals using the Internet (last 3 months) for reading/downloading the news online, 2005 and 2017



Note: OECD average includes data for 33 countries. Where the data for countries were not consistently available in the same years, figures from the closest year are used (see StatLink for full information).

Source: OECD (2018), *ICT Access and Usage by Households and Individuals* (database), https://stats.oecd.org/.

StatLink https://doi.org/10.1787/888933888488

And education?

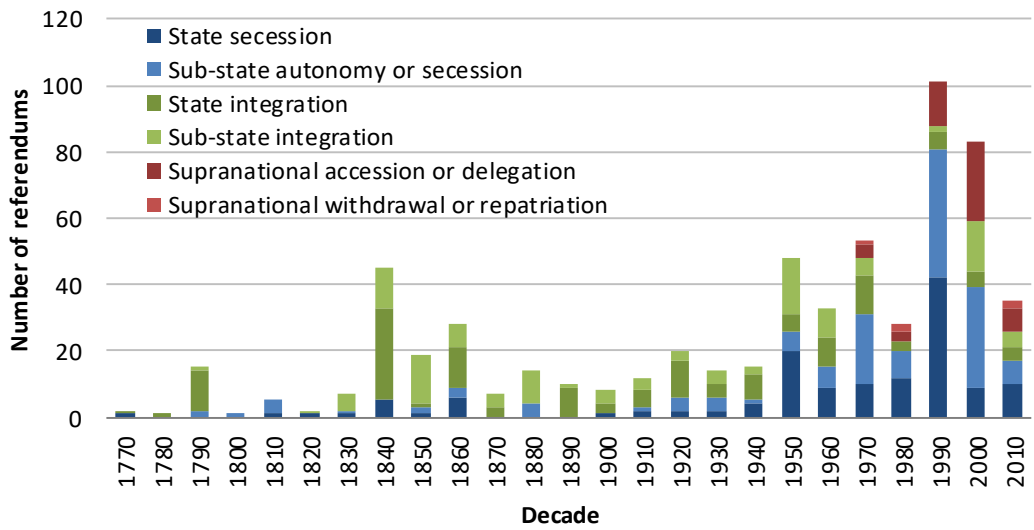
- How can education systems better support students develop the necessary civic knowledge, skills and attitudes democracy requires? What about adult citizens?
- What are the media and digital skills (hard and soft) that citizens need to navigate "digital" democracies? Is digital citizenship different from its traditional form?
- What does democracy mean in terms of school governance? When and how can different stakeholders be involved in educational decision-making?

THE NATION-STATE IN A COMPLEX WORLD

The nation-state has traditionally been the holder of sovereignty, exercising it at home and protecting it abroad. This is now shifting: On the one hand, international institutions have emerged, global integration deepened, and transnational forms of citizenship have appeared. On the other hand, decentralisation has given more autonomy to regions and actors that were once seen as subsidiaries of national governments, such as cities. These now have growing influence at local and global scale. Sovereignty seems thus shared rather than fully held by the nation-state, although not without controversy. These transformations have implications for democratic governance and citizenship, and pose questions for education systems as well.

Figure 2.5. Sovereignty disputes: Should I stay or should I go?

Decade-wise sovereignty referendums by type and frequency, 1776-2017



Note: Data for 2010s covers the period 2000-2017. 2013-17 data provided to the OECD by original authors.

Source: Mendez, F. and M. Germann (2016), "Contested sovereignty: Mapping Referendums on Sovereignty over Time and Space"; N. Aubert, M. Germann and F. Mendez (2015), "Contested sovereignty: A global compilation of sovereignty referendums 1776-2012".

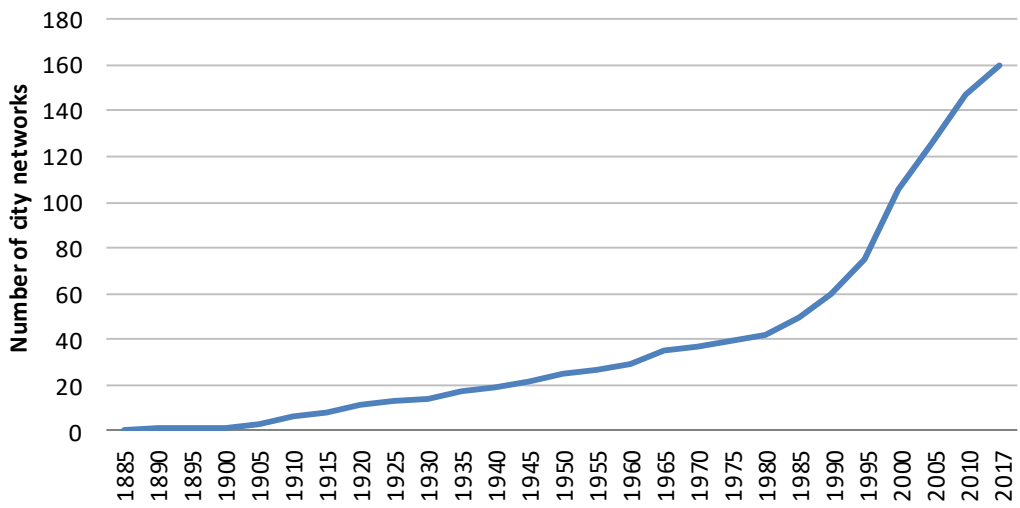
StatLink https://doi.org/10.1787/888933888507

Referendums on state sovereignty have evolved over time. In a first phase starting in 1770, referendums mainly concerned the building process of modern federal republics, such as Australia, Switzerland and the United States. This logic changed after World War II, with a surge in secession referendums on decolonisation (1950-1960s) and the dissolution of the communist bloc (1990s). Since the 1970s both the logic and the scope have changed. First, many referendums had to do with granting sub-state autonomy within OECD countries, such as in Denmark, Spain and the United Kingdom. Secondly, and perhaps more striking, referendums on the successive waves of EU enlargement marked the first integration process of once fully sovereign states within a larger transnational polity, although the future of this trend remains an open question.

Increased transnational collaboration and integration can also be found among governance actors other than nation-states and transnational institutions. In our increasingly urban world, cities find themselves at the forefront of some of the most pressing issues of our time, such as climate change and the integration of migrants into communities. In this context, cities are increasingly collaborating to promote knowledge exchange and to ensure that national and international decision-making includes the urban perspective. The growth of city networks is impressive: While only one city network existed in 1885, there were 59 in 1985 and by 2017, 200 city networks existed worldwide. Examples include United Cities and Local Governments (UCLG) and the Global Covenant of Mayors for Climate and Energy.

Figure 2.6. Para-diplomacy on the rise in cities

Cumulative number of city networks, 1885-2017



Source: Acuto et al. (2017), "City Networks: New Frontiers for City Leaders".

StatLink https://doi.org/10.1787/888933888526

And education?

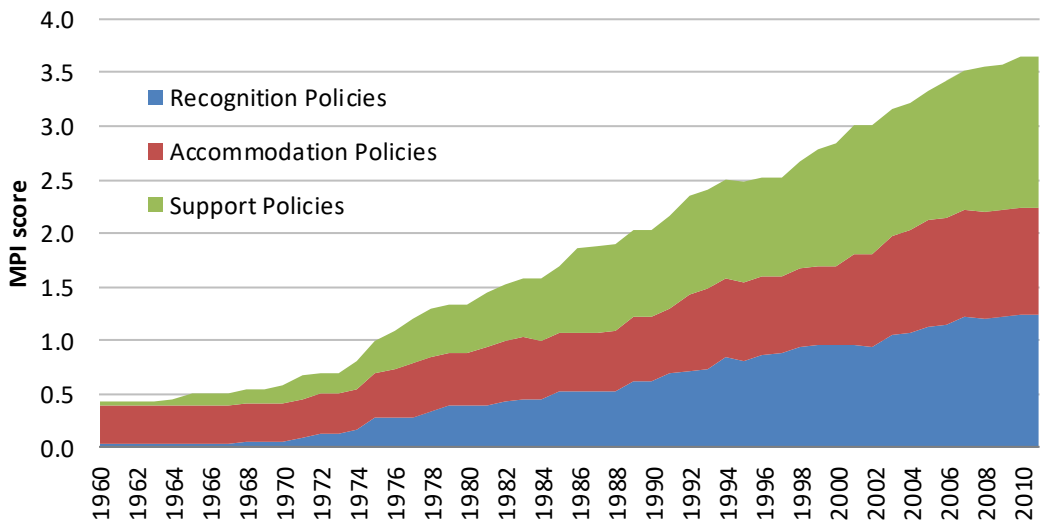
- How can decentralised, multilevel education systems address local needs while ensuring overall quality education is accessible for all students?
- Education networks (local stakeholders, professional, school-to-school) are an increasingly prevalent means for capacity building and knowledge exchange. What should the role of public authorities be in setting up, steering and ensuring quality in such networks?
- Sovereignty seems increasingly shared rather than held and exercised in isolation by nation-states. How important should 'nation' and 'nationhood' be in civic education today? Can we imagine a time when the teams in the Olympics will represent cities, not countries?

LIBERTÉ, EGALITÉ, FRATERNITÉ

That individuals are created equal and enjoy certain unalienable rights was declared to be a self-evident truth at the end of the 18th century. Since then, modern democracies have gradually extended civil rights to originally excluded groups, such as women and ethnic minorities. Yet fulfilling the promise of emancipation in pluralistic societies is often a delicate issue. How do we strike a fair balance between all parties in a diverse society? Do certain minorities require special attention to ensure their rights, and does that imply targeted policies to enforce them? Education systems have a role in fighting all forms of prejudice and discrimination, fostering inter-cultural tolerance and understanding and promoting equitable relations between all citizens.

Figure 2.7. This land is your land

Adoption of multiculturalism policy for immigrant minorities, 1960-2011



Note: The Multiculturalism Policy Index (MPI) is composed of 21 OECD countries. Its results are based on eight individual policies that can be either adopted (1), partially adopted (0.5) or not adopted (0). Individual policies are weighted equally in the three clusters of the figure (see StatLink for full information).

Source: Multiculturalism Policy Index (2018), "Multiculturalism Policies for Immigrant Minorities", www.queensu.ca/mcp/.

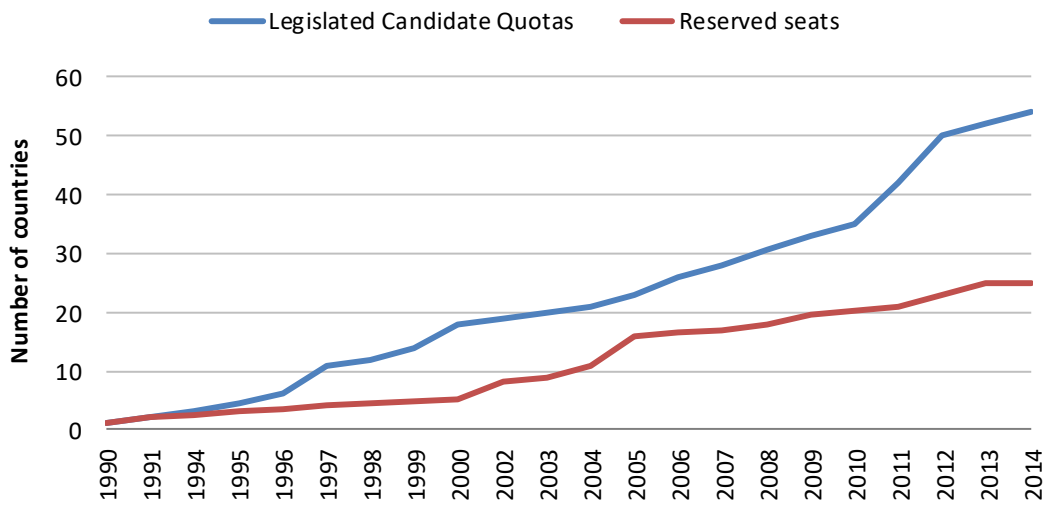
StatLink https://doi.org/10.1787/888933888545

Since the 1960s, many democracies have moved from cultural assimilation practices towards a multicultural accommodation of increasing ethnic, religious and linguistic diversity. Policies to recognise, accommodate and support immigrant minorities were initially fostered by the traditional countries of immigration (Australia, Canada, New Zealand and the United States) in the mid-20th century. Since then, Belgium, Sweden the United Kingdom, and more recently Finland, Ireland, Norway, Portugal and Spain are among the OECD countries and economies that have been particularly active in the recognition of multiculturalism.

The logic of minority rights protection is not restricted to immigrant communities. In fact, it is not even restricted to minorities. An increasing number of countries worldwide have adopted laws to ensure equal representation for women in national parliaments since the early 1990s, either by setting up candidate gender quotas or reserving seats for women in parliament. Attempts to tackle gender inequality via legislative action are not restricted to political representation only, as Iceland demonstrated in 2017 by passing a law establishing equal pay for women for all firms with 25 or more employees. All these efforts relate to a much larger underlying challenge: the existence and persistence of gender prejudices in society. Education is an important vehicle for promoting equitable and respectful relations between women and men (and boys and girls).

Figure 2.8. Objective: 50/50

Number of countries with laws defining gender quotas in national legislatures worldwide, 1990-2014



Note: The figure covers quotas legislated at the national level. It does not include voluntary party quotas.

Source: World Bank (2017), *World Development Report 2017: Governance and the Law*, www.worldbank.org/en/publication/wdr2017.

StatLink https://doi.org/10.1787/888933888564

And education?

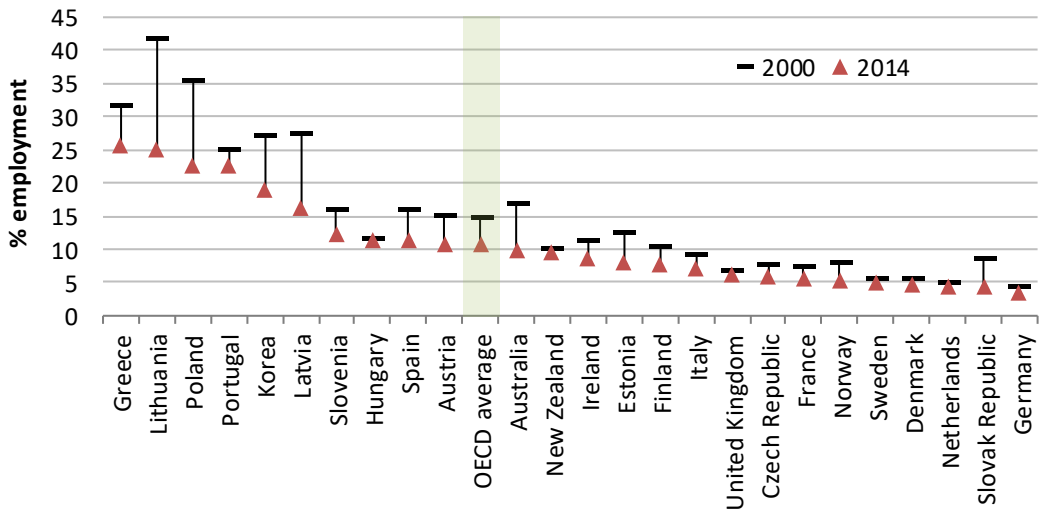
- Are teachers adequately prepared to teach students from diverse cultural and linguistic backgrounds?
- Fairness has to do with equity, but also inclusion. To what extent are teachers prepared and supported to teach students with special education needs? Are there policies in place to facilitate smooth transitions from education to work for these students?
- What role does education play, both implicitly and explicitly, in shaping the professional and educational choices made by males and females? What are the priorities for future change in this respect?

RURALITY IN THE 21ST CENTURY

In an increasingly urban world, social, economic and cultural opportunities tend to concentrate in larger, more dynamic cities. Yet one in four individuals still lives in predominantly rural regions across the OECD. With the decline of agricultural and traditional primary industries, rural areas are working to develop and diversify their economic activity, for example through tourism. But challenges such as population loss and poor service delivery remain, particularly in more remote and sparsely populated areas. Ensuring that high-quality lifelong learning opportunities meet the needs of rural citizens is key. New demands for skills, including entrepreneurship and innovation, often mean rethinking educational provision and training in rural regions.

Figure 2.9. Rural economic landscape shifting

Share of employment in primary activities in predominantly rural regions, 2000 and 2014



Note: Primary activities include agriculture, forestry and fishing. Where the data for countries were not consistently available in the same years, figures from the closest year are used (see StatLink for full details).

Source: OECD (2018), "Regional employment by industry" (indicator), https://stats.oecd.org/.

StatLink https://doi.org/10.1787/888933888583

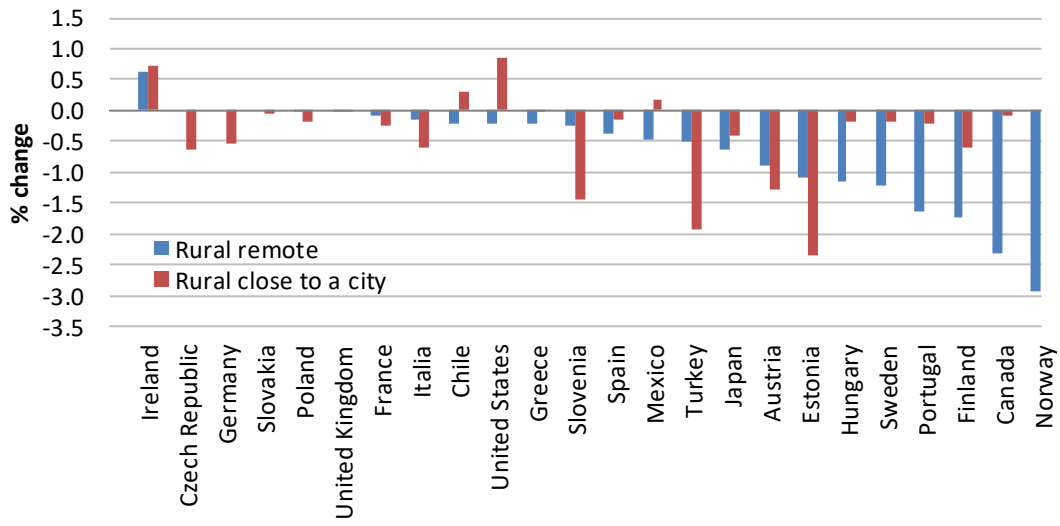
Rural communities have been traditionally associated with economic activities such as farming, forestry and fishing. Yet there is great variety in how important these are across countries: In Belgium and Germany, primary activities represented less than 4% of the share of employment in 2014, while in Greece, they accounted for more than 25%. Despite this variation, these activities are declining overall: from 2000 to 2014, the share of employment in primary activities fell on average 4% across the OECD. The largest drops were observed in Lithuania, with a decrease of 17%, and in Latvia and Poland, where the share fell over 10%. These trends demonstrate the diversification of rural economies, which have increasingly invested in other sectors such as tourism and

renewable energies. Education and skill systems can help facilitate lifelong learning, adapting skill sets as local economies and industries evolve.

Rurality in the 21st century is a diverse picture. Rural regions that are closer to cities or have good access to transport can facilitate mobility of people, goods and services and create strong "economies of proximity". Between 2000 and 2014, rural regions close to a city experienced population gains in Chile, Ireland and the United States. Regions more remote from urban areas, on the other hand, are characterised by limited connectivity and sparse populations, as well as highly specialised economies that tend to be more vulnerable to booms and busts. These regions have struggled more to retain their population. In Canada, Finland and Norway, rural remote regions experienced population loss between 2000 and 2014. Quality rural education is important for individual growth and social cohesion as well as regional smart and sustainable development.

Figure 2.10. Distance matters

Change in the share of population living in rural regions, 2000-2014



Source: OECD (2016), *OECD Regions at a Glance 2016*, http://dx.doi.org/10.1787/reg_glance-2016-en.

StatLink https://doi.org/10.1787/888933888602

And education?

- How can the education, attraction and retention of teachers in rural areas be improved? Is teaching in rural areas and small multi-grade classrooms part of teachers' pre- and in-service education?
- Can technology help smaller rural schools provide more curricular and extra-curricular opportunities to their students (e.g. open educational resources for distance learning, blended pedagogical strategies, etc.)?
- In changing rural economies, skills are critical for innovation. How can educational attainment be raised in rural areas? What is the role for schools, families, administrations, employers and the larger community in improving attainment and building skills?

PUBLIC MATTERS AND EDUCATION: MOVING FORWARD

What are some of the ways democracy trends interact with education, and how can education affect these trends? Some answers are obvious and immediate, for example the impact of large numbers of refugees on classrooms, and conversely, the potential for educators to harness the strength in diversity. Others operate on the longer term, for example encouraging civic participation in early years to foster engagement in democratic processes in adulthood.

Connecting education and democracy

Equity

- Providing high-quality early childhood education and care for all, with a special focus on low-income households
- Increasing permeability between different educational pathways (e.g., VET and general schools)
- Funding mechanisms and incentives for disadvantaged students to complete tertiary education

Democratic citizenship

- Supporting students to develop an understanding of democratic rights and values as well as social and organisational skills for civic engagement
- Promoting participatory governance arrangements for schools and classrooms
- Teaching anaytical and critical thinking skills to carefully research, assess and use sources of information off- and online
- Developing tolerance and respectful attitudes through deliberation

Inclusiveness

- Developing the potential of all pupils regardless of their gender, ethnicity, or any other difference, and challenging stereotypes that limit choice of study or career
- Fighting segregation through fair student admission criteria, controlled choice schemes, and a redistributive use of educational resources
- Addressing the urban/rural gap and rethinking education facilities as stimulators for small communities and villages

Modern governance

- Involving multiple stakeholders in decision-making and implementation, including teachers, parents and students, researchers and employers
- Developing evaluation, assessment and accountability mechanisms that combine different types of data
- Supporting education networks (local stakeholders, professional, school-to-school) to promote knowledge exchange and compensate for capacity gaps across the system

Future thinking: preparing for uncertainty

Despite the best laid plans, the future is inherently unpredictable. This section explores some examples of uncertainties surrounding the trends discussed in this chapter.

SHOCKS & SURPRISES — Platform governments?

- Some governments are developing highly sophisticated digital systems for functions such as providing public services and regulating markets. In some cases this involves gathering large amounts of personal data about citizens, and trialling social rating systems that allow for discrimination based on past behaviour. What if more governments extended their online presence in this way?
- *What role could such technologies play in guaranteeing universal access to education, while also making it more personalised?*

CONTRADICTIONS — The truth about online news media?

- Disinformation is nothing new; even governments have used false information as propaganda. What is new is the massive increase in the number of ways to distribute information and opinion, both reputable and not. What kinds of rules, conventions or technology might be developed to potentially resolve doubts about the veracity of online content – or make the situation much worse?
- *Should schools teach students how to target specific audiences and select the kind of messages and online platforms that will reach them more effectively?*

DISCONTINUITIES — Strong state, nationalistic education?

- Nationalist sentiment and the rising power of digitally enhanced state-led economies around the world could bring about a dramatic increase in government interest and involvement in education. This could potentially reduce the role of the private sector, which has been rising in many countries.
- *Which countries might be at the forefront of such a turnaround, and how might their policies affect other countries?*

COMPLEXITY — Power to the people, or power to places?

- As we become more urbanised, the differences between city life and country life are becoming more pronounced. Countries are debating whether their political systems strike the right balance between representing urban majorities and protecting rural minorities. These debates have implications for solidarity and trust within nations.
- *Is this challenge also reflected in education? How can we ensure that education design and content are inclusive of multiple voices and viewpoints?*

FIND OUT MORE

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Glossary

- **Affirmative action**: Affirmative action policies attempt to actively dismantle institutionalised or informal cultural norms and systems of group-based disadvantage, for example, via positive discrimination in accessing college and employment.
- **Algorithm**: A set of instructions designed to perform a specific task. This can be a simple process, such as multiplying two numbers, or a complex operation, such as playing a compressed video file. Search engines use proprietary algorithms to display the results from their search index for specific queries in a particular order, taking into account criteria such as relevance.
- **City networks**: Formalised organisations whose main membership is local governments. These coalitions focus on cities but can allow institutions that include, or have even been started by, actors others than cities.
- **Democracy**: Political system in which citizens are allowed to participate in decision-making and discussions. Politicians are typically elected by the citizens in free and fair elections, and serve therefore as representatives of the people.
- **Digitalisation:** The use of digital technologies and data as well as their interconnection, which results in new or changes to existing activities.
- **Economies of proximity**: Refers to emerging clusters of firms with low geographic proximity due to facilitation of available resources and simplification of access to specialised goods and services.
- **Global Covenant of Mayors for Climate and Energy**: An international alliance of cities and local governments with a shared long-term vision of promoting and supporting voluntary action to combat climate change and move to a low emission, resilient society. It supports locally relevant solutions, captured through strategic action plans that are registered, implemented and monitored and publicly available.
- **Multiculturalism Policy Index (MPI) for immigrant minorities**: MPI tracks the extent to which 21 Western democracies have adopted policies recognising, accommodating and supporting immigrant minorities. Multiculturalism policy is defined by eight policies: (1) constitutional, legislative or parliamentary affirmation of multiculturalism; (2) the adoption of multiculturalism in school curriculum; (3) the inclusion of ethnic representation/sensitivity in the mandate of public media or media licensing; (4) exemptions from dress-codes, Sunday-closing legislation etc.; (5) allowing dual citizenship; (6) the funding of ethnic group organisations to support cultural activities; (7) the funding of bilingual education or mother-tongue instruction; and (8) affirmative action for disadvantaged immigrant groups.
- **Net national wealth**: The sum of all assets, including housing, business, and financial assets, both public and private and net of debt, accumulated in a national economy.
- **Offshore wealth**: Assets held in a country where one has no legal residence or tax domicile.
- **Para-diplomacy**: External relations undertaken by legitimate representative of local and regional authorities with other local, regional, national and international actors.
- **Referendum**: Any popular vote directly related to an issue of policy that is organised by the state or at least by a state-like entity, including both binding and consultative votes.
- **Predominantly rural regions**: Regions in which two conditions are met: 1) the share of population living in rural units (municipalities in which the population density is below 150 inhabitants per square kilometre—500 inhabitants for Japan and Korea) is higher than 50%. 2) regions do not contain an urban centre of more than 200 000 inhabitants (500 000 for Japan and Korea) representing at least 25% of the regional

population. Rural regions can be further classified as either rural regions close to a city or rural regions remote depending on the driving distance from an urban centre.

- **Rural regions, close to a city**: Rural areas where driving time of at least 50% of the regional population to the closest locality with more than 50 000 inhabitants is below 60 minutes.
- **Rural regions, remote**: Rural areas where driving time of at least 50% of the regional population to the closest locality with more than 50 000 inhabitants exceeds 60 minutes.
- **Search algorithm**: In computer science, a search algorithm is a pre-defined step-by-step procedure to locate specific data among other data. One example is a linear search algorithm, which would check every record against the search key in a linear fashion.
- **Sovereignty**: The full right and power of a governing body over itself, without any interference from outside sources or bodies.
- **Sovereignty referendum**: A referendum that involves the reallocation of sovereignty between at least two territorial centres.
- **Tax avoidance**: Legal minimisation of tax liability by taking advantage of the opportunities of a tax regime such as deducting charitable contributions.
- **Tax evasion**: Unlawful attempts and actions to minimise tax liability, such as deliberately not filing taxes, not declaring income or non-payment of due taxes.
- **United Cities and Local Governments (UCLG)**: Organisation of sub-national governments with over 240,000 members in over 140 UN Member States. Its main objectives are 1) increasing the role and influence of local government and its representative organisations in global governance; 2) becoming the main source of support for democratic, effective, innovative local government close to the citizen; and 3) ensuring an effective and democratic global organisation.
- **Voter turnout**: Total number of votes cast (valid or invalid) divided by the number of people registered to vote, expressed as a percentage.

Chapter 3. Security in a risky world

In an increasingly borderless and connected world, OECD countries are facing ever more complex security challenges. Education has an important role to play in building awareness to prevent security risks and strengthening resilience in times of crisis. This chapter explores these issues through five themes:

Personal and health security *– explores a positive trend and a negative trend: the increasing safety on our roads and the decreasing effectiveness of antibiotics.*

Cyber security *– illustrates the rapidly growing number of cyber security incidents and the rising importance of privacy and security experts in a digital world.*

National security *– highlights the decline of nuclear testing and traditional war between countries, as well as ongoing internal conflicts.*

Environmental security *– emphasises the importance of environmental protection by examining the worldwide rise in natural disasters and the consequences of air pollution.*

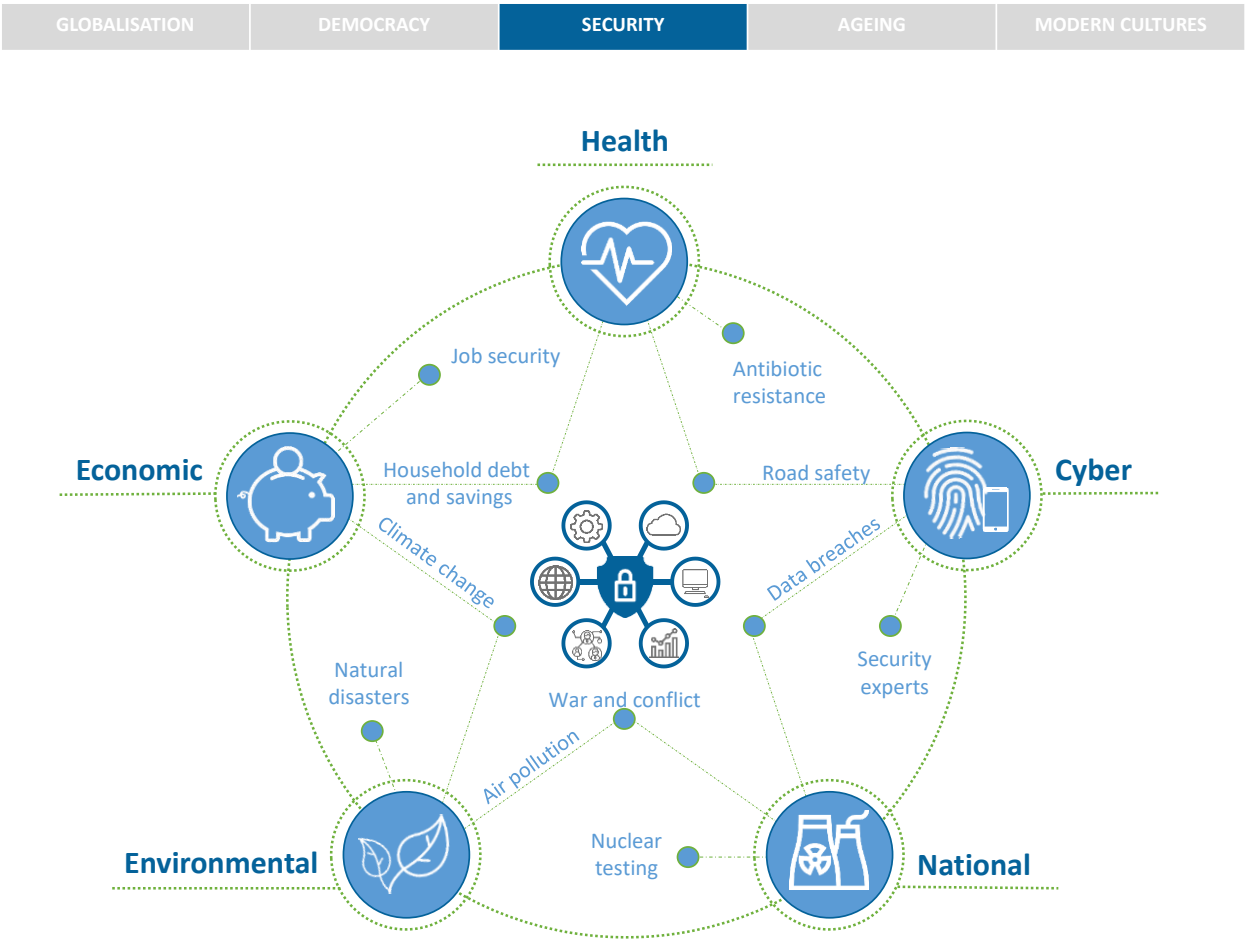
Economic security *– examines job market insecurity with the trends of increasing household debt and expected earnings loss due to unemployment.*

The security trends highlighted in this chapter are then linked to education, from early childhood education and care to lifelong learning. The chapter ends with a look at how using different versions of the future can help us better prepare for the unknown.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

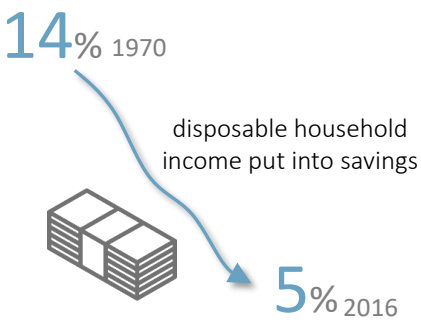
SECURITY IN A RISKY WORLD: A VISUAL OVERVIEW

On average OECD countries are more secure than they were in the past. They have benefited from less armed conflict on their soil, growing affluence, safer roads and more effective medicines and healthcare. However, in an increasingly borderless and connected world, we are now facing ever more complex security challenges. Climate change; disease and the risk of rapidly spreading pandemics; networks of terrorism and cyber threats all pose serious risks for society. Threats can also be very personal: Many individuals are experiencing financial and work-related insecurity and are concerned about the safety of their families and communities. Education can play a role in helping understand, prevent and mitigate security risks. It can also help build resilience and better prepare citizens for times of crisis.



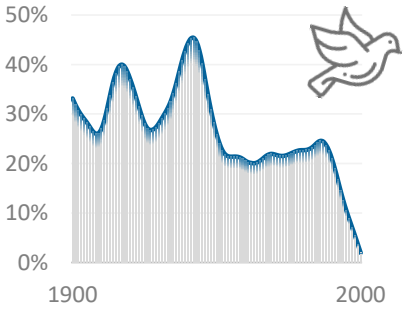
Chapter highlights

Declining savings



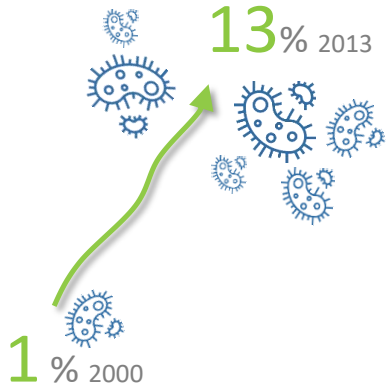
National security

Probability of living in a country in an armed external conflict decreased dramatically since WW II



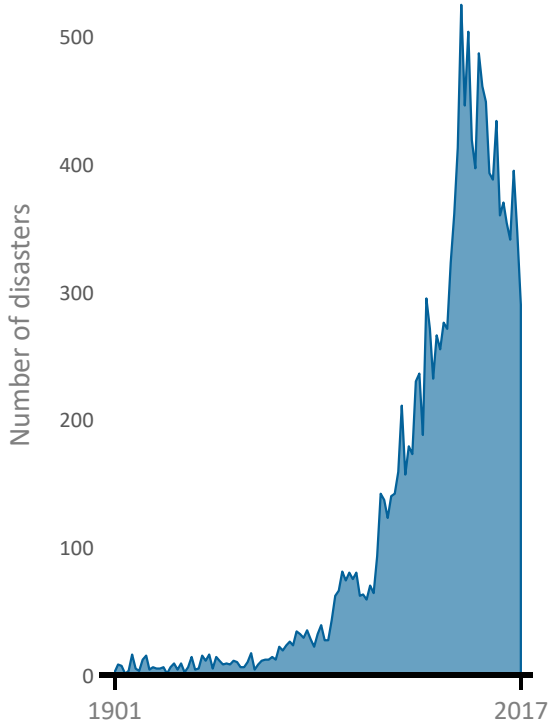
Health security

Bacteria increasingly resistant to antibiotics



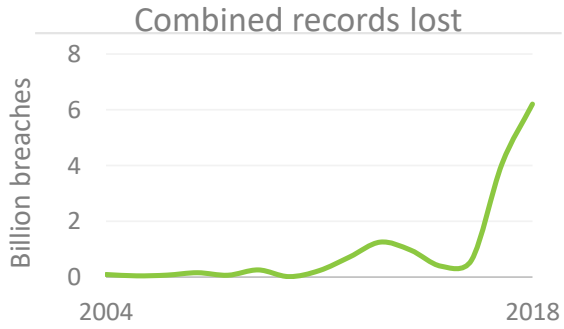
Changing climate

The number of worldwide natural disasters has been increasing since the 1960s



Cyber risks

Data breaches due to poor security, accidents or hacks have surged

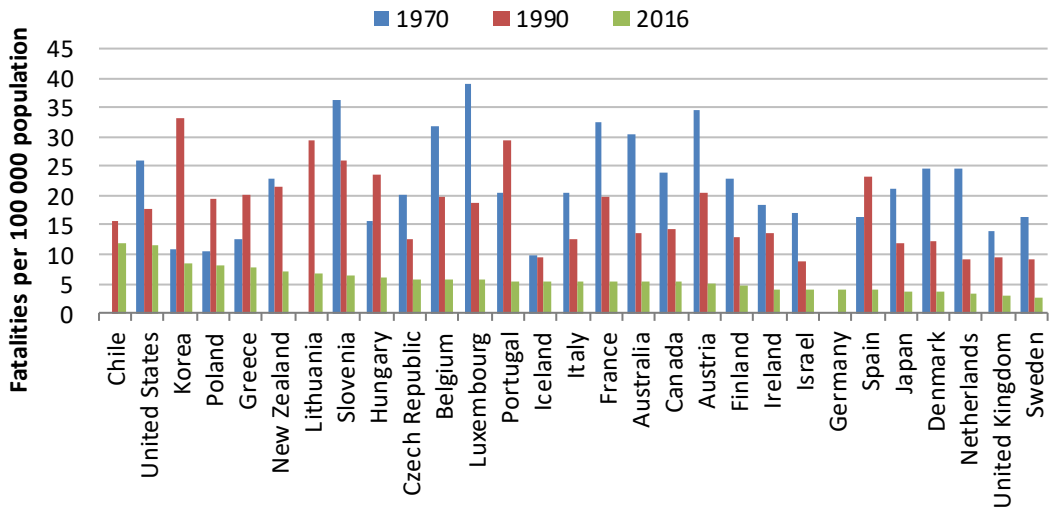


PERSONAL AND HEALTH SECURITY

Security of person is a basic right guaranteed by the Universal Declaration of Human Rights of 1948. Though we have benefited from safer roads, more effective medicines and better food hygiene, we are now facing increasingly complex security challenges. As we travel more, diseases have a greater opportunity to spread. In a progressively connected world, networks of terrorists pose a threat in many countries at the same time. And globalised supply chains mean that the risk of faulty or contaminated products can come from many different places. Education can play a role in raising awareness and preventing newer and more complex security threats, and in helping us to manage and reduce personal risk.

Figure 3.1. Safer on the roads

Number of road fatalities per 100 000 population, 1970, 1990 and 2016



Note: Countries are ranked by descending order of 2016 data.

Source: OECD (2018a), "Road casualties", *Road Injury Accidents* (dataset), http://stats.oecd.org/.

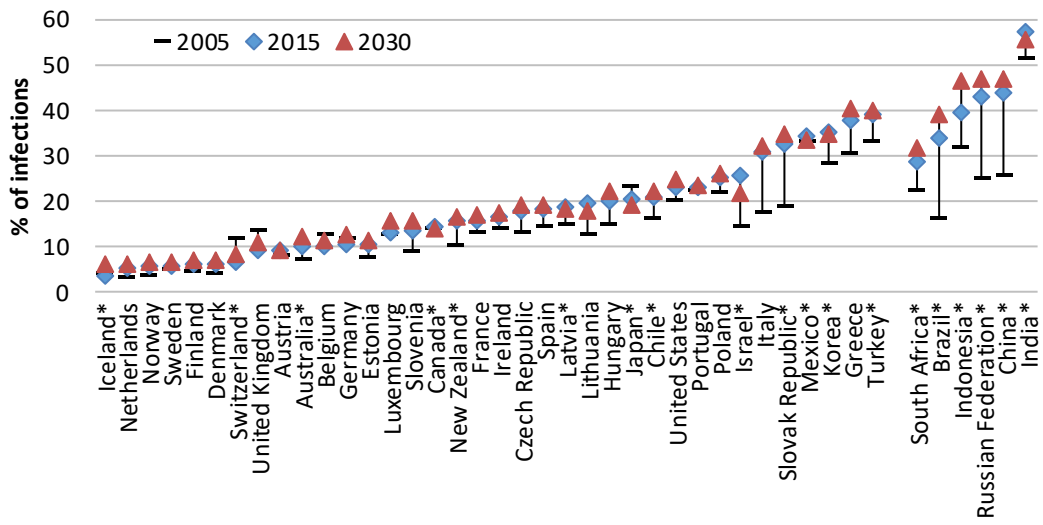
StatLink https://doi.org/10.1787/888933888621

OECD countries have benefited from a dramatic reduction in road traffic injuries since 1970. Some of the largest declines include Austria, Belgium, France, Luxembourg and Slovenia, all of which saw around 20 fatalities per 100 000 population in 1970 to fewer than seven in 2016. Korea, Lithuania and Portugal all achieved similarly impressive reductions even more rapidly, falling from around 30 fatalities per 100 000 population in 1990 to below nine in 2016. Road safety has been improved through multiple means: better road design and safety standards of vehicles, speed limits and distracted driving laws (e.g., driving while using a mobile phone or while under the influence of alcohol). As experts predict that autonomous vehicles will soon become the norm, policy makers are already considering the implications of this trend for maintaining and improving road safety.

While there have been many successes, other trends threaten our personal and health security. In particular, there has been increasing attention to antimicrobial resistance, when infectious organisms can develop resistance to antimicrobials such as antibiotics, thus rendering them ineffective. Inappropriate and excessive use of antibiotics are among many important drivers of resistance. In OECD countries the average proportion of infections caused by resistant bacteria rose from 14% in 2005 to 17% in 2015. In Greece, Turkey, and many of the BRIICS, the proportion is expected to be over 40% by 2030. Meanwhile, the number of new antibiotics receiving approval has been falling, meaning that there are increasingly limited prospects for new treatments to replace the current ones when they become ineffective.

Figure 3.2. The rise of superbugs

Average proportion of infections caused by bacteria resistant to antimicrobial treatment for eight antibiotic-bacterium combinations in 2005, 2015 and 2030



Note: * indicates country is missing more than 50% of observations, across all eight antibiotic-bacterium pairs, between 2005 and 2015. Countries are sorted left to right based on ascending proportions in 2015.

Source: OECD (2018), *Stemming the Superbug Tide: Just A Few Dollars More*, https://doi.org/10.1787/9789264307599-en.

StatLink https://doi.org/10.1787/888933888640

And education?

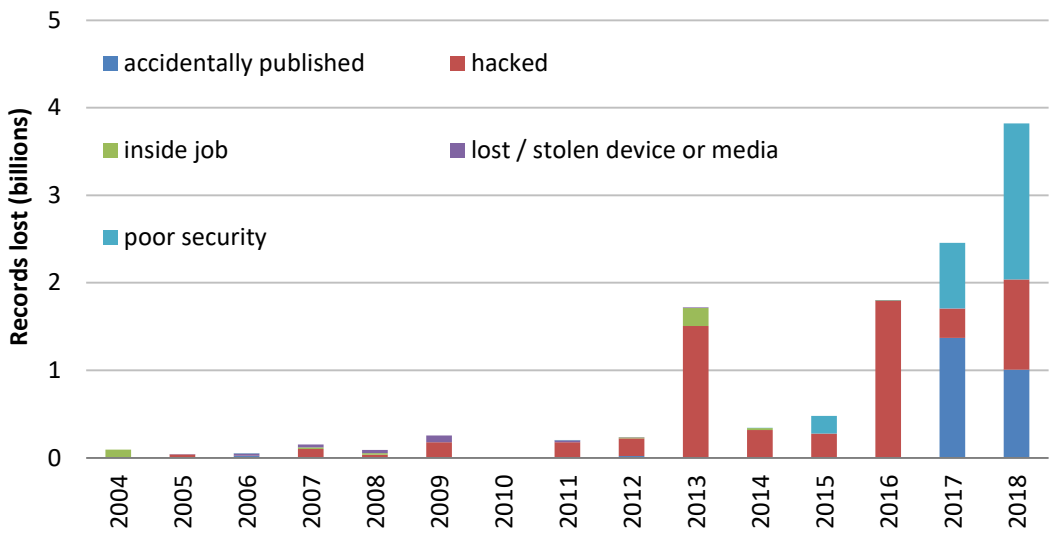
- What should be the role of schools in inspiring healthy behaviour? For example, to help combat obesity should schools ban sugary drinks and fast food items from their cafeterias or impose daily physical education?
- Should children be allowed to go to nursey/ kindergarten/school if they do not have up-to-date vaccinations? Is there a trade-off between personal choice and better security of society?
- Road safety is still a prominent issue. What action might educators take to raise student awareness of risks on the road, as well as ensuring safety within the physical proximity of the campus?

CYBER SECURITY

We depend on the uninterrupted functioning of information and communication technology systems for virtually all aspects of our daily lives. Physical goods, services, and much of our infrastructure are all now coordinated and delivered through computer systems. A great deal of sensitive and confidential data are stored on servers all around the world. Security risks in the event of data theft, leaks or other breaches have economic, social and political consequences. Who controls what data—individuals, firms or governments—is also a matter of discussion. Education is important in empowering individuals to make wise choices in handling their own and others' information online, keeping abreast of new developments in cyber risks, and in preventing and detecting fraud.

Figure 3.3. Too big for your (data) breaches?

World's biggest data breaches by method of leak (billions of records lost), 2004-2018



Note: Selected losses greater than 30 000 records; data compiled from DataBreaches.net, IdTheftCentre and press reports; 'inside job' refers to authorised individuals (such as employees) intentionally releasing data in unauthorised ways.

Source: Information is Beautiful (2018), "World's biggest data breaches: Selected loses bigger than 30.000 records", https://informationisbeautiful.net/visualizations/worlds-biggest-data-breaches-static/.

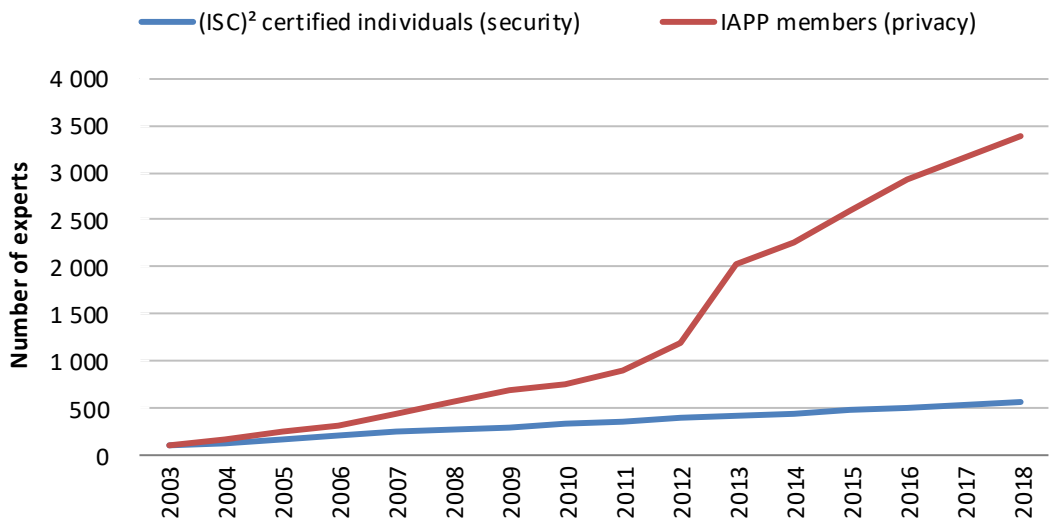
StatLink https://doi.org/10.1787/888933888659

We share increasing amounts of information about ourselves online. This comes with risks, with the sale of sensitive personal information increasingly valuable. The scale of data breaches has been growing: 2013's highest-profile breach was the hack of over a billion records at Yahoo. Names, telephone numbers, passwords and other data were leaked; the breach was only disclosed in 2016. One enormous leak recorded in 2017 and attributed to accidental publication is India's Aadhaar system, which keeps biometric and other data on over a billion Indian residents. And the number of government records lost or stolen in 2018 was the highest ever in one year.

Cyber security incidents have an economic price, and are forecast to cost global business over 8 trillion USD in the years 2017-2022 (Moar, 2017). There are also ethical issues concerning the use of personal data and the extent to which individuals can or should give consent for it to be collected or shared. Knowledge and skills in cyber security and privacy are valuable assets, as shown by a steady increase in the number of individuals with cyber security certifications from the (ISC)2 consortium since 2003. Privacy Professionals (IAPP) members also increased steadily, with a rise from 100 members in 2003 to over 3300 members in 2018.

Figure 3.4. Increasing need for privacy and security experts

Number of certified/professional privacy and security experts, 2003-2018



Note: Data for 2017 were unavailable. IAPP data for 2018 are approximate.

Source: OECD (2017), *OECD Digital Economy Outlook 2017*, http://dx.doi.org/10.1787/9789264276284-en; (ISC)², www.isc2.org/About/Member-Counts; IAPP, https://iapp.org/about/iapp-facts/.

StatLink https://doi.org/10.1787/888933888678

And education?

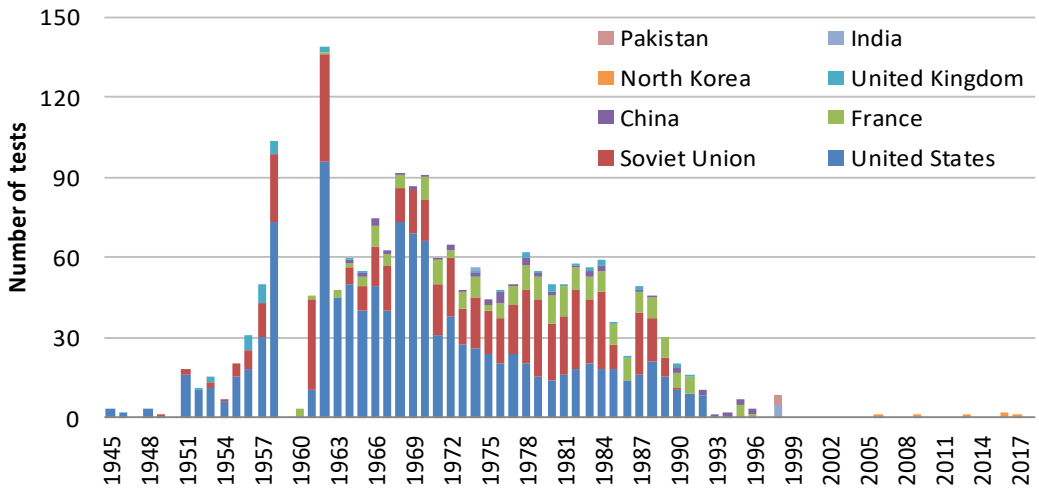
- How can education encourage young people to make informed and responsible choices about handling personal data? And how should educators integrate digital literacy – including risk - into their lessons?
- What skills will be needed in a world of constant cyber risk? Is it possible to train "responsible hackers" to fight against illegal infiltration? Is it the role of education, and, if not, who should be responsible?
- New threats such as cyber-attacks and biological weapons require new strategies to defeat them. How can education systems produce the highly-skilled and flexible workforce with the skills necessary (ICT, problem solving, critical thinking, languages, etc.) to secure our nations?

NATIONAL SECURITY

National security commonly refers to defending the nation against invasion or occupation, although it can also have broader meanings such as freedom to maintain core values without the threat of war. National security is a priority reflected in armed forces, border controls, and the funding of research and development. As the threats facing our nations change and evolve, our perception of security changes too. Traditional inter-state war has become less common, but political violence and intrastate conflict are still present. There are also new threats such as cyber-attack. Education should play a role in helping us to learn the lessons of the past, and (hopefully) develop better foreign policy to avoid conflict.

Figure 3.5. Mutually assured détente?

Number of worldwide nuclear tests, 1945-2018



Note: Since 2014, nuclear tests have been confirmed to have taken place in North Korea.

Source: Oklahoma Geological Survey Observatory and Lawson (2014), http://digitalprairie.ok.gov/cdm/compoundobject/collection/stgovpub/id/9093/rec/1.

StatLink https://doi.org/10.1787/888933888697

Only two nuclear weapons have ever been used during warfare: the attacks on Hiroshima and Nagasaki, Japan in 1945. In the years that followed, a small number of countries raced to develop and test nuclear weapons. The United States and the Soviet Union built up such large nuclear arsenals that any hypothetical conflict between the two was widely assumed to be a scenario of 'mutually assured destruction'. By the early 1970s, a process called *détente* led to a gradual decline in the number of annual nuclear tests. These then dramatically dropped in the early 1990s amid the dissolution of the Soviet Union. There has been a total absence of nuclear testing worldwide since 1998, with the one exception of North Korea.

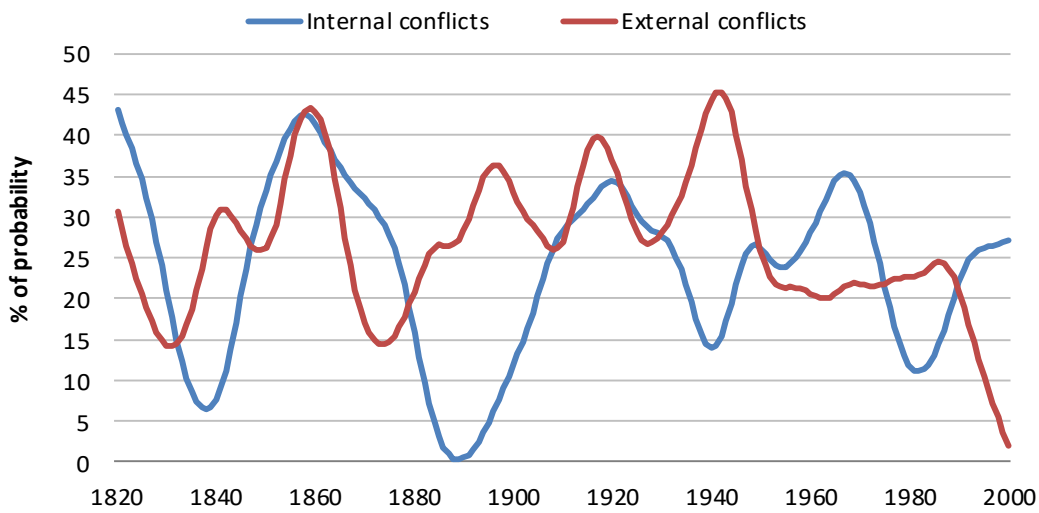
The decline in nuclear testing is part of a broader downward trend in armed conflict between countries. In 2000, the probability of a person inhabiting a country with an

armed conflict reached its lowest since records began in 1820. This trend has continued, although this does not include inter-state aggressions or cyber-attacks.

In contrast, intrastate war, or civil wars within a country, has continued to go up and down over time. In 2000, it stood at just over 27%, slightly above the historical annual average of 24%. There is one area where security risks are clearly increasing: Terrorism has also sharply risen by some accounts, although there is difficulty in accurately tracking and defining what counts as terrorism. As the threats faced by nations transform with the modern world, so too do the skills they require of their citizens and security personnel.

Figure 3.6. Peace across time

Probability of inhabiting a country with an armed conflict, 1820-2000



Note: The probability of inhabiting a country involved in a conflict is estimated by the average occurrences of a conflict in a given country in a given year (a binary variable) weighted by population.

Source: van Zanden, J. et al. (2014), *How Was Life? Global Well-being since 1820*, http://dx.doi.org/10.1787/9789264214262-en.

StatLink https://doi.org/10.1787/888933888716

And education?

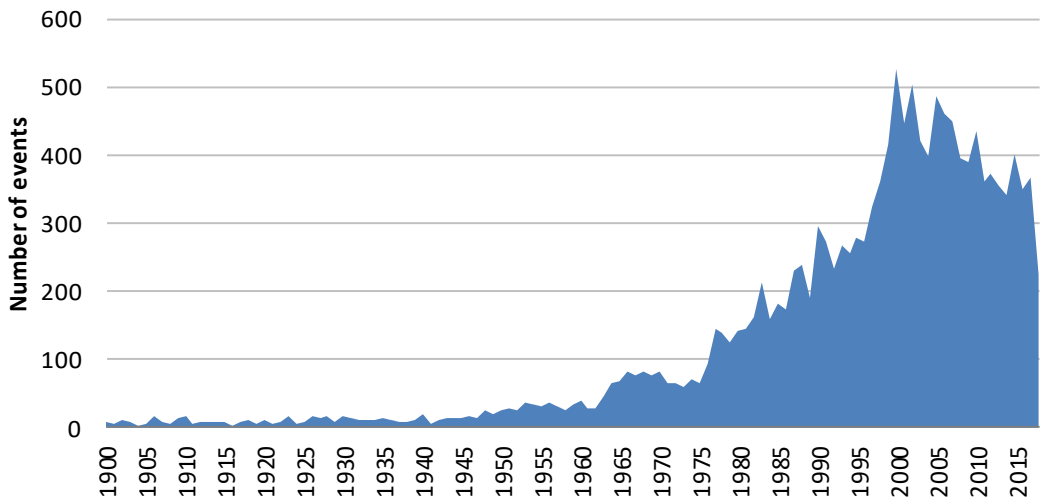
- Civic education has been linked to increased tolerance and trust. Is this potential being fully exploited by our schools, for example in preventing radicalisation? Can we do more?
- Countries often turn to education to solve social problems. Does education have a role in preventing crime, for example, through keeping at-risk youth engaged in the system or by providing self-defence training for students? Should it?
- Learners from war zones, especially unaccompanied minors, face special challenges. Do education systems have the capacity to help, for example through mental health support and dealing with school years lost?

ENVIRONMENTAL SECURITY

Our environment is precious. It supports life and health, as well as our economies and societies. International efforts to combat climate change have the potential to dramatically reduce emissions and pollution. However, change has been slow, and we are running out of time. Forecasts currently call for rising sea levels, continuing loss of biodiversity and more extreme weather events as a result of climate change. Education is important in preventing and mitigating the risks to our planet. It can also help develop the responsible and sustainable behaviours needed for a secure, global future.

Figure 3.7. Eye of the storm: increasing natural disasters worldwide

Number of recorded events, 1900-2018



Note: Events include drought, floods, biological epidemics, extreme weather, extreme temperature, landslides, dry mass movements, extra-terrestrial impacts, wildfires, volcanic activity and earthquakes.

Source: EM-DAT (2018), *The Emergency Events Database,* www.emdat.be.

StatLink https://doi.org/10.1787/888933888735

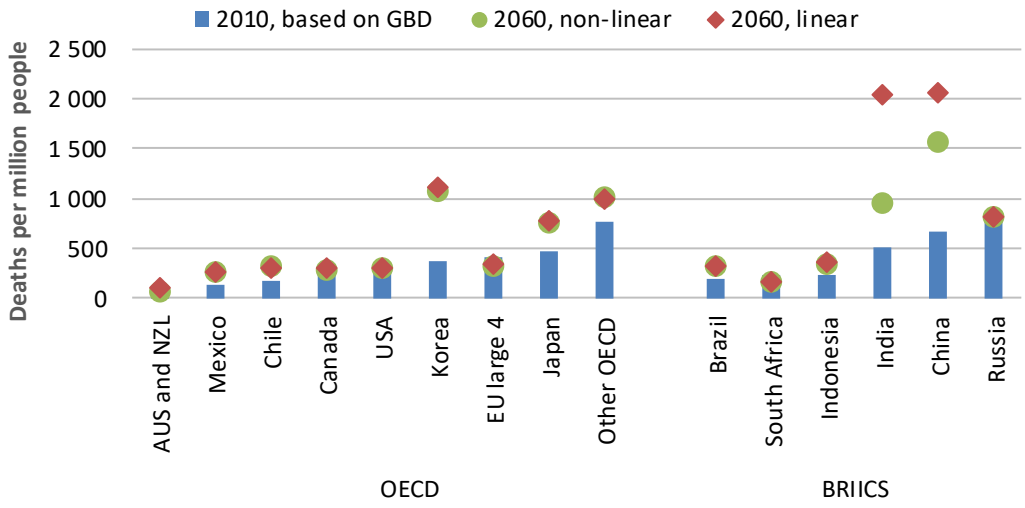
Climate change is having an impact in terms of higher temperatures, rising sea levels and more frequent extreme weather events. The number and severity of natural disasters recorded per year has been steadily rising over the last century. 2018 saw hurricanes, floods, droughts and wildfires take thousands of lives. Efforts to mitigate climate change may be bearing fruit, for example in growing use of renewable energy, but more remains to be done. In addition to reducing climate change, it will be increasingly important to build resilience so that our economies and societies can withstand environmental shocks and bounce back from them as quickly as possible.

Air pollution has been linked to multiple health problems such as cardiovascular diseases and cancers. It is a killer, claiming 3.2 million lives, and these numbers are projected to keep increasing. In the OECD, only a few European countries and possibly Australia and New Zealand are expected to see a decline in pollution-related deaths by

2060. Many OECD countries are directly addressing urban pollution in their largest cities, taking measures such as reducing vehicle and industrial emissions and increasing green spaces. The rising popularity and falling prices of electric vehicles could also contribute to reversing the trend.

Figure 3.8. Toxic air

Projected number of deaths caused by outdoor air pollution per year per million people, 2010 and 2060



Note: 2010 data are based on the Global Burden of Disease (GBD) project. The linear projection assumes that every increase in pollution will result in the same proportionate increase of deaths; the non-linear projection considers that the rise in deaths will slow at higher pollution levels.

Source: OECD (2016), *The Economic Consequences of Outdoor Air Pollution,* https://doi.org/10.1787/9789264257474-en.

StatLink https://doi.org/10.1787/888933888754

And education?

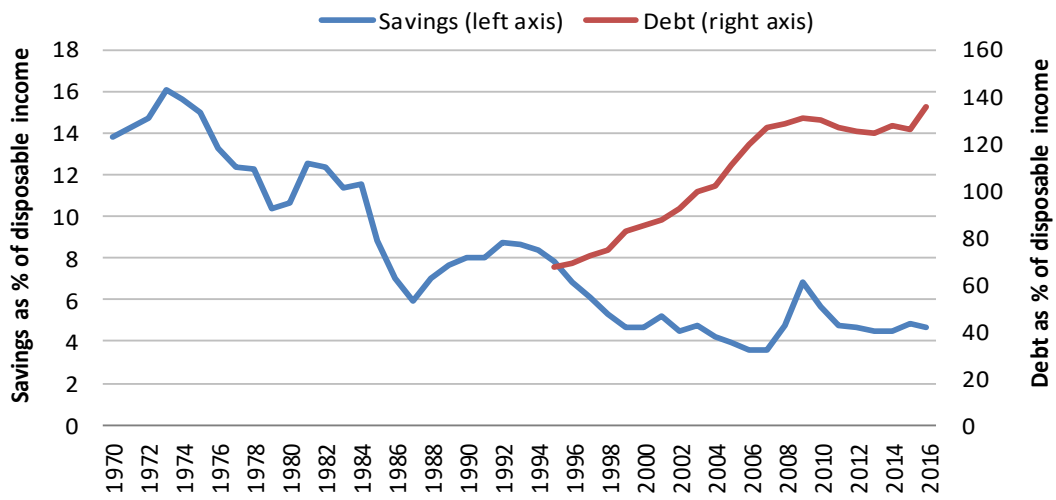
- How can policy makers ensure that school attendance is one of the first, not one of the last, things to return to normal after a disaster? Which skills and knowledge could schools teach to better prepare students to survive and bounce back from natural disasters?
- Our attitudes are influenced by our surroundings. How can education facilities be built to promote environmental awareness, accommodate the needs of learners and keep up to new ecological standards?
- How well do young people develop an awareness of the connections between their daily decisions and possible long-term consequences, not just for themselves as individuals but for society as a whole? How can education systems support this awareness?

ECONOMIC SECURITY

Economic security for individuals includes financial security (having adequate savings and insurance, and affordable credit), as well as work-related security such as paid employment and a safe work environment. In recent decades, OECD countries have seen trends towards lower financial security and weaker work-related security, as economies have changed in the aftermath of the financial crisis. Education will play an important role in equipping adults and children with the skills they need for the labour markets of the future, as well as in coping with the increased emphasis on personal responsibility for financial security.

Figure 3.9. Household savings and debt

Household savings (% of disposable income, left axis) and household debt (% of disposable income, right axis), OECD average, 1970-2016



Note: OECD average refers to 32 countries (see StatLink for full information).

Source: OECD (2018), *OECD National Accounts Statistics* (database), https://stats.oecd.org/.

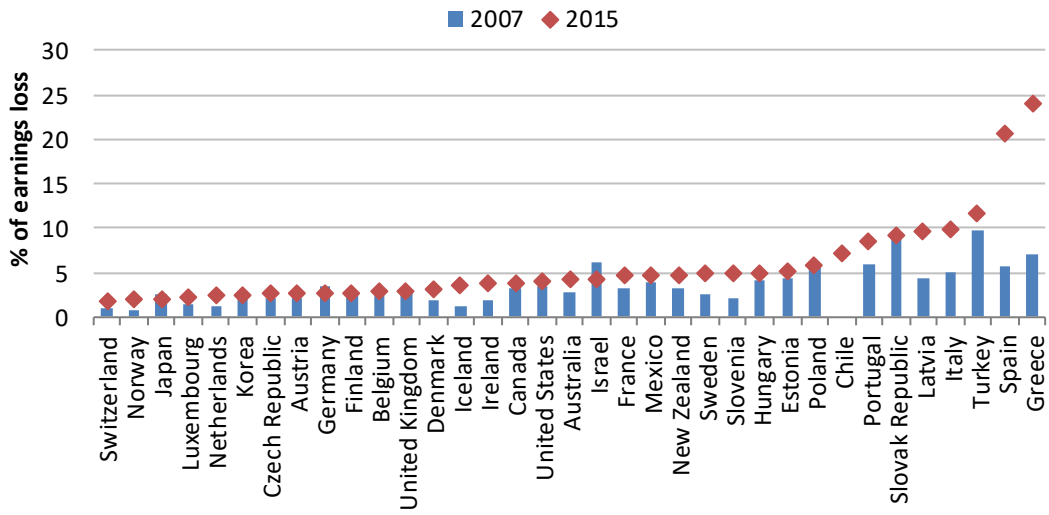
StatLink https://doi.org/10.1787/888933888773

On average across OECD countries, household debt has been rising while savings have been declining. In 2016, household debt was at its highest level in the previous two decades. Higher debt and lower savings can be risky. Depending on the affordability of the debt and accessibility of the savings, a sudden rise in expenses or drop in income could be a more severe shock if debt is already high. When the effects of such a shock are widespread, such as during the 2008 financial crisis, large parts of the economy could be in an insecure position. With the right knowledge and skills, individuals can play a role in ensuring their own economic security. However, levels of financial literacy are low: in 2015 almost a quarter of 15-year-old students lacked the baseline level of proficiency in financial literacy, meaning that at best they could make decisions on everyday spending and recognise the purpose of everyday financial documents such as an invoice (OECD, 2017).

Job security is an important element of economic and financial security. Globalisation has resulted in many jobs moving to different parts of the world; with automation machines are able to perform tasks previously carried out by human employees; and deindustrialisation has led to more and more jobs becoming part of the 'knowledge economy' instead of manual labour. Another trend is the rise of a 'gig economy', where most work might no longer be tied to a steady job but instead coordinated through some kind of digital freelance platform. In 28 out of 33 OECD countries where data were available, labour market insecurity rose between 2007 and 2015, meaning that the expected loss in earnings associated with potential unemployment went up on average.

Figure 3.10. Precarious workers

Expected percentage earnings loss associated with unemployment, 2007 and 2015



Note: This loss depends on the risk of becoming unemployed, the expected duration of unemployment and the degree of mitigation against these losses provided by government transfers to the unemployed (effective insurance). For Israel, 2008 data are used in place of 2007.

Source: OECD (2016) *Job Quality Database,* www.oecd.org/statistics/job-quality.htm.

StatLink https://doi.org/10.1787/888933888792

And education?

- Even tertiary graduates sometimes lack the knowledge and skills to manage their finances. Do education systems need to provide more financial education, or improve what is currently on offer?
- What skills (for example, entrepreneurship, resilience and perseverance) will be important if the future of work is based mostly on freelance digital 'gigs'?
- What knowledge and skills would support individuals to adopt prudent behaviours and make informed decisions with regard to their own economic security?

SECURITY AND EDUCATION: MOVING FORWARD

What are some of the ways the security trends presented in this chapter interact with education, and how can education affect these trends? Some answers are obvious and immediate, for example, the impact of cyber risks on students, and conversely, the potential for educators to teach digital resilience. Others are longer term, for example, the need to build school buildings that can withstand extreme weather events.

Connecting education and security

Protecting mind and body

- Fostering health literacy, including informed decision-making about the proper use of antibiotics and the importance of vaccinations for all age groups
- Maintaining comprehensive education about safety standards in schools and playspaces
- Involving more actors in educational governance, such as family, community and academics

Safeguarding cyberspace

- Developing digital literacy for all citizens, especially those most vulnerable
- Strenthening digital skills of educators to help them better use technology in teaching and learning
- Building partnerships with industry leaders, experts and responsible hackers to keep abreast of new online threats and opportunities

Respecting boundaries

- Investing in R&D to strengthen national innovation systems and defense, including against cyber terrorism
- Teaching politics, history, and civic education, as well as fostering tolerance, trust and resilience
- Encouraging student empowerment through student associations and class representatives

Preserving the environment

- Fostering "green" fields of study in secondary and tertiary education to build capacity to prevent, mitigate, or defend against natural disasters
- Promoting ecofriendly schools and universities by using sustainable designs and materials, and incentivising clean forms of transport
- Supporting national and international research efforts in "clean tech" and innovative green technology

Securing financial well-being

- Strengthening financial literacy at all ages, from the youngest to the oldest
- Providing effective re-training and skills development to help the unemployed re-enter the labour market
- Strengthening VET systems and supporting apprenticeship models with diverse types of employers (including digital skills)

Future thinking: preparing for uncertainty

Despite the best-laid plans, the future is inherently unpredictable. This section explores some examples of uncertainties surrounding the trends discussed in this chapter.

SHOCKS & SURPRISES — Global pandemic?

- With a more densely populated planet and a lot more international travel than 100 years ago, it is impossible to rule out another global pandemic of the scale of the 1918 influenza. A future pandemic could be immensely disruptive as we are not sure who would be worst affected or how. A pandemic involving drug-resistant bacterial infections could be particularly destructive.
- *If this occurred, how would education systems balance the need to bring students and teachers together in spite of the possible risk of infection?*

CONTRADICTIONS — Robots: friend or foe?

- As the capabilities of machines and AI grow, they may gain the ability to make decisions that differ from human preferences or interests. They may also start attempting to increase their own power at the expense of humans. How much of a risk this would be to humans and how soon it could happen are matters of dispute even among informed experts.
- *Should education prepare us for a world of negotiation and possibly even conflict between humans and robots?*

DISCONTINUITIES — Digital conflict?

- War between countries could become more frequent again, in the form of traditional attacks or cyber warfare. Cyber attacks could also have significant physical consequences, for example on infrastructure and health care provision.
- *What kinds of partnerships might governments form with universities and other research institutions in the pursuit of the best knowledge and skills to achieve cyber-military goals?*

COMPLEXITY — Remote learning: so far, yet so near?

- Telecommunications and telepresence are becoming more useful thanks to improved video conferencing and augmented reality. As a result, many physical interactions are being replaced by virtual interactions. Distance learning is a well-established idea that could become mainstream. Technological development in fields such as virtual reality makes it even more promising.
- *How can education keep pace with such changes if they take off in other spheres of the economy and society, and how could it make the most of their benefits?*

FIND OUT MORE

Relevant sources

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Glossary

- **Ambient air pollution**: Particulate matter and ozone pollution of the air.

- **Antimicrobials**: Medicines which kill microorganisms or stop their growth. Antimicrobials can be classified according to the type of microorganism they treat. For example, antibiotics are a type of antimicrobial used against bacterial infections.
- **Antimicrobial resistance**: The ability of a microorganism (like bacteria, viruses, and some parasites) to stop an antimicrobial (such as antibiotics, antivirals and antimalarials) from working against it. As a result, standard treatments become ineffective, infections persist and may spread to others.
- **Biometrics**: Measurements and calculations based on body characteristics such as fingerprints, iris patterns or DNA. The data produced from biometrics can be used to identify individuals uniquely, which makes biometrics useful for access control and surveillance.
- **BRIICS**: The BRIICS grouping of countries includes Brazil, the Russian Federation, India, Indonesia, China and South Africa.
- **Data breach**: Incident in which unauthorised or untrusted people are able to access, copy, view, steal or otherwise use data.
- **Deindustrialisation**: Process of social and economic change which occurs when industries such as manufacturing decline or disappear in a particular country or region.
- **Financial literacy**: Combination of awareness, knowledge, skill, attitude and behaviour necessary to make sound financial decisions and ultimately achieve individual financial well-being.
- **Gig economy:** A way of working that is based on people having temporary jobs or doing separate pieces of work, each paid separately, rather than working for an employer.
- **(ISC)^2**: International non-profit membership association focused on inspiring a safe and secure cyber world.
- **International Association of Privacy Professionals (IAPP)**: A non-profit membership association of professionals in the field of information privacy.
- **Natural disaster**: A terrible event in nature (e.g., droughts, earthquakes, epidemics, floods and wind storms) that usually results in serious damage and many deaths.
- **Pandemic**: The rapid spread of an infectious disease throughout a large region, or even worldwide.
- **Renewable energy**: Energy generated from hydro (excluding pumped storage), geothermal, solar, wind, tidal, wave and biomass sources.
- **Security, cyber**: The protection of computer systems from theft and damage to their hardware, software or unauthorised access to information stored on those systems.
- **Security, economic**: Ability of individuals, households or communities to sustainably pay for their essential needs.
- **Universal Declaration of Human Rights**: A document adopted by the United Nations General Assembly affirming an individual's rights, such as the right to life and freedom from slavery.
- **Warfare, interstate**: Violence between two or more states, which use their respective national forces in the conflict.
- **Warfare, intrastate**: Political violence between armed groups representing the state, and one or more non-state groups.

Chapter 4. Living longer, living better

Healthier seniors are living and working longer and our concept of "elderhood" is changing accordingly. These developments invite reflection about the role of education, so often seen as primarily for the young. This chapter explores these issues through five lenses:

***Ageing societies** – examines trends in increasing life expectancy and life expectancy in good health.*

***The picture of health** – highlights threats to well-being in the elderly, including the increase in rates of dementia and more individuals living alone.*

***Active elders** – discusses the implications of ageing societies for pension systems and labour markets.*

***The silver economy** – looks at the new economic opportunities and skills needs created by an older population with more disposable income.*

***The digital age(s)** – illustrates the increasing digitalisation of the life of older adults, bringing with it new opportunities as well as new threats.*

The ageing trends highlighted in this chapter are then linked to education, with a special focus on lifelong learning. The chapter ends with a look at how using different versions of the future can help us better prepare for the unknown.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

LIVING LONGER, LIVING BETTER: A VISUAL OVERVIEW

Our population is ageing. Healthier seniors are living and working longer, and they also tend to be relatively richer on average, opening the possibilities of a "silver market" aimed at the specific needs of this group. However, there are risks as well: chronic diseases such as diabetes and dementia are becoming more prevalent, and shrinking social circles increase the potential for loneliness. Digitalisation may help address many of these risks, but it also opens up new threats, for example Internet fraud targeted specifically at the elderly. These trends invite reflection about the role of education, so often seen as primarily for the young. Questions about retraining, lifelong learning and using the expertise of so-called silver workers are key questions for education in an ageing society.

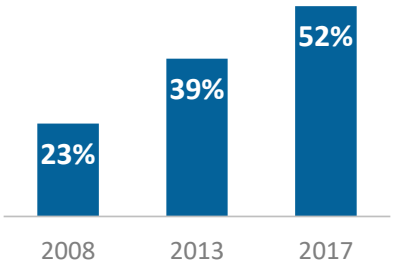
Chapter highlights

Dementia on the rise

19 million people in OECD countries suffered from dementia in 2017. This number is likely to reach nearly 41 million by 2050

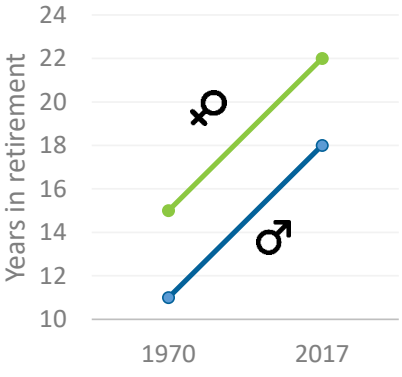
Digital elders

Adults aged 55-74 increasingly use the internet almost every day



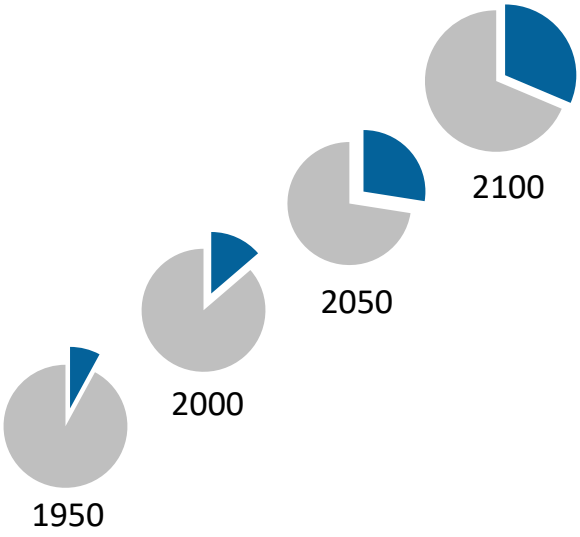
Lengthier retirement

Average years in retirement increased across all OECD countries



Ageing societies

Share of people aged **65+** expected to grow



Living longer

All OECD countries reported gains in life expectancy at birth, most of it in good health

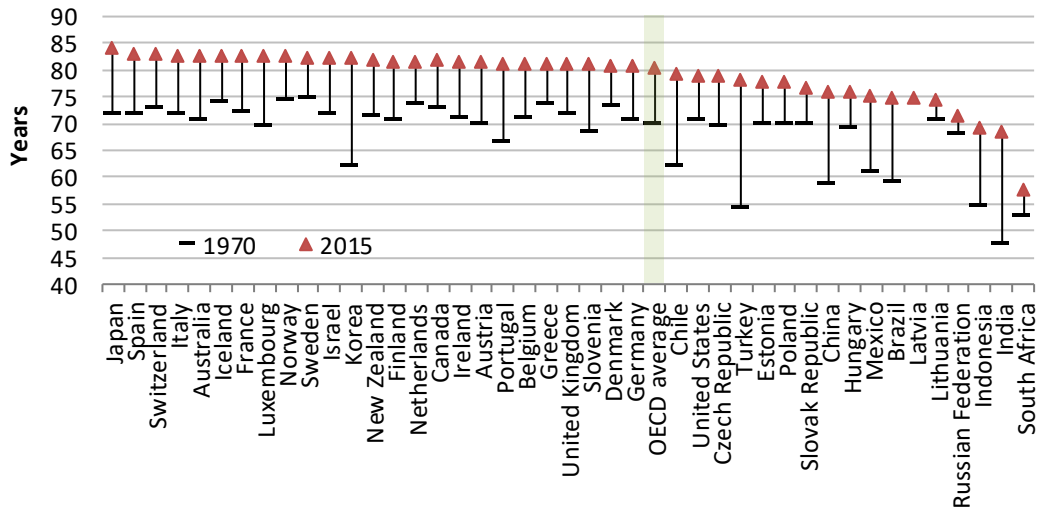
Years gained on average

AGEING SOCIETIES

Our population is ageing: we have fewer young people and more adults are living to old age. Improvements in our health and lifestyles have led to a substantial growth in life expectancy across OECD countries in recent decades. Importantly, these gains have been mostly in good health, setting the stage for an active retirement. Ageing societies have several potential implications for education, such access to lifelong learning. Reskilling and retraining can support people in taking on healthier habits and behaviours, crucial in ensuring healthier, extended lives for all.

Figure 4.1. Getting on in years

Life expectancy at birth, 1970 and 2015



Note: Where data for countries were not consistently available in the same years, figures from the closest year are used (see StatLink for full information).

Source: OECD (2017), *Health at a Glance 2017: OECD Indicators*, http://dx.doi.org/10.1787/health_glance-2017-en.

StatLink https://doi.org/10.1787/888933888811

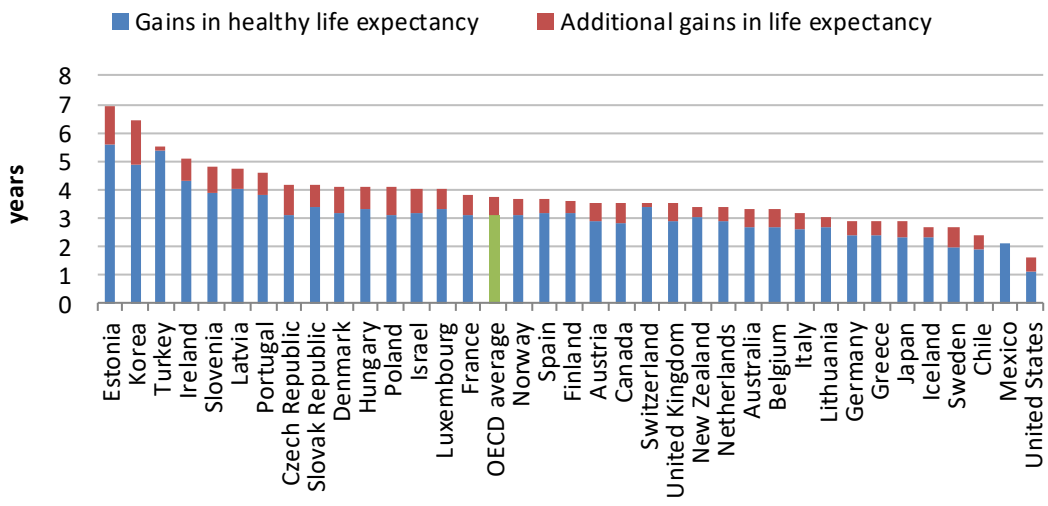
Life expectancy at birth has been rising. Over the last 45 years it has risen across OECD countries from an average of 70 to 80 years. A person born today is expected to live to more than 80 years in most OECD countries, with a high of 83 years in Spain and Switzerland and 84 in Japan. Many countries have seen large gains in life expectancy over this time, notably Turkey (an increase of 24 years), Korea (an increase of 20 years) and Chile (an increase of 17 years). Better health care, healthier lifestyles, higher incomes and better education levels are some of the factors that contributed to such life expectancy gains.

Increased life expectancy is one thing: the quality of these extra years is another. Here there is good news: Of the life expectancy gains over the period 2000-2016, 80% of this time has consisted of additional years lived in good health. The remaining 20% has

been marked by poor health resulting from injuries and diseases. Gains in healthy life expectancy have been particularly large in countries that had relatively low levels in 2000, such as Estonia and Turkey, but also in Korea. On the other hand, healthy life expectancy in the United States grew by about one year, which is only one third of the average growth of OECD countries.

Figure 4.2. 70 is the new 60

Total gains in life expectancy at birth, OECD countries, 2000-2016



Note: Countries are ranked in descending order of life expectancy gains.

Source: WHO (2018), *Global Health Observatory* (database), www.who.int/gho/en/.

StatLink https://doi.org/10.1787/888933888830

And education?

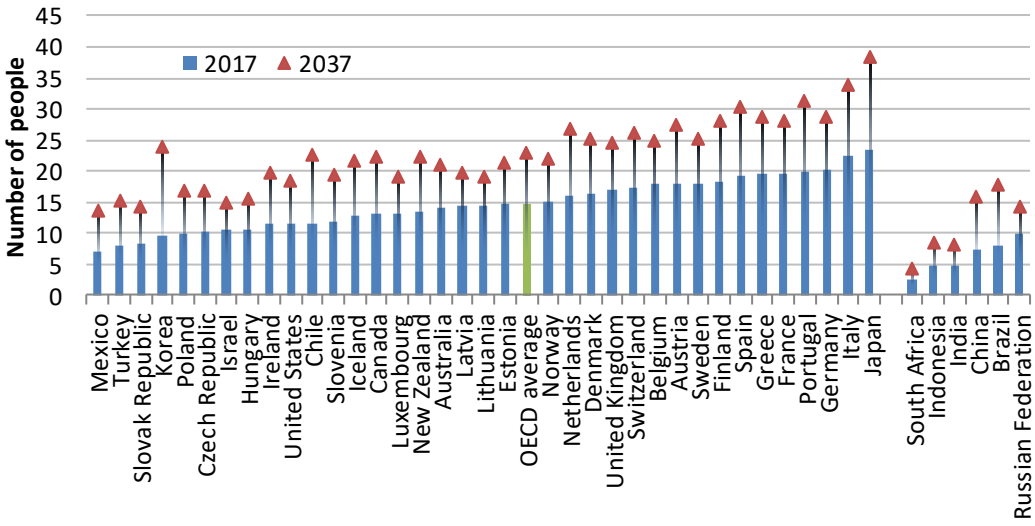
- As health and pension expenditures increase, national governments could face increasingly tight budgets. How might education co-operate with other sectors to tackle the public policy challenges from a cross-governmental perspective? Should other actors, such as citizens and companies, help finance the education system?
- When we expect schooling to prepare young people "for life", that means something very different if average life expectancy is 80 to 90 years than 60 to 70 years. Do our "long-life" societies call for rethinking what education should equip young people with? What about learners who are 80+?
- The education workforce at all levels is ageing in line with the general population. How can we attract and retain sufficient numbers of teachers and academics to the profession?

THE PICTURE OF HEALTH

Despite an overall increase in healthy life expectancy, good health in old age is not a given. While deaths from communicable diseases (such as measles or the flu) are decreasing, chronic and degenerative diseases such as diabetes and dementia are becoming more prevalent, especially among the most elderly. Furthermore, as people age and their social circles shrink, risks of social isolation increase, potentially resulting in loneliness, depression and decreased capacity to perform everyday activities. Education can play a role in strengthening the competence of seniors and their carers in dealing with chronic conditions. It can also contribute to building stronger and more supportive communities that can cope better with the growing challenges of old age.

Figure 4.3. The dementia threat

People with dementia per 1 000 population (all ages), 2017 and estimates for 2037



Source: OECD (2018), *Care Needed: Improving the Lives of People with Dementia*, https://doi.org/10.1787/9789264085107-en.

StatLink https://doi.org/10.1787/888933888849

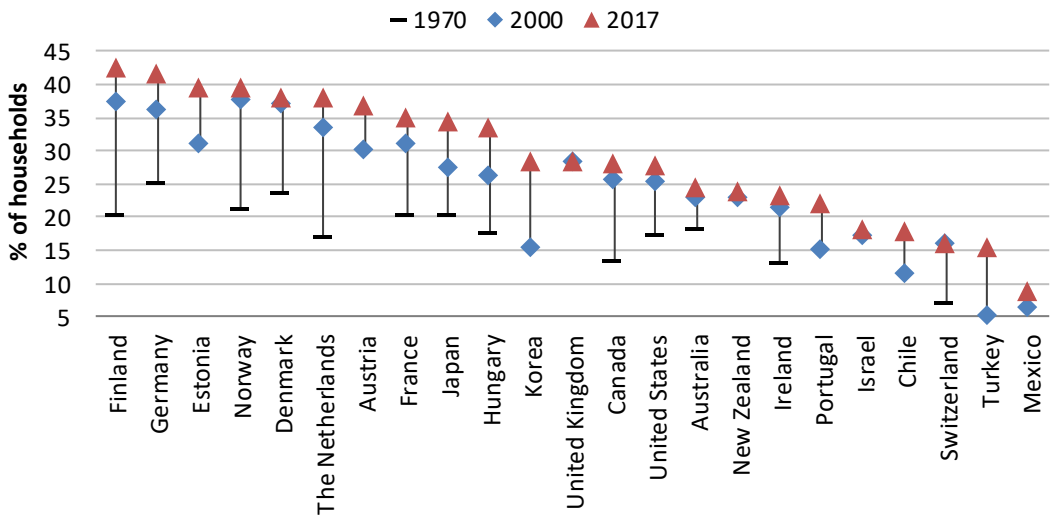
About 19 million people, or 15 out of 1 000 on average across OECD countries, suffered from dementia in 2017. Dementia is a progressive degenerative disorder of the brain and one of the fastest-growing causes of death. Its prevalence rises rapidly with age: about 2% of people between 65-69 years suffer from dementia, but this increases to more than 40% for those over 90 years old. Dementia impacts the life of the individual, but also the many relatives and other informal carers around them. It is a growing burden for health and care systems, and its prevalence is expected to rise further in the decades to come as the share of people aged over 80 keeps growing.

The number of people living alone is growing. A large proportion of single person households is composed of older adults in many OECD countries. On the one hand, this reflects the fact that elders are more and more capable of living autonomously until an

advanced age. However, living alone entails the loss of certain advantages that are not always easy or possible to substitute, such as economic support and company. Unsurprisingly, the quality of social relations is strongly related to the perception of loneliness regardless of age. Isolation and loneliness are linked to a number of issues including higher depression rates, lower levels of daily activity and mobility, and an increased risk of death. As more people find themselves living alone, loneliness might become more prevalent. This could be especially true for the elderly as they experience shrinking social circles and the death of peers. Social and emotional skills developed through education can support individuals in developing stronger and more meaningful social relations over their lifetime. Engaging in lifelong learning (e.g., taking community courses) can also help provide opportunities for seniors to connect with others.

Figure 4.4. A loneliness epidemic in the making?

Share of households inhabited by a single person, selected OECD countries, 1970, 2000 and 2017



Note: Where data were unavailable, figures from the closest year are used (see StatLink for full information). Data from the respective national statistics offices has been used by the OECD to produce this figure.

StatLink https://doi.org/10.1787/888933888868

And education?

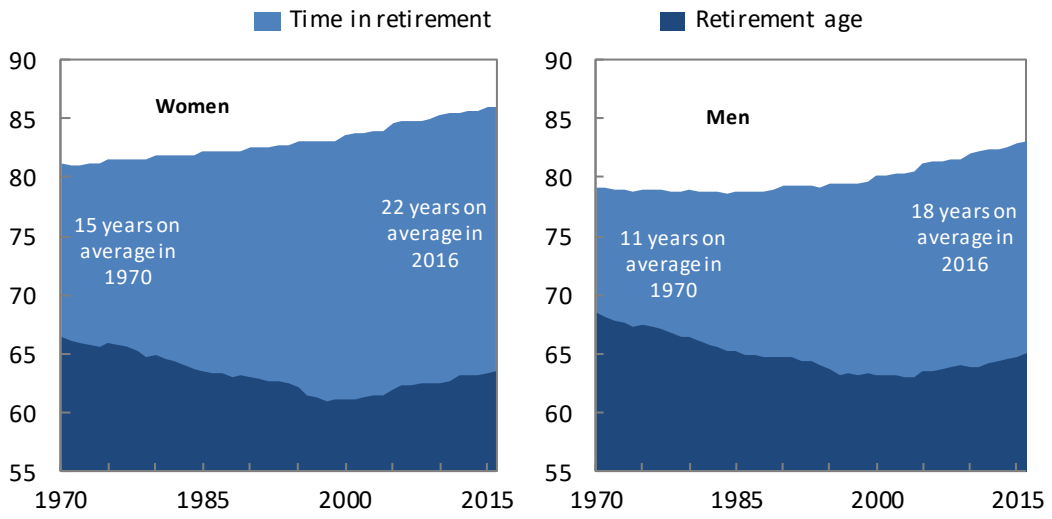
- What is the role of formal and informal education in reducing solitude and social isolation? Should schools more actively promote intergenerational exchange as a way to promote social cohesion?
- What kind of training do public officials and carers need to foster well-being among the elder segments of the population?
- How can education help improve well-being in older adulthood? What is the best way to strengthen health literacy in the 80+ age group, for example? What about other learning and cultural needs of older members of the population?

ACTIVE ELDERS

Active and healthy seniors are working longer. Even so, most people will spend close to two decades in retirement. This raises profound questions about the sustainability of pensions as well as perceptions of life after work. While some individuals are unwilling or unable to work until the statutory pension age, others capitalise on their professional networks and continue working well into their seventies and eighties and beyond. In this context, OECD countries have started introducing flexible pensions that increasingly blur the line between work and retirement. How can we support individuals to adapt their skill set over longer working lifetimes? Can education and training play a role in fighting stereotypes of "the elderly" within and outside the world of work?

Figure 4.5. Time to retire?

Average years in retirement across all OECD countries, 1970-2016



Source: OECD (2017), *Pensions at a Glance 2017: OECD and G20 Indicators*, https://doi.org/10.1787/pension_glance-2017-en.

StatLink https://doi.org/10.1787/888933888887

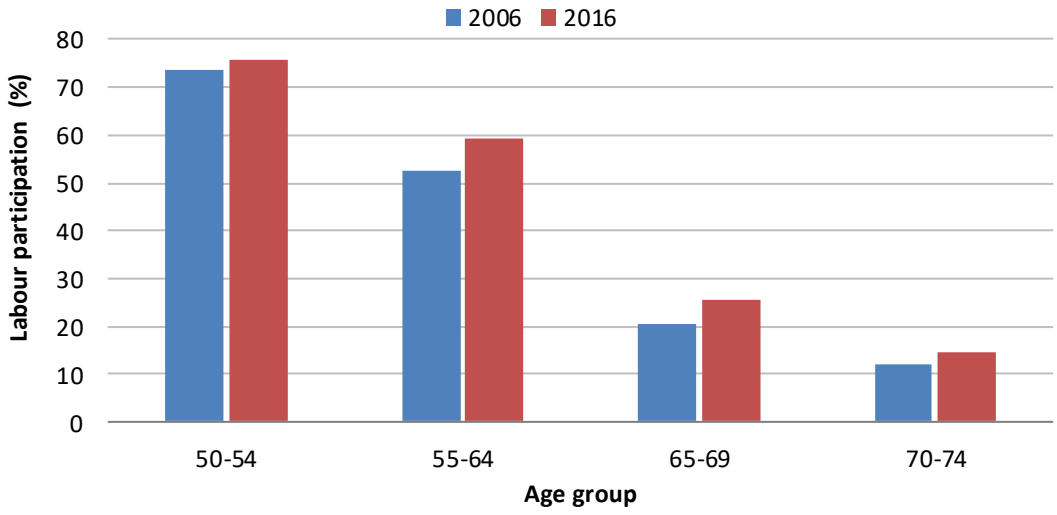
Although the average retirement age in OECD countries has remained relatively stable since 1970, greater life expectancy has increased the amount of time in retirement, from an average of 13 years (for women and men) in 1970 to 20 years in 2015. This threatens the financial sustainability of pension systems and has resulted in policies such as the end of early retirement and the increase of official retirement ages. Furthermore, many countries have started introducing flexible or partial retirement schemes, and building automatic adjustment mechanisms for increases in life expectancy. These are intended to enable older workers to remain active in the workforce by reducing their working time and compensating income lost with benefits or a partial pension.

Under these circumstances, people are indeed working to an older age. The effective labour market exit age rose from 62 to about 64 years on average across OECD countries

between 2006 and 2016. At the same time, employment rates for individuals aged 55 to 64 increased from 53 to 59%, and similarly, for those aged 65 to 69, from 20 to almost 26%. Even the oldest workers (70 to 74 years old) showed a modest 3% increase in their labour force participation. Linear career paths and clear distinctions between working and non-working time might be things of the past, and not only for older citizens. Education and training systems need to adapt to these flexible, ever-evolving lives.

Figure 4.6. Working later in life

Senior and older (50-74 years) labour participation rates (% of the age group), 2006 and 2016



Source: OECD (2016), "OECD Older Worker Scoreboard 2016", www.oecd.org/els/emp/older-workers-scoreboard-2016.xlsx.

StatLink https://doi.org/10.1787/888933888906

And education?

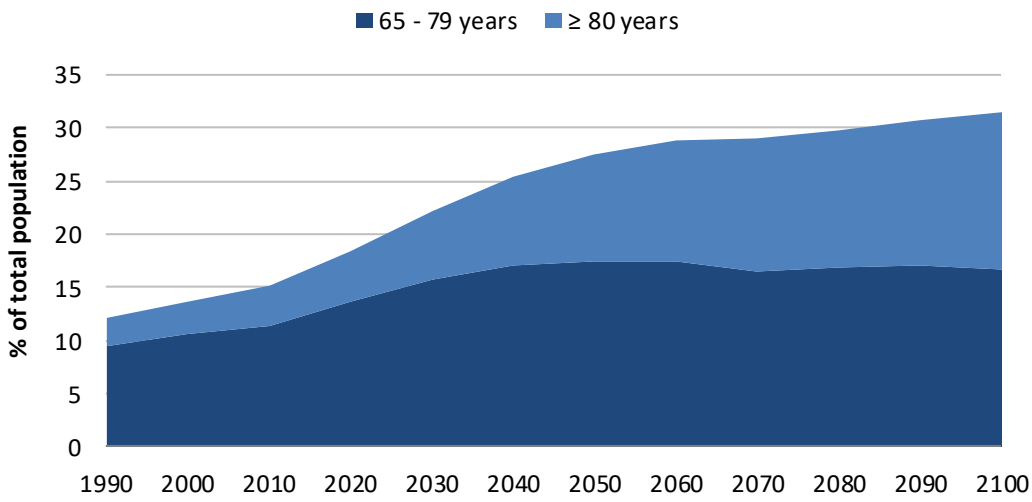
- Longer working lives and rapidly changing skill demands increase the need for continuous learning throughout life. Should some form of lifelong learning be compulsory? Should lifelong learning become a right?
- Do experience and savoir-faire always correlate with age? What is the best way to organise junior-senior teacher relations for professional innovation and improvement, especially in the ever-changing technology sector?
- What is the role of technology in improving skills attainment and certification for youngsters and adults (e.g. micro-certifications)? What are the implications of emerging forms of digital education provision for quality assurance?

THE SILVER ECONOMY

Seniors are living and working longer. This opens up the possibilities of a "silver market" aimed at the specific needs and services of this group. Digital solutions linked to mHealth, new care services, or innovation in mobility in and outside of the home are some examples. In addition, healthier ageing opens up a new life phase of exploration and civic, social and cultural engagement. Seniors are relatively richer on average, and markets related to tourism and entertainment, education and cultural products and services for more active elders are on the rise. What are the skills that will be needed in these emerging markets? How can education institutions better serve the educational demands of this segment of the population?

Figure 4.7. Ageing societies, ageing markets?

Population 65+ as percentage of the total population, OECD average, 1990-2100



Note: Data for 2015-2100 are projections, median prediction interval.

Source: United Nations (2018), *World Population Prospects: The 2017 revision* (database), https://esa.un.org/unpd/wpp/.

StatLink https://doi.org/10.1787/888933888925

Across the OECD, the percentage of people aged 65 or above will reach almost 20% in 2020, an increase of ten percentage points in the 50 years since 1970. By 2070, this figure is expected to increase 30% according to United Nations estimates. Increased and healthier life expectancy means that many of these elders will be aged 80 years or older. This trend is not limited to OECD countries: While the share of the total world population aged 80+ was about 3% in 1990, it is now almost 5%, and is expected to reach 15% by the turn of the 22nd century.

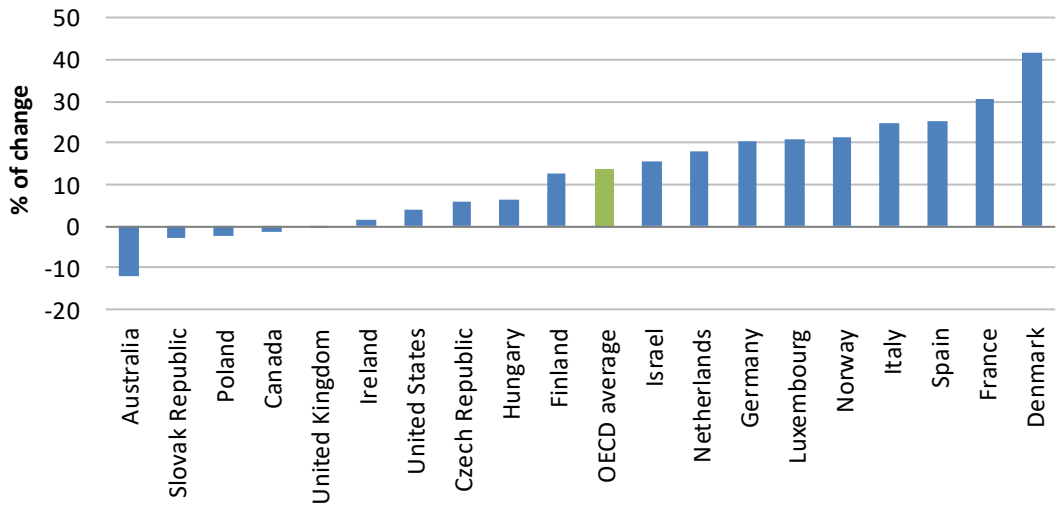
Elders are not only more numerous, they are also relatively richer than they used to be. In the last thirty years individuals aged 60-64 years old have on average seen their income increase by about 13% more than their counterparts aged 30-34. There is

variation across countries however, with the biggest increases observed in Denmark, France and Spain, and Australia showing a reverse trend.

The silver economy refers to the expanding markets linked to healthier and more autonomous seniors, who have distinct needs and purchasing preferences compared to younger adults. Despite this trend, it cannot be forgotten that the frailest seniors remain one of the age groups most vulnerable to the risk of poverty, and therefore need special care. Education and training systems need to think carefully about the knowledge and skills that individuals require to leverage the opportunities these changes bring about.

Figure 4.8. Elders' expenditure power

Percentage change in relative income of 60-64 vs 30-34 between the mid-1980s and the mid-2010s



Note: OECD average includes 19 countries (see StatLink for full information).

Source: OECD (2017), *Preventing Ageing Unequally*, https://doi.org/10.1787/9789264279087-en.

StatLink https://doi.org/10.1787/888933888944

And education?

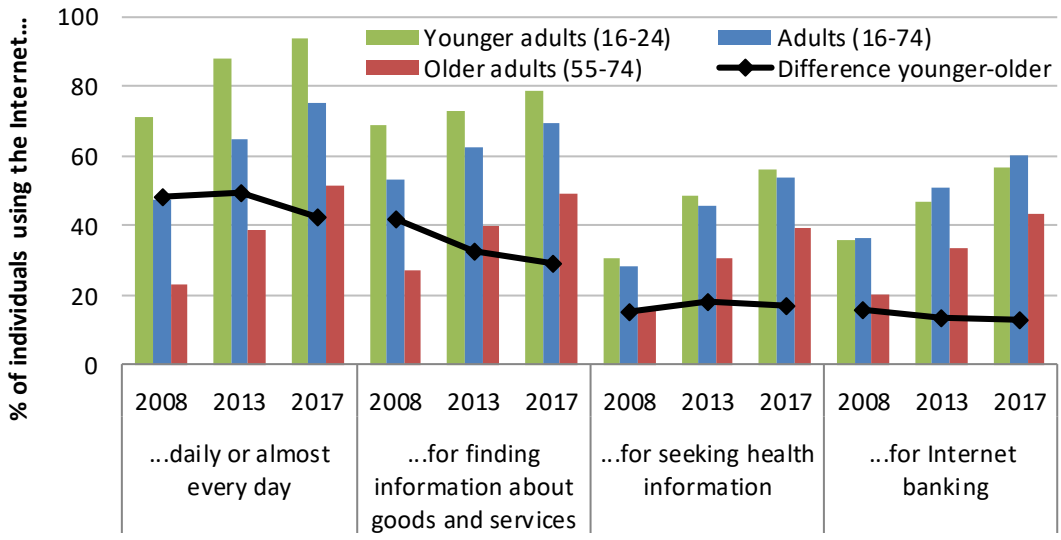
- The "silver" economy requires a workforce sensitive to the needs of its consumers. Will there be substantial changes in skill demand linked to the rise of silver markets? What would this mean for education provision?
- More active seniors could mean new demands for education and skill retraining. What would this mean for formal and informal education? Work? More senior internships, perhaps?
- How can our societies better accommodate the growing learning needs of all age groups? Should existing institutions be radically re-purposed? Teaching and learning methods redefined? Facilities reimagined?

THE DIGITAL AGE(S)

The Internet is used today in many different aspects of our daily lives, from shopping and connecting with friends and family to managing household finances and informing our health decisions. Digital engagement is growing across all age groups, reducing concerns about older populations being excluded due to lower participation rates. Yet, spending more time online comes with a higher exposure to digital risks, and senior citizens are the most vulnerable group. How can education support older adults in accessing the benefits of digitalisation while lowering its associated risks? Furthermore, how can individuals of all ages better prepare to cope with the fast pace of technological change?

Figure 4.9. Going digital

Different Internet uses by age group (last 3 months), OECD average, 2008, 2013 and 2017



Note: OECD average is based on data for 26 OECD countries (see StatLink for full information).

Source: OECD (2018), *ICT Access and Usage by Households and Individuals* (database), https://stats.oecd.org/.

StatLink https://doi.org/10.1787/888933888963

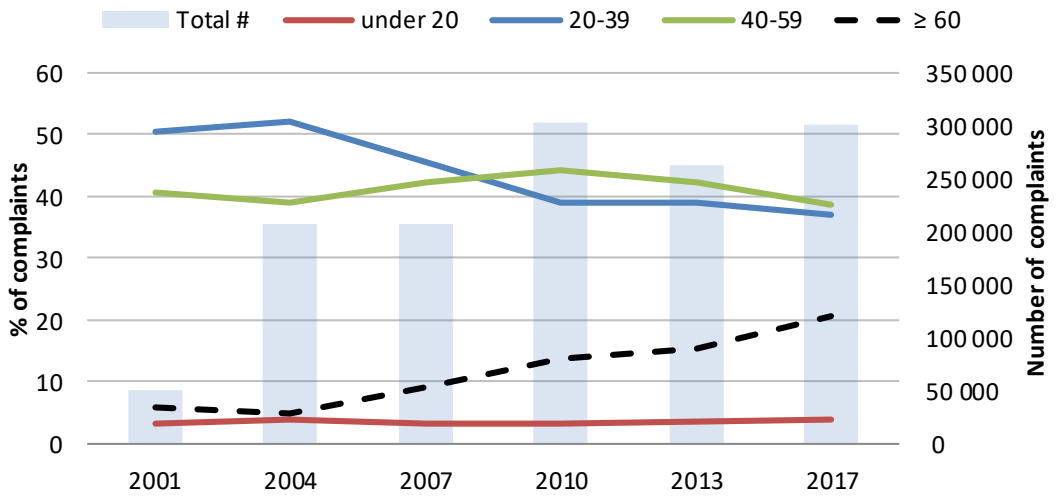
Three out of four Internet users (16-74 years old) used the Internet daily or almost every day in 2017. Their purposes were diverse: connecting with friends and social networks, looking up information, and accessing a variety of services online, such as Internet banking. Digital engagement is generally higher for younger adults than for older ones, although the differences between age groups are less pronounced today than they were 10 years ago. Twice as many adults aged 55-74 used the Internet daily or almost in 2017 compared to 2008, and the difference between this age group and the youngest one (16-24) decreased by seven percentage points.

Digital opportunities come with threats. Online fraud, for example identity theft, loan collection hoaxes and suspicious offers of access to fortune in exchange for personal

bank details, is a serious concern. The numbers and types of reported online fraud are constantly evolving. While everyone is vulnerable, it can be especially worrisome for older citizens, who might not always feel as confident as youngsters in their digital skills. In 2001, individuals aged over 60 years of age represented less than 6% of the complainants to the FBI's Internet Crime Center; by 2017, this had grown to almost 20%. Helping the oldest members of society detect potential fraud and protect themselves is especially important, given the constant and rapid pace of change of technology. For all ages, permanent vigilance, caution, and educating oneself and others are essential. It is also important to report experiences of fraud to the appropriate authorities so that the types, volume and strategies of Internet fraud can be monitored and dealt with appropriately.

Figure 4.10. Digital crime

Internet fraud complaints, total number (right axis) and percentage by age group (left axis), 2001-2017



Note: Complaint data are derived from United States figures but the Internet crime may originate anywhere in the world.

Source: IC3 (2017), "Internet Crime Report" series 2001-2017, www.ic3.gov/media/annualreports.aspx.

StatLink https://doi.org/10.1787/888933888982

And education?

- How can formal and informal education help bridge gaps in ICT use, skills and attitudes across different age groups? Is there a role for intergenerational learning in this process?
- Vocational education and training and adult education providers prepare many of the current and future workers in society. Are they using state-of-the-art technology? If not, what is the best way to change this?
- Given the speed of technological change, the most effective protection against cyber risks often comes from the private sector. Are education systems able to partner with these actors in mutually beneficial ways?

AGEING SOCIETIES AND EDUCATION: MOVING FORWARD

What are some of the ways ageing trends interact with education, and how can education affect these trends? Some answers are obvious and immediate, for example, the impact of dementia, and conversely, the need for further research on brain diseases. Others possess an importance in the longer term, for example increasing life expectancy at birth and the time spent in retirement.

Connecting education and ageing

Lifelong learning

- Fostering public and private initiatives to reskill and upskill individuals throughout their working lives
- Ensuring all age groups have access to education that covers their learning and life needs, including health, financial and digital literacy skills
- Promoting continuous professional development of teachers and school leaders via in-job training and peer learning (e.g. peer evaluation, professional networks)

Social and emotional well-being

- Teaching and learning about emotions and social skills for all ages
- Providing targeted initial teacher education and continuous professional learning that addresses holistic well-being of children and adults
- Combatting loneliness and isolation and challenging prejudices and age discrimination

Physical health and lifestyles

- Addressing obesity, smoking, sleep deprivation and other public health concerns through collaboration between local education institutions and healthcare providers
- Offering education and training in caring for fragile elders and other expanding job markets
- Supporting excellence in medical research and science

Intergenerational contact and learning

- Partnering with local actors to engage students of all ages in addressing community needs through service and voluteering
- Developing formal partnerships as well as informal opportunities to share the wisdom of older generations (e.g. grandparents in the classroom)
- Supporting innovative learning arrangements within schools and communities, such as one-to-one tutoring, mentoring programmes, digital skills and resilience for the elderly

Future thinking: preparing for uncertainty

Despite the best laid plans, the future is inherently unpredictable. This section explores some examples of uncertainties surrounding the trends discussed in this chapter.

SHOCKS & SURPRISES — Supercentenarians?

- A series of medical breakthroughs could occur in coming years, allowing a dramatic rise in life expectancy far beyond the steady increases we have seen recently. The result could be far greater numbers of people reaching their 110th birthday, so-called supercentenarians.
- *Is education ready for a dramatic demographic shift, with increasingly larger numbers of students of all ages? What does 110 years mean for lifelong learning?*

CONTRADICTIONS — Not so old before we die?

- People are increasingly likely to live to a grand old age. Nevertheless, the process of ageing may make a person so frail that they are no longer able to live well. People disagree about whether and when it is biologically and morally desirable to keep people alive in spite of poor quality of life. If these dilemmas become much more commonplace, it may lead to policy changes like easier access to euthanasia.
- *Should education provide a context in which to discuss potential future ethical debates before they become widespread concerns in society?*

DISCONTINUITIES — Ageing: a cognitive win-win?

- Many researchers and medical professionals work on cures for dementia and other cognitive declines associated with ageing. If they are more successful than expected, to what extent would this enhance the mental capabilities of our elders? Could such breakthroughs combine with the experience of years to result in superhuman or at least much improved cognitive abilities throughout our lives?
- *What could be the role of lifelong learning in helping highly active senior generations meet the challenges and opportunities of a fast-changing world?*

COMPLEXITY — Are friends the new families?

- More people live in cities and housing prices are rising quickly. At the same time, fewer people marry nowadays. Could cohabiting, quite common among youth, extend to all segments of the population? Is this a potential cure for loneliness?
- *How would education support such a change, and how could it help all ages make the most of the benefits? What impacts could this have on children's education, for example, in terms of establishing the names of guardians permitted to escort young children and make important decisions on their behalf?*

FIND OUT MORE

Relevant sources

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Glossary

- **Communicable diseases**: Diseases transmissible from one person to another. Either by direct contact with an affected person or indirect, e.g. via a medium such as air, water, blood or an insect bite.
- **Dementia**: A group of symptoms reducing a person's ability to do everyday activities. Associated symptoms are a decrease in the ability to think and remember and difficulties with language, motivation as well as emotional problems.
- **Depression**: Medical illness negatively affecting the way people feel, think and act. Symptoms often include feelings of sadness and a loss of interest in activities, changes in appetite and sleeping patterns as well as increased fatigue.
- **Diabetes**: Disease affecting one's ability to produce insulin. Insulin is a hormone necessary for the transport of glucose, i.e. sugar, within the body. Type 1 diabetes describes the inability of the pancreas to produce insulin, whereas Type 2 diabetes refers to an insufficient production or the inability of cells to use insulin properly, also referred to as insulin resistance.
- **Flexible or partial retirement**: Ability to draw a pension benefit – full or partial – while continuing in paid work, often with reduced working hours. This is also known as "gradual", "phased" or "partial" retirement.
- **Health-adjusted life expectancy**: The number of years that people can expect to live in "full health" by taking into account years lived in less than full health due to disease and/or injury.
- **Household**: One person or a group of persons living in one dwelling on a permanent basis most of the week, and having a common expense budget for food. A household may include people who are not a family.
- **Identity theft**: A deliberate use of another person's name and identification, usually to benefit financially (for example to buy goods and services or acquire other benefits in the other person's name).
- **Life expectancy at birth:** Average number of years a newborn could expect to live if mortality patterns at the time of birth remain constant in the future.
- **Mobile health or mHealth**: The use of mobile and wireless devices to improve health outcomes, healthcare services and health research.
- **Progressive degenerative disorder**: A condition leading to deteriorating cell changes associated with a progressive loss of functions.

Chapter 5. Modern cultures

Our modern world has evolved, with changes to jobs, families, gender roles and expectations for how we live our lives. This chapter explores these issues through five different perspectives:

The connected economy *– focuses on the increasing economic relevance of mobile digital communications combined with the rise of freelance work through online platforms.*

Gender at work *– presents trends on gender equality with a focus on wage gaps and flexible parental leave policies.*

Changing families *– looks at how families have changed in the 21st century, with the example of births out of wedlock and the prohibition of corporal punishment.*

When virtual becomes reality *–explores how digitalisation has created virtual lives and made them real, and in so doing changed access and ownership of goods and services.*

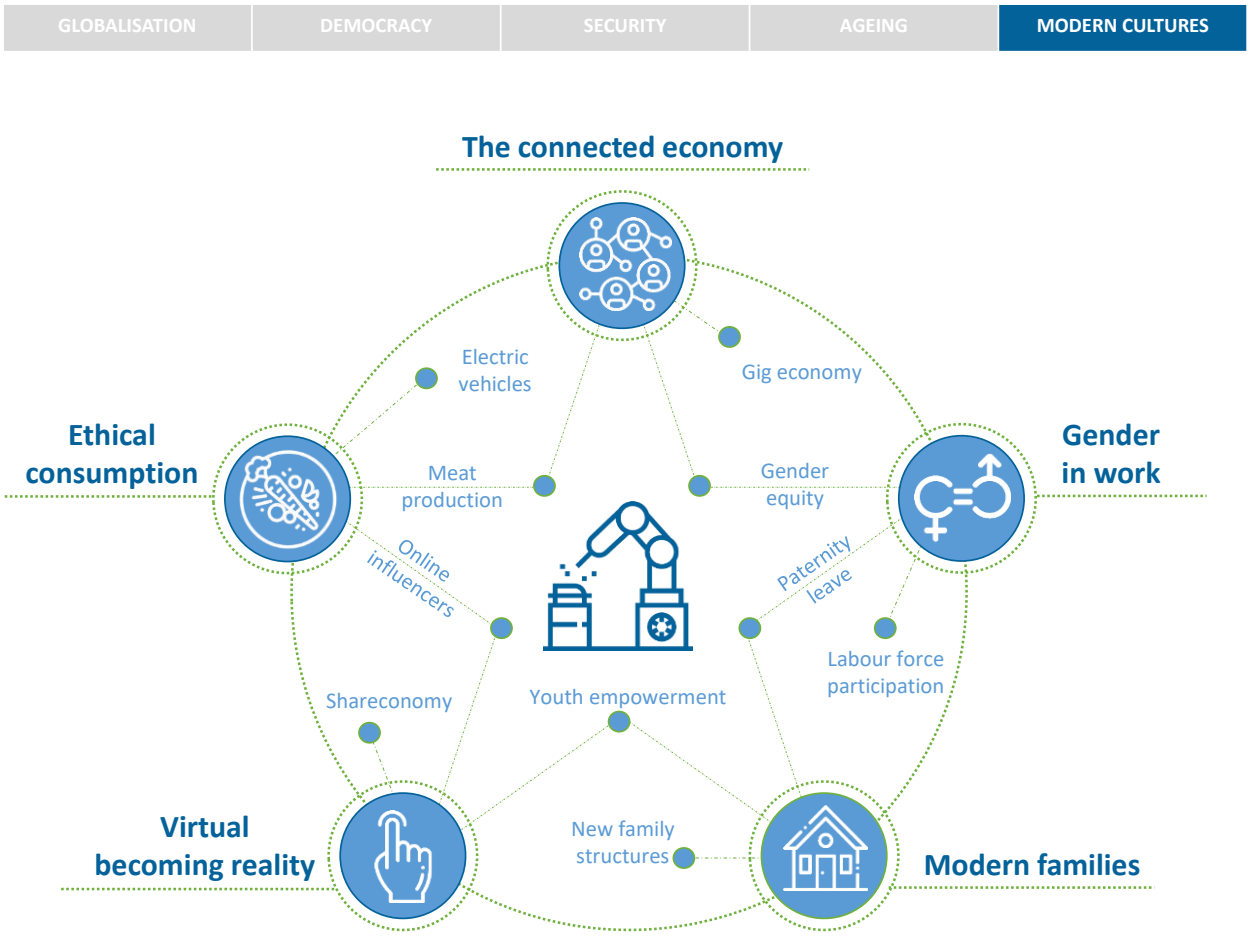
Ethical consumption *– illustrates the important role our buying behaviour plays in achieving sustainability, with examples of electric cars and meat consumption.*

The trends highlighted in this chapter are then linked to education. All of education is explored, from early childhood education and care to lifelong learning. The chapter ends with a look at how using different versions of the future can help us better prepare for the unknown.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

MODERN CULTURES: A VISUAL OVERVIEW

We seem to live in a more individualistic world, with a declining sense of belonging to the traditional reference points of community, church or workplace. At the same time, the notion of a "network society" suggests that belonging is changing not disappearing. Modern cultures looks at evolving patterns of work in the digital world, and the emergence of the gig economy and what this means for consumption and ownership. It explores changing families and gender roles, with fewer traditional families and more active parenting from fathers. Education plays a crucial role in equipping coming generations with the necessary skills, knowledge and sentiment to thrive, shape society and preserve their livelihood.



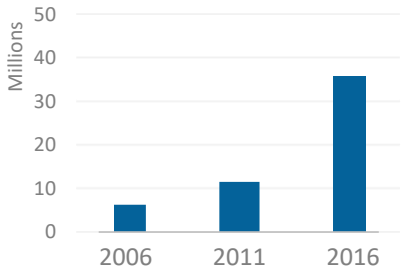
Chapter highlights

Virtual becoming reality

Number of Airbnb hosted nights soared

Flexible work

Participation on freelance platforms surged, granting flexibility but often insecurity as well



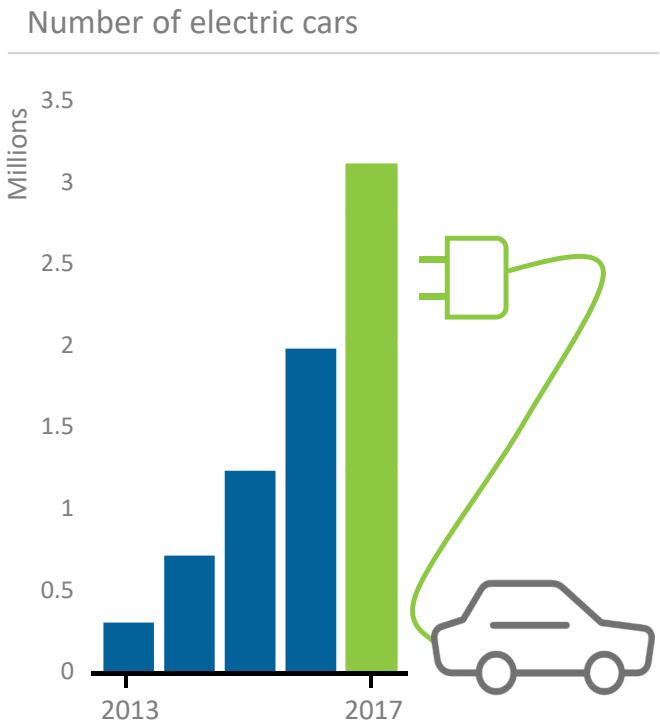
Modern families

40%

of children in OECD countries were born out of wedlock in 2016, up from just over 7% in 1970

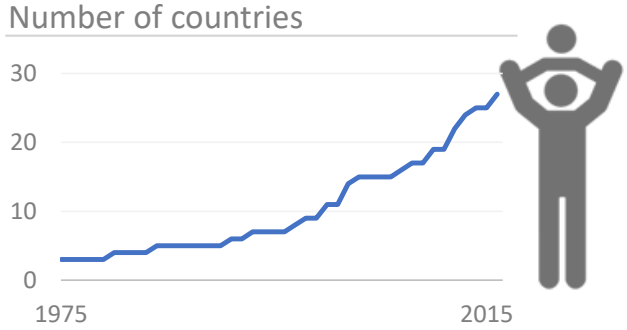
Green mobility

Increasingly choosing clean energy transportation worldwide



More active fathers

75% of OECD countries granted paid father-specific leave in 2016, up from just 10% in 1975

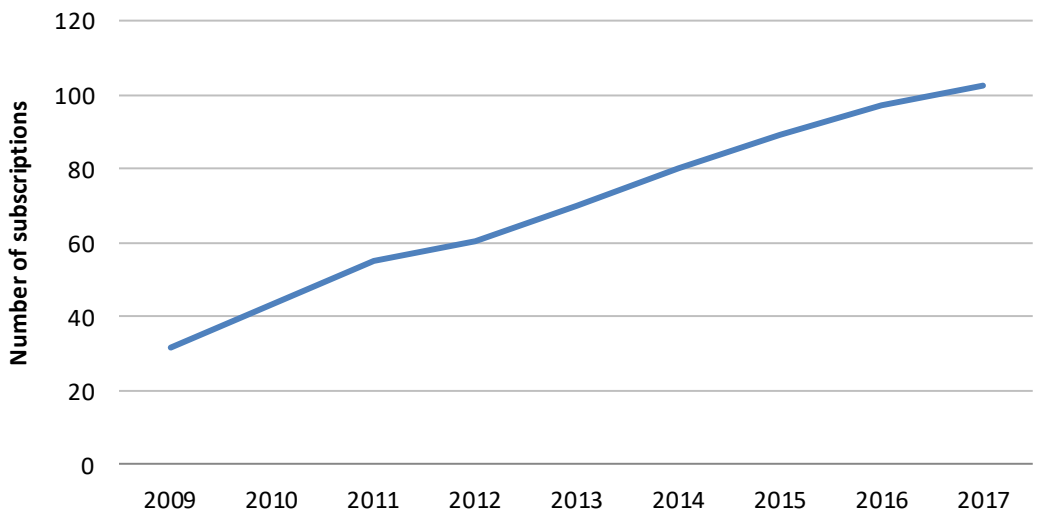


THE CONNECTED ECONOMY

As Internet access has reached almost universal levels in most OECD countries, the digital economy has become big business, accounting for an important share of jobs and growth. The Internet has transformed markets by making it easier for buyers and sellers, workers and employers to come together across time and space. Our fast-changing societies are creating entirely new categories of work, such as social media managing and augmented reality architecture; at the same time, other jobs become obsolete through automation. The role of education in developing the skills needed for the future of work is indispensable. It must also consider equipping students with the flexibility and adaptability to remain occupationally mobile in a changing world.

Figure 5.1. Access to access

Number of mobile broadband subscriptions per 100 inhabitants, OECD average, 2009-2017



Source: OECD (2018), "Mobile broadband subscriptions" (indicator), https://doi.org/10.1787/1277ddc6-en.

StatLink https://doi.org/10.1787/888933889001

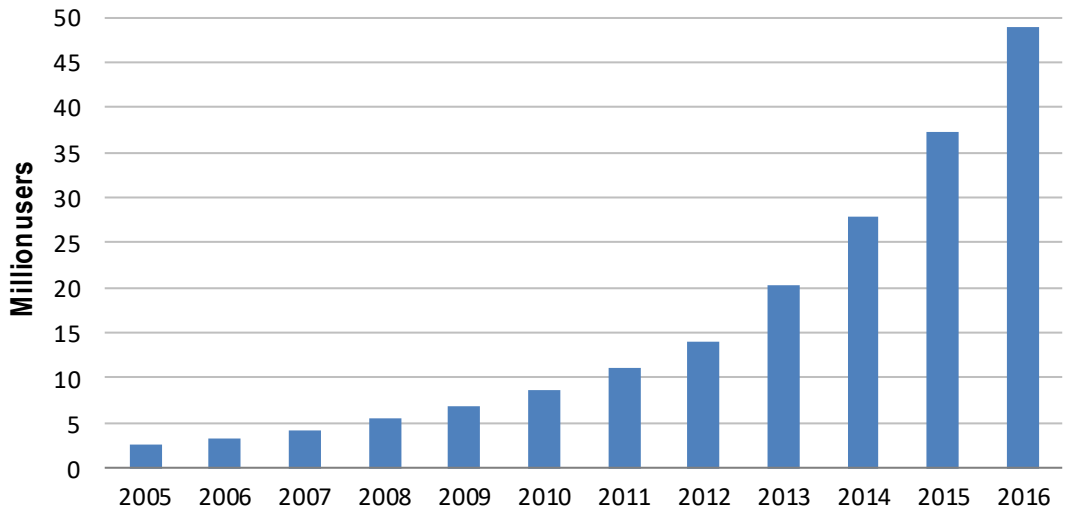
Smartphones and tablets increasingly mediate our daily activity. In recent years, most OECD countries have seen rising numbers of mobile subscriptions providing high-speed or 'broadband' access. At the end of 2017, this trend reached a milestone: More mobile broadband subscriptions than people. The highest numbers were in countries like Japan and Finland – both with more than 150 subscriptions per 100 inhabitants. However some countries have seen declines in recent years, and others remain some way behind: Turkey and Israel both reached around 70 subscriptions per 100 inhabitants at the end of 2017.

Freelance work is historically not new: many people in the past made their living as 'day labourers', hired and paid one day at a time, with no guarantee of further employment in the future. What is new is the rising prevalence of piecework like writing, computer programming, web design, and translating. In our increasingly knowledge-

based economies, firms need this highly specialised expertise – but often for a given project for a specific period, such as for building a new mobile application. Also new is the increasing role of communications technologies in providing a marketplace for those demanding and those supplying freelance work. Online platforms such as Upwork and Freelancer have over 49 million users combined, as well as a global reach (somewhat mitigated by barriers of language, currency, jurisdiction, etc.). Every year, these kinds of platforms facilitate billions of dollars' worth of work. The connected economy has changed the way we work, and indeed, live. Education must be prepared to change with it. Students will need to be equipped with skills for future job and labour markets. Additionally, they will need to be able to navigate the increasing uncertainty and potential precariousness of the gig economy.

Figure 5.2. Freeing up work?

Combined registered users of Upwork and Freelancer, 2005-2016



Source: OECD (2017), *OECD Employment Outlook 2017*, https://doi.org/10.1787/empl_outlook-2017-en.

StatLink https://doi.org/10.1787/888933889020

And education?

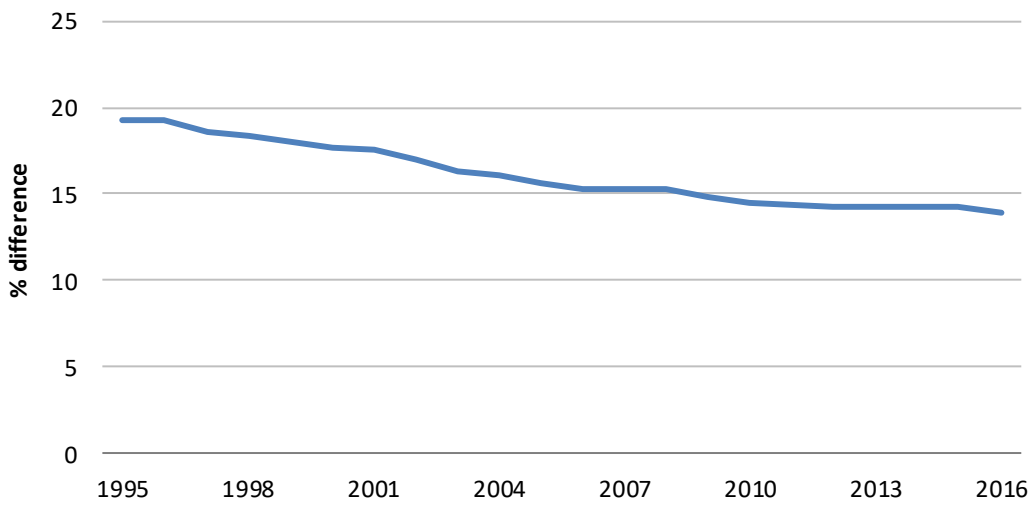
- How can education help to bridge digital divides (associated with both access to technology and the skills to use technology appropriately) to take advantage of the opportunities of the digital economy?
- What are the consequences for on-the-job learning and training if increasing numbers of workers have no permanent fixed employer to sponsor such education?
- Digitalisation changes the way people communicate and collaborate, with less (or potentially no) face-to-face contact. What does this mean for the world of work and what are the implications for education and training systems?

GENDER AT WORK

Women are increasingly participating in the labour market, thanks in part to campaigns for equal work for women over many decades. In the 1970s and 1980s, many OECD countries banned discrimination in the labour market on the ground of gender. These efforts continue, including with Iceland in 2017 becoming the first country to legally require companies employing more than 25 people to obtain certification that they offer equal pay for work of equal value. Gender-related disparities in education such as choice of subjects and differing attainment appear at an early age and may lead to unequal work prospects for men and women. Preventing discrimination and ensuring equal opportunities are therefore important issues well before children leave compulsory education.

Figure 5.3. Closing the gap

Unadjusted difference between median earnings of men and women relative to median earnings of men, % of male median wage, OECD average, 1995-2016



Note: Data refer to full-time employees and to self-employed.

Source: OECD (2018), "Gender wage gap" (indicator), OECD Gender Data Portal, www.oecd.org/gender/data/.

StatLink https://doi.org/10.1787/888933889039

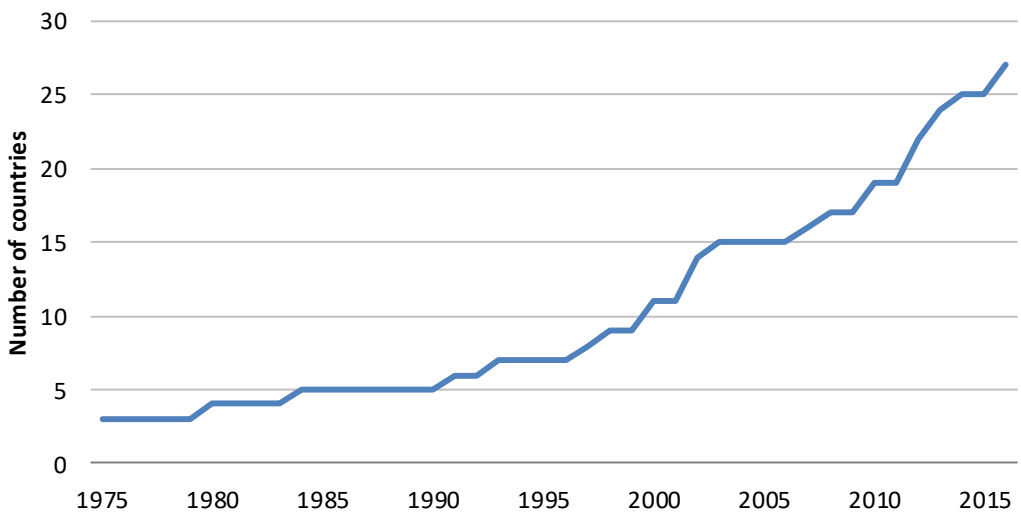
The gender wage gap has been declining in OECD countries for decades, although the overall average decline has been small in recent years. Some countries have seen particularly dramatic decreases, for example the United Kingdom, where the gap has been reduced from almost 50% in 1970 to below 20% today – still above the OECD average of 14%. Korea is the OECD country with the greatest gap, at 35% in 2017, although this continues to shrink. For all countries, there is still some way to go, not only in equal earnings, but also in type of work. For example, in most OECD countries women are more likely than men to be in part-time work and to occupy positions with lower status.

Women also hold fewer positions as executives and directors, although this is also changing.

One of the reasons for different career trajectories between men and women is that it is women who predominantly take time away from the working environment to have children, which can slow networking opportunities and is perceived to reduce awareness of new developments needed to remain good at one's work. One interesting counter trend to this is the increasing numbers of men who take paternity leave. Not only beneficial for the infant, this can potentially also free up female partners to return to the labour market. Back in 1975, only three OECD countries (Belgium, Luxembourg and Spain) provided the option of father-specific leave. Since then, an increasing number of OECD countries have joined them, reaching 27 in 2016.

Figure 5.4. Partners in time

Number of OECD countries granting paid paternity leave, 1975-2016



Source: OECD (2018) "Length of paid father-specific leave" (indicator), OECD Gender Data Portal, www.oecd.org/gender/data/.

StatLink https://doi.org/10.1787/888933889058

And education?

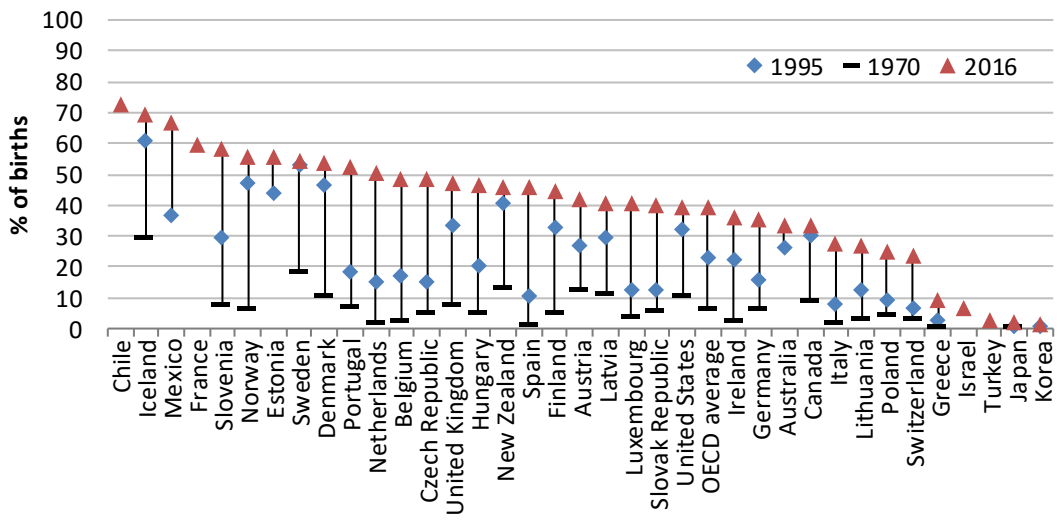
- Initiatives such as father-specific leave and compulsory equal pay do not necessarily change traditional attitudes, which value men spending more time at work and women spending more time on parenting. Can education help?
- With the increasing participation of women in the labour force, the demand for after-school care has increased. How might schools and kindergartens need to adapt accordingly?
- The numbers of children in early childhood education and care are expected to continue to rise. What does this mean for the capacity of the system? How can governments ensure high quality service delivery and standards?

CHANGING FAMILIES

Families are changing in many different ways, reflecting our evolving economies, societies, and values. As social norms have changed in many countries, bringing more relaxed laws and attitudes towards divorce, the predominant model of the nuclear family (two opposite-sex married parents and their biological children living all together) has changed. Now families of many kinds are common: Single-parent families; families with three or more generations in one house; families with unmarried or remarried parents; families with half-siblings and step-siblings; and families headed by same-sex and interracial couples are all part of our modern culture. Education plays an important role in supporting modern and traditional families and ensuring that learning needs are met for all.

Figure 5.5. Out of wedlock, but not out of the ordinary

Proportion of all births where mother's marital status at time of birth is other than married, 1970 and 2016



Note: Where the data for countries were not consistently available in the same years, figures from the closest year are used. Respective countries are labelled with a letter (see StatLink for full information).

Source: OECD (2018), "Share of births outside of marriage" (indicator), *OECD Family Database*, https://stats.oecd.org/.

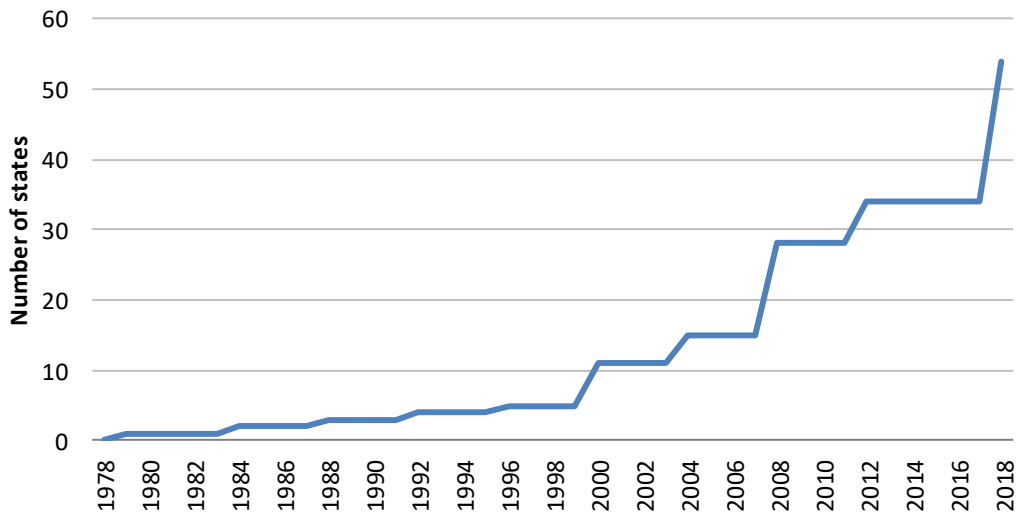
StatLink https://doi.org/10.1787/888933889077

In most countries worldwide, children were traditionally born to a woman who was married at the time of birth. However, the institution of marriage is not as central as it once was: Marriage rates are declining, divorce rates rising, and many couples are opting for civil partnerships rather than marriage. By the mid-1990s, extramarital births accounted for almost a quarter of births in OECD countries, and around half of births in Nordic countries like Denmark, Iceland, Norway and Sweden. In 2016, extramarital births represented around 40% of all births on average across OECD countries, even reaching 70% in Chile and Iceland. The taboo surrounding children born out of wedlock is in decline as the types and forms of modern families evolve.

Children's upbringing is changing too. Historically many societies considered corporal punishment (for example, slapping or spanking naughty children) to be beneficial; but this attitude has been shifting. As child rights to dignity, protection from violence and equal treatment under the law are strengthened, more and more countries are legislating against corporal punishment. In 1979, Sweden became the first country in the world to make it illegal to spank children in all settings. The number of countries with equivalent legislation has steadily risen, and now stands at 54.

Figure 5.6. Spare the child

Cumulative number of states prohibiting all corporal punishment of children by law, 1978-2018



Note: Countries included have made corporal punishment unlawful in all settings, including the home.

Source: Global Initiative to End All Corporal Punishment of Children (2018), "Working towards universal prohibition of corporal punishment", https://endcorporalpunishment.org/.

StatLink https://doi.org/10.1787/888933889096

And education?

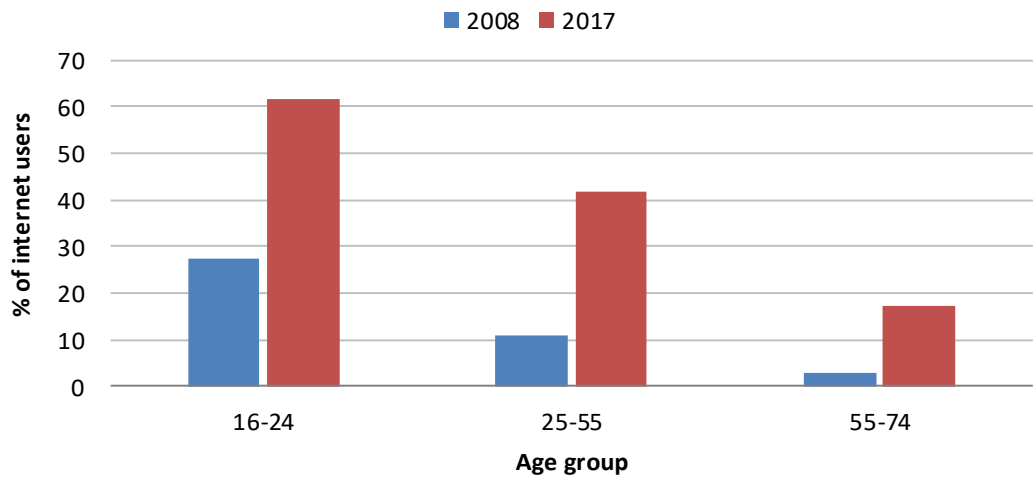
- As families change, children's need for stability and certainty remains the same. How can education help provide a sense of security for children even as their family arrangements may shift, for example in cases of divorce or remarriage, death of a parent etc.?
- There is a difficult debate about the rights and responsibilities of parents and schools. What is the role of educators as part of a system designed to protect children from violence and abuse? Does your system have mandatory reporting of suspected physical, emotional or sexual abuse? Should it?
- Effective education at the school level relies on good home-school relations. Does the growing diversity of family structures affect the nature of these relationships? If so, how?

WHEN VIRTUAL BECOMES REALITY

The Internet has become an integral part of our lives. Many common activities that once required physical contact or social interaction are now carried out online, such as talking to family and friends or consulting a doctor. But digital is no virtual "second life". It is increasingly an integral part of our physical reality. Whether it is a job, a room for the night, or the love of your life, online activity often translates into offline outcomes. This challenges the education system, which must take advantage of the tools and strengths of new technologies while simultaneously addressing concerns about potential misuse, such as cyberbullying, loss of privacy or illegal trade in goods.

Figure 5.7. Mass self-communication and creative expression

Individuals using the Internet (last 3 months) for uploading self-created content on sharing websites, 2008 and 2017



Note: The figure is based on average data for 26 OECD countries (see StatLink for full information).

Source: OECD (2018), *ICT Access and Usage by Households and Individuals* (database), https://stats.oecd.org/.

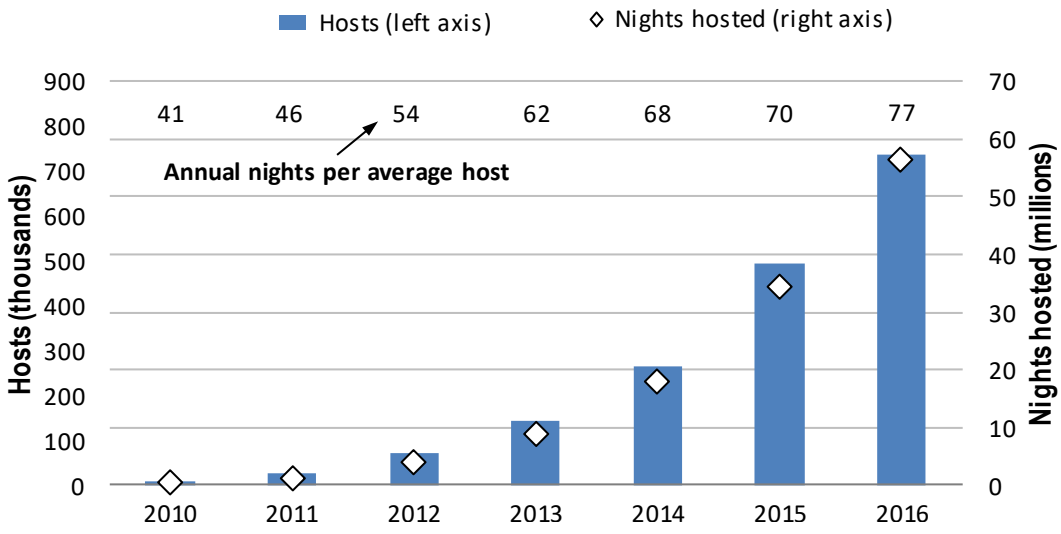
StatLink https://doi.org/10.1787/888933889115

Social networks are spaces for individual and collective expression and creativity. They allow us to communicate with the wider world and maintain multiple and broader identities and social connections. People increasingly share self-created content online via sharing and social networks sites, like YouTube, Twitter and Instagram, giving birth to phenomena such as self-branding and micro-celebrities ("influencers", "YouTubers"). Cultural shifts linked to digitalisation are particularly relevant for children, adolescents and young adults, who are more frequently users of emerging online services. Education can encourage students' engagement in and motivation towards positive ICT uses and the development of strong digital skills, especially for those students who do not receive such support at home.

Online platforms are changing the face of our society, transforming how we call a taxi, order take-out food and book accommodation. They also help find new value for assets in disuse, such as a spare room, although concerns have emerged around the rise in temporary accommodation which risks pricing out local residents and putting pressure on local services and infrastructure. Airbnb hosts provided a quarter million nights' accommodation in 2010, only about a year and a half after its debut in the market. In 2016, the platform served more than 50 million users worldwide. As brokers of this kind become more commonplace, questions arise about how they could be used to distribute educational activities, for example through peer-to-peer virtual learning.

Figure 5.8. Log on, check in, cash out

Airbnb hosts and nights hosted in the US and major European markets, 2010-2016



Note: European markets include Germany, Italy, Spain and the UK. The number of hosts shown in this figure is 'hosts who hosted'.

Source: OECD (2017), *OECD Digital Economy Outlook 2017*, https://doi.org/10.1787/9789264276284-en.

StatLink https://doi.org/10.1787/888933889134

And education?

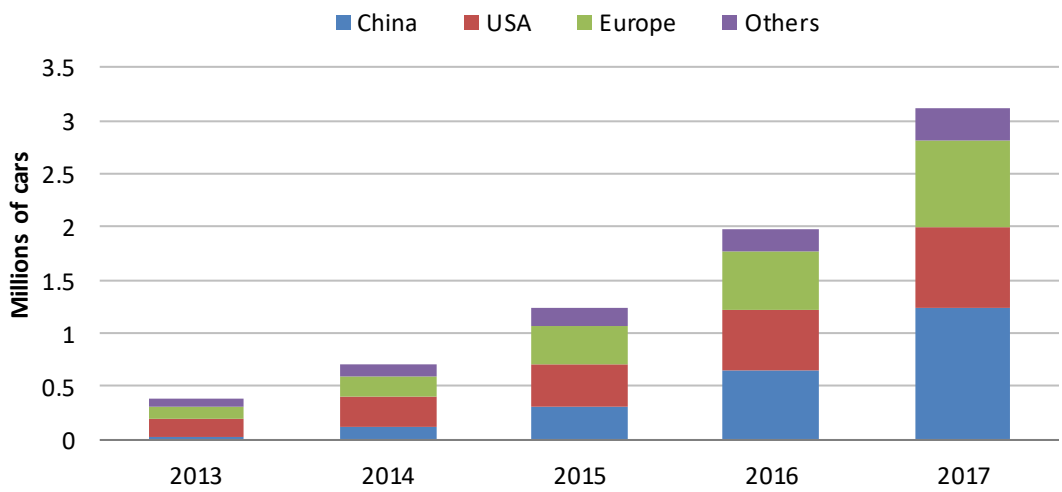
- How can education support all students develop the digital skills needed to create and produce content, which can help their self-expression, learning and well-being?
- Is a peer-to-peer market for education and training (akin to Airbnb, but for education) something we should start preparing for today?
- Do schools have the partnerships they need (e.g. with technology experts, entrepreneurs and more) to help their students develop skills for dynamic online marketplaces?

ETHICAL CONSUMPTION

As more humans fill the planet, the more impact we have on the environment. We can moderate or even reverse some of the negative effects, as shown by successful campaigns to ban chemicals responsible for the hole in the ozone layer. Many people are making purchasing choices that help to mitigate the environmental or social impact, for example choosing electric cars to reduce emissions, or buying fair trade goods. However, other human behaviours, such as the rising consumption of meat, continue to put pressure on our environment. Education can foster the knowledge and social awareness needed to make sustainable choices; and empower individuals to identify and take action in cases of environmental degradation or social exploitation.

Figure 5.9. Eco-mobility

Number of electric cars in circulation worldwide, 2013-2017



Source: IEA (2018), *Global Electric Vehicle Outlook 2018*, www.iea.org/gevo2018/.

StatLink https://doi.org/10.1787/888933889153

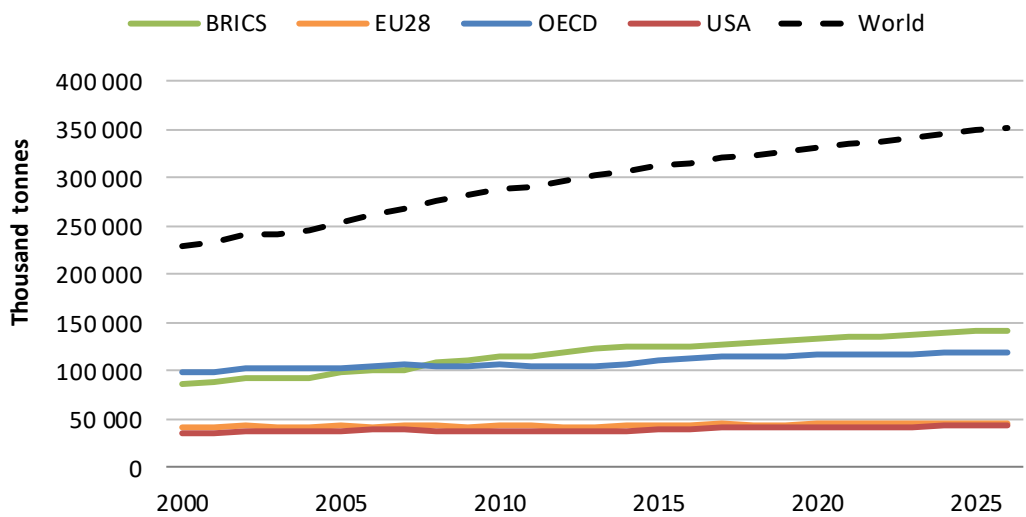
Transportation has a considerable environmental impact. Most journeys imply the burning of fossil fuels (especially for aviation). Even electric cars can have an impact, as coal and gas can be used to generate electricity. But electric vehicles also have the option of being powered by 'cleaner' sources of energy such as wind and solar. And unlike conventional cars, electric ones do not produce emissions at the point of use so they do not directly contribute to the pollution of city air. Sales of electric vehicles are rising: By 2017, there were over three million electric cars in circulation, with the largest number in China, followed by Europe and the United States. Electric car-sharing fleets in cities are also increasingly popular, as congested urban areas seek innovative ways to reduce emissions and air pollution.

Conversely, many industries which make intensive use of natural resources such as land and water are on the rise. One such industry is meat production. Although annual

meat consumption has remained largely stable in the EU and the USA since around 2000, worldwide meat consumption has increased every year for many years, and forecasts suggest that it will continue to do so until at least 2026. The increase in consumption is largely driven by some emerging economies, notably Brazil, China, Russia and Vietnam. However, in terms of overall volume consumed, the USA is currently the largest consumer and is forecast to remain near the top, surpassed only by China in 2026. The popularity of vegetarian and vegan lifestyles, along with innovations making meat substitutes better and more widely available, could challenge the continued rise in meat production.

Figure 5.10. Carnivorous future

Past and forecast annual meat consumption by location, thousand tonnes, 2000-2026



Source: OECD (2018), "Meat consumption" (indicator) https://data.oecd.org/agroutput/meat-consumption.htm.

StatLink https://doi.org/10.1787/888933889172

And education?

- What is the role of formal education in raising awareness and creating responsible citizens with civic values, critical thinking skills and sustainable consumption habits?
- Should governments incentivise walk-to-school, electrical transport, or other "clean" forms of transit for school commutes in order to reduce pollution and reliance on cars?
- Do VET programmes provide high-quality apprenticeships in emerging skill areas such as clean energy, bike and car-sharing networks, or other? If not, what is the best way to support them to offer this?

MODERN CULTURES AND EDUCATION: MOVING FORWARD

What are some of the ways the trends presented in this chapter interact with education, and how can education affect these trends? Some answers are obvious and immediate, for example, the impact of women in the workforce, and conversely, the need for high quality early childhood education and care. Others operate in the longer term, such as trends in sustainable consumption.

Connecting education and modern cultures

Creativity and entrepreneurship

- Equiping students with knowledge, skills and attitudes to become future entrepreneurs
- Promoting the teaching and learning of creativity and other skills that go beyond traditional distinctions between disciplines
- Practicing collaborative problem-solving and teamwork through hands-on projects within and beyond the classroom

Values and attitudes

- Addressing differences in social values within communities and upholding respect among students
- Promoting trust and respect between parents, teachers and administrators
- Developing awarness of gender-based and other forms of discrimination to build a zero tolerance for discrimination culture in educational settings

Diverse families

- Welcoming all families, traditional or non-traditional, in schools
- Acknowledging multicultural backgrounds in the classroom and providing teachers with the tools to teach diverse classrooms
- Creating strategies and providing resources for schools to effectively communicate with all households

Digital divides

- Ensuring that all students have the digital skills necessary for the modern world, both hard and soft
- Fostering effective integration of pedagogical, digital and content knowledge of teachers
- Fostering positive uses of and attitudes towards ICT, especially among female and more disadvantaged student populations

Future thinking: preparing for uncertainty

Despite the best laid plans, the future is inherently unpredictable. This section explores some examples of uncertainties surrounding the trends discussed in this chapter.

SHOCKS & SURPRISES — Smart drugs?

- There is significant research today into drugs that can enhance our cognitive performance. This concerns both novel and well-known substances. For example, some people take tiny doses ('microdoses') of LSD in the hope that doing so will boost their creativity. There are always risks associated with drug taking.
- *What if 'smart drugs' came into widespread use? What could some of the risks be? Would they apply equally to all ages, including children in primary school (or younger)? What could be the issues around equality of access?*

CONTRADICTIONS — Family time: learning together at the expense of playing together?

- As remote virtual work and learning develop, they could partially replace their physical counterparts. That could mean more time at home for everyone, and adults could become much more involved in children's learning. Conversely, the lines between the personal and professional could continue to blur, and reduce time for play and informal interaction.
- *Does education have a role in setting boundaries for time spent studying? Can play be a required part of formal education?*

DISCONTINUITIES — An appetite for ethical food?

- Could developments in technology such as improved meat substitutes, artificial ('lab-grown') meat, and different attitudes to alternative protein sources (such as insects as food) reverse the current trend of rising meat consumption?
- *Could this become a deliberate and mandatory policy action for public (and private) school food services? Could this open a new area of study for agricultural colleges?*

COMPLEXITY — Inclusion by technology?

- Diagnoses of learning difficulties such as ADHD and autism have grown in recent years. The cause is unclear, but likely due to a combination of reduced stigma, better diagnoses and reporting, and environmental input.
- *How can technology be used to adapt learning and work to make them more accessible to people with different needs?*

FIND OUT MORE

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Glossary

- **AirBnb**: A privately held company that acts as an online marketplace for people looking to rent out their homes and as provider for touristic services.
- **Broadband, access**: Internet access via a high-speed wired and wireless networks, such as DSL, fibre or satellite, capable of download speeds of at least 256 kbit/s.
- **Broadband, mobile**: Mobile subscriptions that advertise data speeds of 256 kbit/s or greater. The subscription must allow access to the Internet via HTTP and must have been used to make a data connection via Internet Protocol (IP) in the previous three months. Standard SMS and MMS messaging do not count as an active Internet data connection even if they are delivered via IP.
- **Corporal punishment**: Any punishment in which physical force is used and intended to cause some degree of pain or discomfort, however light, as well as non-physical forms of punishment that are cruel and degrading.
- **Extramarital birth**: The birth of a child to a mother whose legal status is other than married.
- **Freelancer**: A global crowdsourcing marketplace website founded in 2009 that allows potential employers to post jobs that freelancers can then bid to complete.
- **Gender wage gap**: The difference between median earnings of men and women relative to median earnings of men. Data refer to full-time employees and to self-employed.
- **Gig economy**: A way of working based on temporary jobs or doing separate pieces of work, each paid separately, rather than working for an employer.
- **Leave, father-specific**: Any employment-protected parental or home care leave that can be used only by the father or 'other parent'. Any entitlements that are initially given to the father but that can be transferred to the mother are not included.
- **Leave, maternity**: A job-protected leave of absence for employed women prior to and after childbirth or, in some countries, adoption. Most countries allow beneficiaries to combine pre- and post-birth leave, while some mandate a short period of pre-birth leave and six to ten weeks after childbirth. Almost all OECD countries provide specific public income support payments that are tied to the length of maternity leave.
- **Leave, parental**: Employment-protected leave of absence for employed parents that supplements maternity and paternity leave. In most, though not all, countries it follows maternity leave. Unlike eligibility for public income support that is often family-based, entitlement to parental leave is individual so that only one parent can claim support at any one time.
- **Leave, paternity**: Employment- or job-protected leave of absence for employed fathers after childbirth, or in some countries, adoption.
- **Meat consumption, worldwide**: The carcass weight of beef and veal, pig and sheep as well as the ready to cook weight of poultry.
- **Occupational mobility**: The ease with which a person (or resource) can move from one job to another.
- **Online platform**: Software-based facilities offering two- or even multisided markets where providers and users of content, goods and services can meet.
- **Piece work**: Work paid for according to the number of things or amount produced, rather than time spent.
- **Upwork**: Upwork Global Inc., founded in 2013 after the merger of the platforms Elance and oDesk, is a global freelancing platform where businesses and independent professionals connect and collaborate remotely.

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