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TESTING THE RESILIENCE OF EUROPE'S INCLUSIVE GROWTH MODEL

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CONTENTS

In brief

Testing the resilience of Europe's inclusive growth model

Page 1

Different types of social contract may display specific resilience and vulnerability

Page 3

Much of Europe has returned to growth, but its inclusiveness remains under pressure

Page 8

Six megatrends could test the resilience of Europe's inclusive growth model

Page 12

The megatrends mean Europe may face higher inequality and more divergence

Page 28

Action in three areas is required to strengthen Europe's inclusive growth model

Page 36

Technical appendix

Page 44

Further reading

Page 57

Acknowledgements

Page 58

IN BRIEF

TESTING THE RESILIENCE OF EUROPE'S INCLUSIVE GROWTH MODEL

European countries have different flavours of welfare model, yet they share a history of solid social protection and a focus on inclusive growth, which has been under stress since the recent financial crisis. Although inequality across Europe has grown only moderately since the early 2000s, social divergence between and within some European countries has increased. Citizens' trust of national and European Union (EU) institutions has fallen. Six global megatrends could widen income inequality and social divergence further to 2030, putting Europe's inclusive growth model under even more strain. The EU is likely to be able to preserve the essence of its social contract only by delivering effective policies in response to the megatrends to restore social convergence in the EU, and by adjusting the parameters of its social contract. Our key findings include:

- Investment rates have not recovered to pre-crisis levels, trust in national governments is still falling in one-third of European countries, and populist parties have won greater shares of the vote.
- Market income inequality in Europe rose only moderately compared with other regions, and redistribution almost stabilised disposable income distribution in recent years. However, the cross-country picture is mixed. Nordic countries have achieved the largest income growth, but in Southern Europe, all income quintiles have lost between 1 and 3 percent a year of disposable household income, with the lowest-income households experiencing the largest losses.
- There could be cracks in the sustainability of the EU social contract in the next decade caused by six megatrends: ageing demographics; digital technology, automation, and artificial intelligence (AI); increased global competition; migration; climate change and pollution; and shifting geopolitics. Based on these trends, inequality may rise again, and divergence within Europe may increase.
- In a simulated “denial” scenario, in which the EU and European countries do not respond to the megatrends (and roll back current policies), a social contract centred on inclusive growth would seem elusive, as Europe would face prolonged economic stagnation, rising inequality, and growth in welfare costs outstripping gross income growth.
- But in a simulated “deliver” scenario, in which Europe scales up current policies (particularly on ageing, diffusion of digital and AI, and investment in the circular economy), Europe could rebuild solid income growth—in our simulation of 1.9 percent a year per capita to 2030, producing an additional €9,000 of per capita gross income that could fund additional public social spending.
- One of the EU's most pressing challenges—even in the deliver scenario—could be rising inequality. Particularly digitisation and AI, but also global competition, could amplify skills premiums and put pressure on wages of routine jobs, superstar effects among firms and cities could continue, and both ageing and migration could further increase the wedge between top- and bottom-income households.
- What's more, consensus forecasts project that Europe's South is likely to diverge from, rather than reconverge with, Europe's North, and a shift in global competition to digital may create yet more headwinds in Europe's economically weaker geographies, threatening EU cohesion.
- Improved innovation and upgrades in human skills should be key priorities for Europe given that both can support inclusive growth. In all scenarios, the EU is likely to need to adapt the parameters of the social contract to cope with the megatrends, for instance embedding lifelong learning in the workplace and enforcing behaviour with respect to limiting pollution and overuse of natural resources.
- Europe will also need to increase, and better communicate, efforts to rebuild citizens' trust in order to gain their support for the required changes ahead.

TESTING THE RESILIENCE OF EUROPE'S INCLUSIVE GROWTH MODEL

Behind the economic performance of countries—their GDP growth—lies a set of institutions that set the foundations: their social contracts.¹ The main backbone of the social contract of the European Union (EU) is more or less defined by lower disparity in income generation and high redistribution to ensure inclusive growth, and high access to healthcare. Typically, income taxes are relatively high, public social expenditure relatively large, and coverage of social risk material.² However, today the sustainability of Europe's inclusive growth model and the EU's social welfare-oriented contract and its local variants is subject to intense discussion in light of limited growth in median income, falling trust in institutions, discomfort with mass migration, worries about security and the resilience of global agreements, and a rise in populist politics that challenges the status quo.³ The perceived strains are sufficiently serious that European Central Bank executive board member Benoît Coeuré referred to them in a speech at Harvard in March 2013 in which he said, "What is at stake is nothing less than the sustainability of the European social market economy".⁴

The critical question is whether perceptions that the EU social contract is breaking are justified, and, if they are, how the contract could be amended. This paper builds on research the McKinsey Global Institute (MGI) conducted in the context of our knowledge partnership with Friends of Europe for the #EuropeMatters project, and is the first in a forthcoming MGI series on the evolution and resilience of social contracts.⁵ This paper focuses largely on inclusive growth in the period to 2030.⁶ We concentrate on inclusive growth as this is the common backbone of Europe's social vision and its different flavours of social contract.⁷

¹ A social contract is a framework of settled relationships and agreements between individuals, companies, communities, and governing institutions, which aims to achieve goals such as security, liberty, inclusive prosperity, or sustainability. In this paper, we focus on the economic aspects of the EU social contract.

² Daron Acemoglu and James A. Robinson, *Why nations fail: The origins of power, prosperity, and poverty*, New York, NY: Crown Business, 2012.

³ Around the commonalities within Europe, there is some diversity in focus. Seminal work by Esping-Andersen and others finds that there are five flavours: (1) the liberal model in Anglo-Saxon economies, which is closer to the United States approach that is characterised typically by higher inequality; (2) the corporatist/conservative model of continental Europe, typically associated with lower employment; (3) the social democratic model of Nordic countries, characterised by higher tax rates; (4) the Mediterranean model of Southern Europe, with more focus on pensions and less on social assistance; and (5) a model linked to Eastern Europe, with a greater focus on catching up in growth terms. See Gøsta Esping-Andersen, *Three worlds of welfare capitalism*, Princeton, NJ: Princeton University Press, 1990; Gøsta Esping-Andersen, "The comparative macro-sociology of welfare states", in *Social exchange and welfare development*, Luis Moreno, ed., Madrid, Spain: Consejo Superior de Investigaciones Científicas, 1992; and Gøsta Esping-Andersen, *Social foundations of postindustrial economies*, Oxford, UK: Oxford University Press, 1999. For more on the Mediterranean model, see Maurizio Ferrera, "The 'Southern Model' of welfare in social Europe", *Journal of European Social Policy*, 1996, Volume 6, Number 1. When we discuss Europe's social contract in aggregate terms, we largely refer to the common backbone of inclusive growth. Social convergence happens when the inclusive growth model converges, and vice versa.

⁴ Benoît Coeuré, *Revisiting the European social contract*, Europe 2.0: Taking the next step, Cambridge, MA, March 2, 2013, ecb.europa.eu/press/key/date/2013/html/sp130302.en.html.

⁵ See Pascal Lamy, *Europe 2030: Towards a renewed European social contract*, #EuropeMatters, Friends of Europe, September 2018. In future research, MGI's aspiration is to develop a picture of all regions of the world and their rather heterogeneous social contracts, and of global interdependence, which may give us an idea of how those contracts might converge or not.

⁶ The term "inclusive growth" originated in the field of development economics when economists realised that growth in developing countries did not always result in the expected reductions in inequality and increases in living standards.

⁷ S. Leibfried, "Towards a European welfare state?", in *New Perspectives on the Welfare State in Europe*, Catherine Jones, ed., London: UK: Routledge, 1993.

This is consistent with academic research showing that inclusive growth is possibly the largest driver of citizens' life satisfaction.⁸

Tests to social contracts are not new. Indeed, social cohesion in Europe has been challenged in every recent decade—by the oil shock in the 1970s, the growth of world trade and rising competition from Asian economies in the 1980s, and the information and communications technology (ICT) bubble at the turn of the 21st century. During these periods, inequality rose, but then, as growth returned, restabilised.

The 2007–08 crisis created major turmoil that has not been totally worked through ten years later, in particular not in Southern Europe. After the crisis, income inequality widened, although not by as much as often perceived. It has since reconverged in many economies. However, income levels and inclusiveness worsened significantly in Europe's Mediterranean countries. Could this time be different—could inequality fail to restabilise? We are in a period in which technology is morphing into AI, and globalisation (that is, the integration of value chains) is restarting and expanding to services.⁹ Moreover, Europe's population is ageing, productivity growth has been in marked decline, and Europe's competitiveness is under pressure in the digital age, with R&D gaps with the United States and South Korea widening.¹⁰ We anticipate that six interacting global megatrends (which overlap with Gordon's famous headwinds) could widen income inequality and increase divergence among European countries further in the period to 2030.¹¹

For many observers and analysts, 2030 is an anchor year, because it is the point at which major risks associated with the megatrends may converge. In the case of climate change, it is the point at which the global temperature may have risen by the key threshold of two degrees Celsius. The diffusion of new digital technologies may be in full swing. And, in that year, most of Europe is likely to be close to having declining populations.

We find that Europe may be able to preserve the essence of its welfare-style social contract, but to make this possible, it will need to deliver superbly on all of its current initiatives that are linked to, and aim to respond to, the megatrends. Among initiatives with the best outcomes for inclusive growth, the EU and European countries will have to scale green and technological innovation and develop new skills. It is likely that inequality will grow even while action is being taken. However, social policies may be financed to mitigate rising inequality and to head off anti-EU sentiment when the scale of Europe will arguably be increasingly relevant. Alongside pursuing these policies, Europe will need to reconsider some of the parameters of the current social contract to adapt to this new era, and to initiate new and deeper dialogue about limiting increasing social divergence among its constituent countries.

⁸ Paul C. Bauer, "Unemployment, trust in government, and satisfaction with democracy: An empirical investigation", *Socius: Sociological Research for a Dynamic World*, 2018, Volume 4.

⁹ Richard Baldwin, *The great convergence: Information technology and the new globalization*, Cambridge, MA: Harvard University Press, 2017.

¹⁰ *Solving the productivity puzzle: The role of demand and the promise of digitization*, McKinsey Global Institute, February 2018.

¹¹ Robert J. Gordon, "Secular stagnation: A supply-side view", *American Economic Review, Papers and Proceedings*, 2015, Volume 105, Number 5.

DIFFERENT TYPES OF SOCIAL CONTRACT MAY DISPLAY SPECIFIC RESILIENCE AND VULNERABILITY

Essentially, a social contract is a framework of settled relationships and agreements (written and unwritten) between individuals, companies, communities, and governing institutions, which aims to achieve goals such as security, liberty, inclusive prosperity, and sustainability. For instance, citizens agree to sacrifice some individual freedom in exchange for state protection. The younger generation funds the pensions of the older generation. Trade unions and employers' federations agree on the basic terms of employment contracts and wages. Governments institutionalise these relationships and may write them into law. The combination of all these agreements can be defined as the social contract. History shows that social contracts are often the foundations of economic growth and, more generally, life satisfaction among citizens.¹²

When social contracts are weak and indicators such as poverty rates and wealth and income inequality increase, growth can be limited, and the quality of institutions and the rule of law can deteriorate.¹³ The Human Development Index published by the United Nations Development Programme (UNDP) is a long-established set of indicators building on the work of Amartya Sen.¹⁴ More recently, Fehder, Porter, and Stern have developed a Social Progress Index made up exclusively of three broad noneconomic dimensions: basic human needs, foundations of well-being, and opportunity. Their research examines the interplay between the three, and with economic metrics such as personal income and GDP. They conclude that GDP and social progress are distinct but reinforce each other.¹⁵ In Europe, Nordic countries have achieved the greatest social progress in relation to their economic activity (Exhibit 1).¹⁶

¹² Daniel Fehder, Michael Porter, and Scott Stern, "The empirics of social progress: The interplay between subjective well-being and societal performance", *AEA papers and proceedings*, American Economic Association, 2018, Volume 108.

¹³ See, for instance, Daron Acemoglu and James A. Robinson, *Why nations fail: The origins of power, prosperity, and poverty*, New York, NY: Crown Business, 2012; and Thomas Piketty and Emmanuel Saez, "The evolution of top incomes: A historical and international perspective", *American Economic Review*, 2006, Volume 96, Number 2.

¹⁴ Amartya Sen, *Inequality reexamined*, Cambridge, MA: Harvard University Press, March 1995.

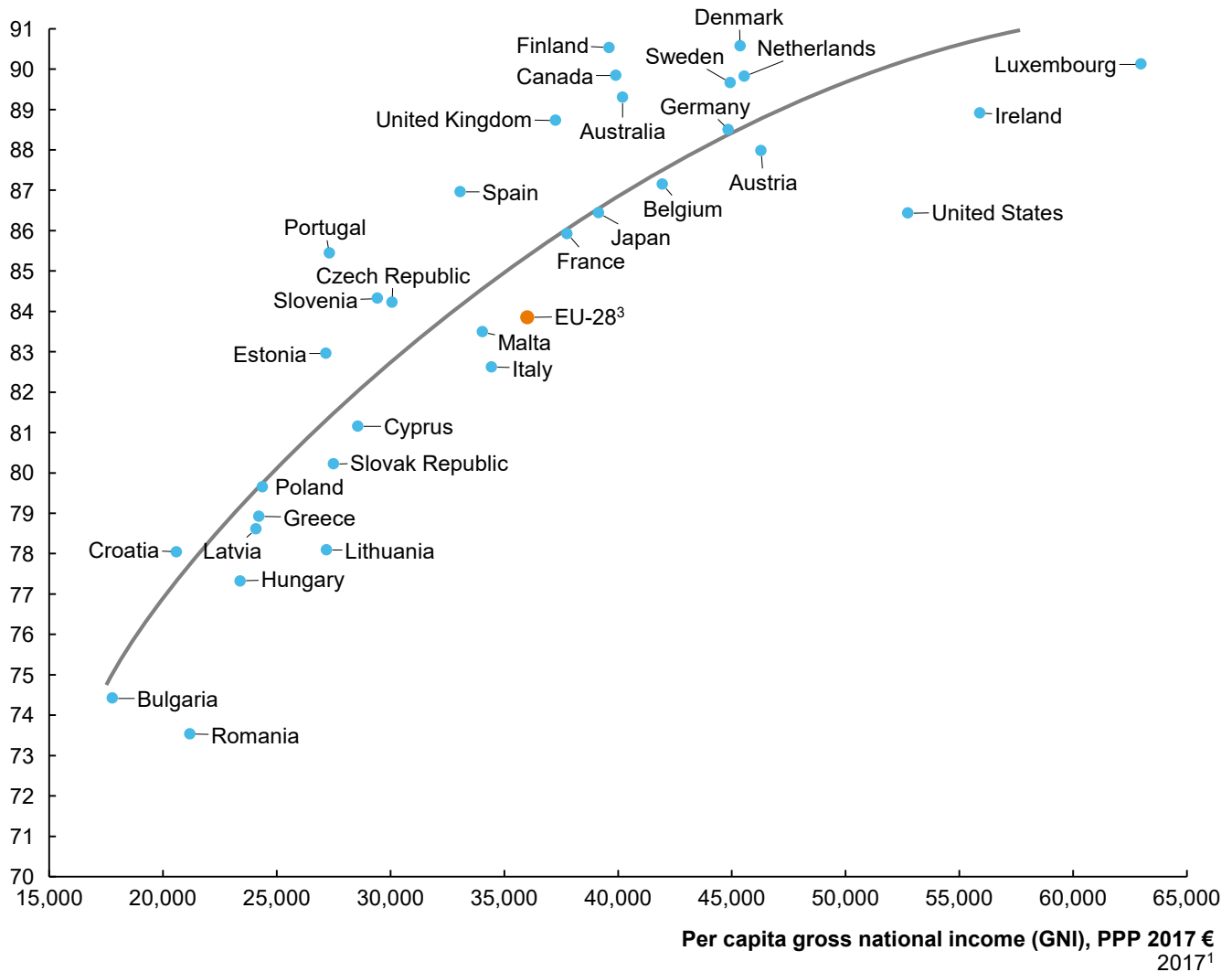
¹⁵ Daniel Fehder, Michael Porter, and Scott Stern, "The empirics of social progress: The interplay between subjective well-being and societal performance", *AEA papers and proceedings*, 2018, American Economic Association, Volume 108.

¹⁶ Ibid.; Michael E. Porter, *Social progress—what works?*, #whatworks2016, Reykjavik, Iceland, April 28, 2016, slideshare.net/socprog/professor-michael-e-porter-at-whatworks2016.

Exhibit 1

Nordic European countries have achieved the most social progress in relation to gross income.

Social Progress Index (SPI), estimated
2017



1 Converted from 2017 real \$ in purchasing power parity (PPP) to € using the average exchange rate for 2017 (\$1 = €0.89).
 2 EU-28 SPI is the average of the SPIs of all EU-28 member states including the United Kingdom.

SOURCE: World Bank; OECD; SPI Index; Gallup; Eurobarometer; EIU ViewsWire; Michael E. Porter, *Social progress—what works?*, #whatworks2016; McKinsey Global Institute analysis

Among the common characteristics that European countries share are higher income equality and higher social inclusion. All countries have more social expenditure than the United States.¹⁷ As of 2016, the EU-28 spent, on average, 19 percent of GDP on social protection including pensions, unemployment support, sickness and disability support, and social housing. Most EU-28 countries have moderate levels of inequality compared with the United States. The Gini coefficient in the United States (which synthesises in a single number the distance to full equality of income after tax and redistribution) was 0.31 in 1980, before rising to above 0.38 today.¹⁸ Europe's Gini coefficient was 0.31 in 2017—the same level as in the United States in 1980, and much lower than today's level there.¹⁹

There are many types of social contract around the world. Countries may decide to rely on different social relationships and agreements among their stakeholders. On the provision of social care and education—also key components of social contracts—East Asia has been more egalitarian than, for instance, Latin America. On the income generation and distribution elements of such contracts, a well-known contrast—and choice—has been highlighted between “laissez faire” in the United States, characterised by high inequality in income generation and limited redistribution, and Europe's so-called “welfare system” with its more equal income generation and larger redistribution.

We acknowledge, of course, that Europe is clearly not homogeneous, and it has clusters of different social models that have exhibited more or less resilience since the financial crisis. The seminal work by Esping-Andersen cited previously provides the basis for the clusters as well as a clear view of the commonalities and specificities of Europe's various clusters of social models.

Beyond this common ground, however, countries may have chosen different social paths (Exhibit 2). For example, by 2016, Southern and Eastern Europe had provided much less social support to those at the bottom of the income pyramid than the Social democratic cluster of the Nordic countries, which have much wider redistribution than other countries in Europe. In general, the Mediterranean cluster has suffered the most socially, with significantly higher unemployment than the rest of Europe and a higher share of people living in poverty.

¹⁷ Eurostat, ec.europa.eu/eurostat/statistics-explained/index.php?title=Government_expenditure_on_social_protection.

¹⁸ A Gini coefficient of zero represents perfect equality (incomes are perfectly evenly distributed), and a Gini coefficient of 100 indicates perfect inequality (one person earns all the income).

¹⁹ Interestingly, Europe and the United States had roughly the same disparity in market income generation a century ago. Europe has become more equal since, especially during the 1980s when US inequality started to rebound. For example, the top 1 percent in the United States earned about 20 percent of market income in the 1920s. This share fell to 12 percent in 1980 but then rose again to 20 percent today. In Europe in the 1920s, the top 1 percent in terms of market income in Denmark, France, and the Netherlands received a higher portion of their total national income than in the United States. The share commanded by the top 1 percent in France had fallen to below 10 percent by 1980 and has stabilised at 12 percent today. In Denmark and the Netherlands, the top 1 percent generated just above 5 percent of total income in 1980 and commands only 7 to 8 percent today.

Exhibit 2

Social clusters within the EU perform differently.

Median of EU = 100

- Liberal cluster (Anglo-Saxon)
 - Corporatist cluster (Continental Europe)
- Social democratic cluster (Nordic)
 - Mediterranean cluster (Southern Europe)
- Eastern cluster (Central and Eastern Europe)



1 All data from 2016.

2 Social welfare system clusters based on the original definition by Esping-Andersen; inequality based on the Gini coefficient. The same picture emerges with the quintile inequality ratio.

SOURCE: Eurostat; European Commission; World Bank; McKinsey Global Institute analysis

Comparing Europe’s model with the more laissez-faire model of the United States provides a good perspective on European social specificities (Exhibit 3). Before the recent crisis, long-term growth differentials between different types of social contract in Europe were small. All countries were growing at a rate of 2 to 2.5 percent from 1970 to 2006 (with the exception of Eastern European countries that were growing faster as they sought to catch up with others in the region). The United States experienced more than 3 percent growth over this period, with higher systematic income inequality than any Western European country. After the crisis, momentum in Europe’s per capita income growth declined to half the rate prevailing in the United States, recovering only over the past two years.

Exhibit 3

EU and US citizens have different socioeconomic profiles.

European Union (EU-28)	Average citizen	United States
25.9	Earns gross income (World Bank, OECD) (GNI, PPP, per hour worked ^{1,2})	29.6
5.2x the bottom 20%	Top 20% retains (OECD, Eurostat)	8.2x the bottom 20%
15,054	Government spends (Eurostat, World Bank) (per citizen PPP, 2017 € ²)	19,791
85/100	...and provides social progress of (Social Progress Index)	86/100
81 years	Has life expectancy of (World Bank)	79 years
37% trust (41% in EU)	Has trust in government (Gallup, Eurobarometer)	30% trust
8	Contributes to climate change (OECD, Eurostat) (tons of CO ₂ equivalent per person)	21

1 GNI per hour computed from full-time workers.

2 Converted from 2017 real \$ in PPP to € using the average exchange rate for 2017 (\$1 = €0.89).

SOURCE: World Bank; OECD; Social Progress Imperative; Gallup; Eurobarometer; EIU ViewsWire; Michael E. Porter, *Social progress—what works?*, #whatworks2016; McKinsey Global Institute analysis

As part of the laissez-faire model, the top 20 percent of US citizens generates eight times more disposable income than the lowest quintile, while the ratio is 5.2 in Europe. US citizens tend to prefer less action from public institutions. Only 30 percent of Americans trust their government; in the EU, the figure is somewhat higher, at 37 percent for citizens' respective national governments and 41 percent for European institutions. Taking indications of "happiness" among citizens of the United States and Europe as an overall marker of contentment as measured in the World Happiness Report, in 2018 seven of the top ten spots were taken by European countries (including Iceland), and 13 of the top 20 were in Europe. The United States ranked 18th.²⁰

These differences in the social and economic performance and evolution of the two regions have led some to question whether one model is superior to the other. Socioeconomic theory suggests that, in practice, there is no clear-cut evidence that one social contract model outperforms the other.²¹ Yet academic research also demonstrates that some social systems may be more resilient in the face of economic shocks than others. In some extreme cases, such shocks could even prompt an unravelling of those contracts.²²

²⁰ John F. Helliwell, Richard Layard, and Jeffrey D. Sachs, *World Happiness Report*, 2018.

²¹ Roland Benabou, "Unequal societies: Income distribution and the social contract", *American Economic Review*, 2000, Volume 90, Number 1.

²² Roland Benabou, *Inequality, technology, and the social contract*, NBER working paper number 10371, March 2004.

MUCH OF EUROPE HAS RETURNED TO GROWTH, BUT ITS INCLUSIVENESS REMAINS UNDER PRESSURE

The EU and its key institutions (the European Commission and the European Parliament) have long strived to reinforce a vision of an inclusive Europe for its member states. However, when the EU's focus started to shift from the completion of the Single Market to the strategic vision of “smart, sustainable, and inclusive growth” that was a major theme of the Treaty of Lisbon, the timing was unfortunate. The treaty was signed by EU member states on December 13, 2007, at the start of the global financial crisis, and came into force on December 1, 2009, a year when the Eurozone and the EU-28 were in a severe recession. Fiscal austerity reigned after 2010 and the sovereign-debt crisis, fuelling debate about the institutional setup of the Eurozone and leading to substantial reform initiatives such as the fiscal compact, the European Stability Mechanism, and the Single Supervisory Mechanism.

The economic crisis has certainly taken its toll on citizens' sense of political and economic well-being.²³ Let's look at the political temperature first. There is no doubt that a sense of uncertainty has built up. Shifting geopolitics and an evolution in security risks from classic warfare to terrorism have caused a number of questions and tensions. Many Europeans are uncomfortable about the economic and social impact of mass migration to Europe (particularly as only between three and five European countries largely absorbed these migrants, arguably raising political tension within the region). European citizens have also been concerned about the effectiveness of established security institutions such as NATO and about crime rates closer to home. The Paris Agreement on climate change and the Iran nuclear deal framework have lost the United States as a signatory, prompting uncertainty about the robustness of international agreements.

Such adverse shocks have resulted in clear markers of increased tension. Voting participation in European countries' parliamentary elections has been declining since the 1980s amid an apparent breakdown of trust between people and their political representatives. Support for authoritarianism and nationalism has gained traction. In Italy, for instance, the Five Star Movement (M5S), regarded as a nationalist and Eurosceptic party, and the Northern League (Lega Nord, now called the Lega), also Eurosceptic, between them gained more than 50 percent of the vote in the 2018 general election. In the United Kingdom, the Eurosceptic UK Independence Party won 14 percent of the vote in the general election. Once the United Kingdom had voted by a slim margin to leave the EU in the referendum held in 2016, UKIP's share of the vote fell to less than 2 percent in the 2017 general election. Participation in elections has generally been low, and the voting share of populist parties as of May 2018 was as high as 65 percent in Hungary, 54 percent in Greece, and 51 percent in Poland.²⁴ Less than half of European citizens trust their government (the only European region where this is not the case is in Nordic countries, although even in these countries there has been a rise in populism; the Sweden Democrats, an anti-immigrant party, won 49 seats in the Riksdag to become the third-largest party).

It is evident that rising social tension and falling trust in institutions do not happen in a vacuum; citizens' perceptions of their economic well-being are key. There is a clear and

²³ See, for example, Luigi Guiso et al., *Demand the supply of populism*, EIEF Working Papers Series 1703, Einaudi Institute for Economics and Finance, February 2017; and Philippe Legrain, *European Spring: Why our economies and politics are in a mess—and how to put them right*, CB Creative Books, 2014.

²⁴ *Vote share of populist parties in EU countries (2018)*, Association of Accredited Public Policy Advocates to the European Union, May 22, 2018, aalep.eu/vote-share-populist-parties-eu-countries-2018.

established two-way link between the momentum of economic growth, strength in social cohesion, and citizens' satisfaction and trust in institutions and politicians.²⁵

On average, Europe has performed solidly in terms of GDP growth and had reduced income inequality in the 15 years before the crisis hit in 2007. Then momentum was lost. Inequality in parts of Europe rose—in market income by 5 percent between 2007 to 2013 for the working-age population, and in terms of disposable income by 3 percent.²⁶ Incomes, particularly at the bottom of the distribution, stagnated or even fell. MGI research has shown that market and disposable incomes did not advance for the majority of the population in the post-crisis years from 2005 to 2014.²⁷ So far, Europe has failed to meet its laudable goal of lifting 20 million EU-27 citizens out of poverty between 2008 and 2020. Indeed, since 2008, an additional 1.6 million have become at risk.²⁸ The perception has been growing that younger generations are destined to be poorer than their parents in some European countries.²⁹

Today, the pressure on Europe's social model appears to have dissipated somewhat as the economic recovery has gathered a measure of momentum. The number of people in the EU-27 at risk of poverty declined by close to five million between 2012 and 2015. Mean and median income growth resumed in most of Europe. The Social Progress Index rose by 4.4 percent and institutional trust increased by 5 percent a year from 2014 to 2016.³⁰ As acknowledged by Bruegel in an April 2018 blog entry, income inequality in the EU declined significantly in 2016 to reach its lowest level since 1989.³¹ In general, our analysis of the period to 2016 suggests that all quintiles and deciles experienced an increase in disposable income, while the ratio of top to bottom 20 percent of disposable income earners stabilised or fell slightly, mostly as a result of top 10 percent earners increasing their disposable income at a lower rate than any other decile.

However, this average evolution may mask cracks in Europe's inclusive growth that bear watching. Regions within Europe—we have divided the continent into Social democratic (Nordic), Corporatist (continental Europe), Liberal (Anglo-Saxon), Mediterranean (Southern Europe), and Eastern (Central and Eastern Europe) clusters—show distinct differences (Exhibit 4). Continental European countries, on average, experienced a recovery in income growth for all citizens, a reduction in inequality, and a rebuilding of trust in institutions and, overall, made social progress. Anglo-Saxon economies, notably the United Kingdom, engaged in austerity programmes and exhibited no real growth in median disposable income. Northern European countries experienced the highest GDP growth in the EU, leading to real positive growth in per capita income and a slight increase in inequality due to superior income growth in the top decile, and improved social progress and trust. In sharp contrast, Southern European countries' per capita growth has been under stress,

²⁵ See, for instance, Daniel C. Fehder, Michael Porter, and Scott Stern, "The empirics of social progress: The interplay between subjective well-being and societal performance", *AEA Papers and Proceedings*, American Economic Association, 2018, Volume 108; Christian Bjørnskov, "How does social trust affect economic growth?", *Southern Economic Journal*, 2012, Volume 78, Number 4; Chase Foster and Jeffrey Frieden, "Crisis of trust: Socio-economic determinants of Europeans' confidence in government", *European Union Politics*, 2017, Volume 18, Number 4; Yann Algan et al., "The European trust crisis and the rise of populism", *Brookings Papers on Economic Activity*, BPEA Conference Drafts, September 7–8, 2017; and Benjamin M. Friedman, *The moral consequences of economic growth*, New York, NY: Vintage Books, 2006.

²⁶ Beñat Bilbao-Osorio and Eva Rückert, "Innovation, productivity, jobs and inequality", in *Science, research and innovation performance of the EU 2018: Strengthening the foundations for Europe's future*, European Union, 2018.

²⁷ *Poorer than their parents? Flat or falling incomes in advanced economies*, McKinsey Global Institute, July 2016.

²⁸ Zsolt Darvas, *Why is it so hard to reach the EU's "poverty" target?*, Bruegel, January 18, 2017.

²⁹ *Poorer than their parents? Flat or falling incomes in advanced economies*, McKinsey Global Institute, July 2016.

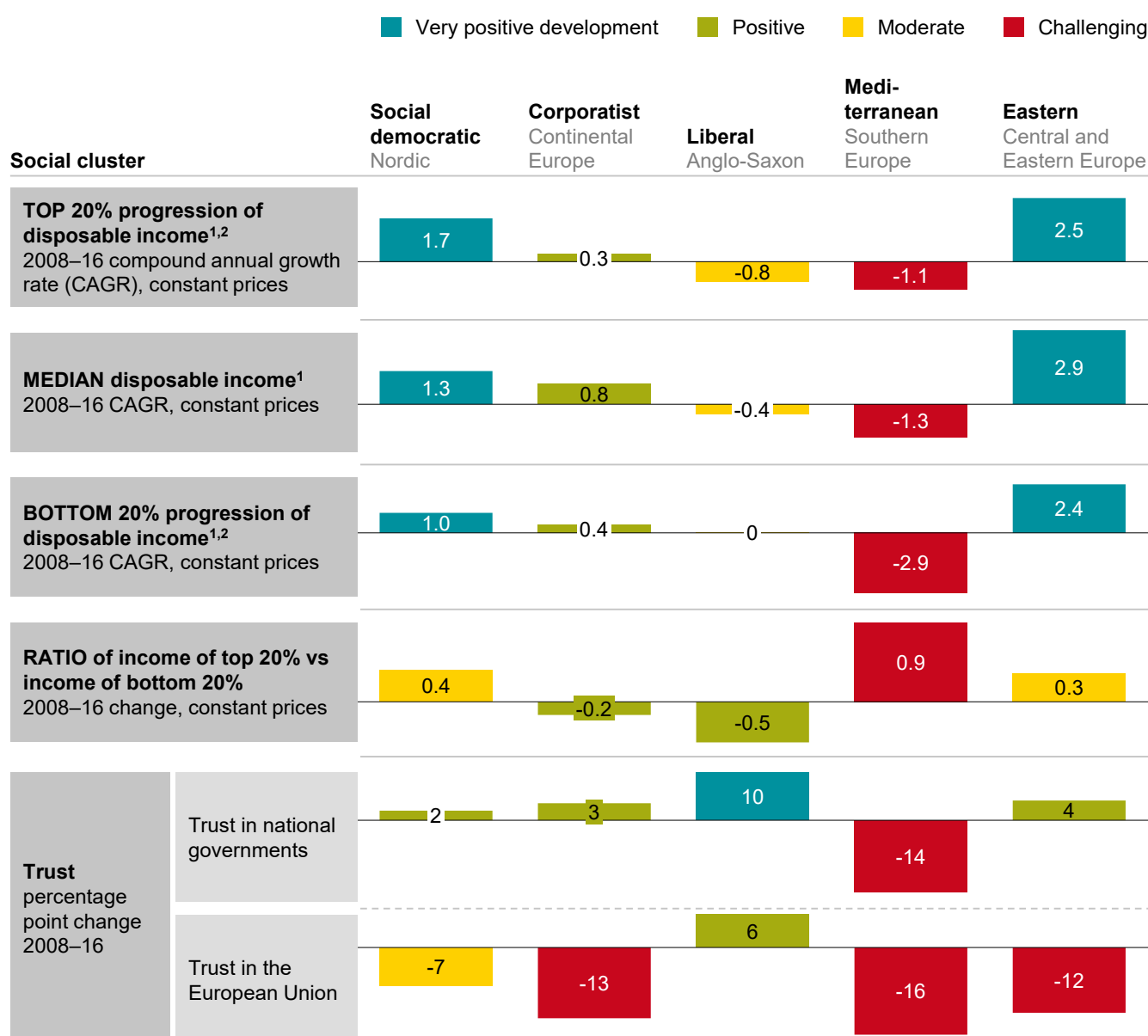
³⁰ Note that this is measured in percent, not percentage points.

³¹ Germany experienced a 0.6 point fall in the Gini coefficient, while the United Kingdom experienced a decline of 0.9. See Zsolt Darvas, *European income inequality begins to fall once again*, Bruegel, April 30, 2018.

disposable per capita income has declined for all deciles and quintiles, and poverty and income inequality have increased.³² Among the most affected economies, median disposable incomes declined by as much as 5 percent a year in Greece over this period, and by about 1 percent per year in Italy and Spain. Trust in domestic and European institutions fell significantly in Southern Europe. Eastern European economies' growth recovered at a slightly faster rate than in Continental European or Nordic countries. However, this relative convergence has been limited. Growth in per capita income over the past eight years has still been lower than in Continental Europe, creating a widening gap in wealth accumulation. Top deciles grew faster than bottom deciles, leading to greater inequality.

Exhibit 4

Social clusters' performance has diverged in Europe since the crisis, with the Mediterranean cluster appearing worst off.



1 Estimates of disposable income are based on the current average tax rate of the income tax bracket, which has been corrected for inflation using the Harmonised Index of Consumer Prices.

2 Estimated change over time in the median income of the quintile.

NOTE: Country aggregation through population weighting.

SOURCE: World Bank World Development Indicators; OECD; Eurostat; Eurobarometer; McKinsey Global Institute analysis

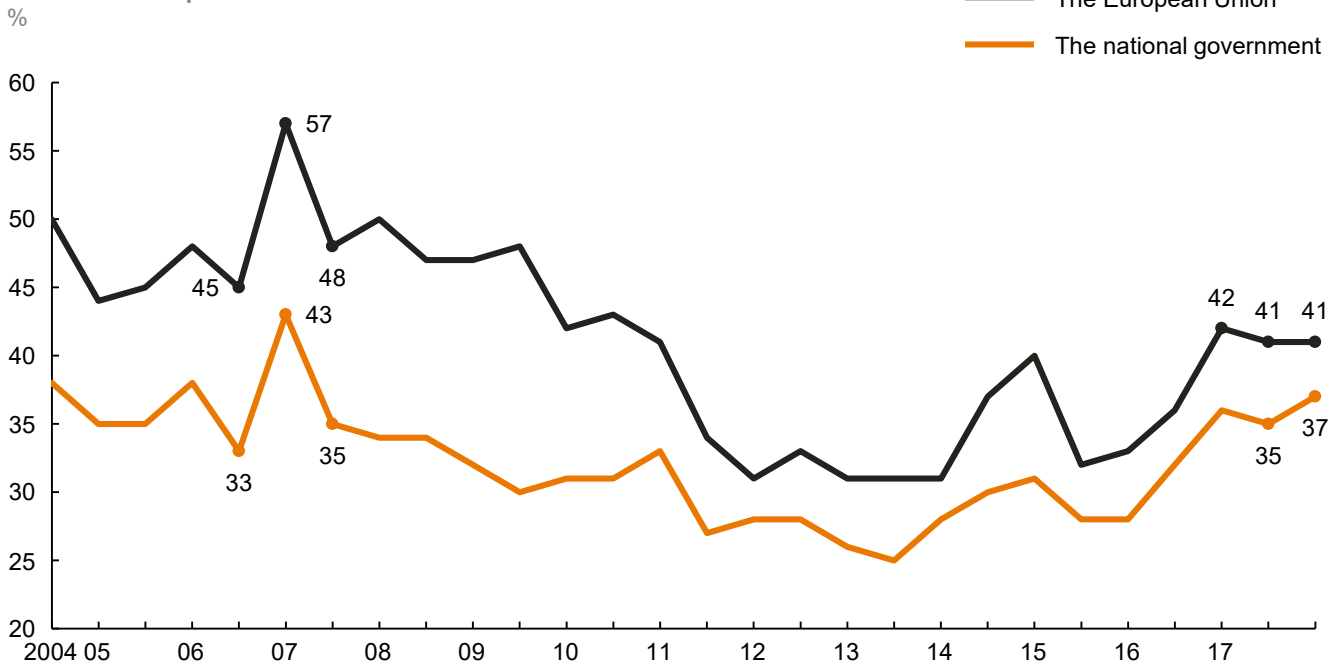
³² Michael Forster, *Divided we stand: Why inequality keeps rising*, OECD Social Policy Division, presentation, March 22, 2012, oecd.org/els/soc/49170768.pdf.

Institutions are coming under challenge, too. Economists have asserted that solid and trusted institutions are core ingredients of economic growth and prosperity.³³ Trust is an intangible but critical feature of modern democratic societies; it is easy to lose and hard to regain.³⁴ Europeans are asking fundamental questions about the continent’s democratic legitimacy and relevance. Citizens and businesses alike are concerned about Europe’s ability to deliver on its commitments. For example, while business leaders surveyed by McKinsey in 2017 were largely positive about the European Commission’s policy priorities, only 28 percent thought EU institutions were very effective at making and managing policy. They were not much more confident in their home governments. In general, trust in institutions is relatively low among European citizens and companies. Trust in own country and European institutions has fallen since the crisis and has yet to recover (Exhibit 5). In the case of European companies, about 54 percent want more rather than less of Europe, but only one-third to 40 percent think that the European institutions have delivered on expressed EU priorities such as deepening economic, monetary, and political integration, and completing the Digital Single Market.³⁵

Exhibit 5

Institutional trust is still significantly below its pre-crisis level.

Share of EU respondents who “tend to trust” each institution



SOURCE: Eurobarometer; McKinsey Global Institute analysis

³³ Daron Acemoglu and James A. Robinson, *Why nations fail: The origins of power, prosperity, and poverty*, New York, NY: Crown Business, 2012.

³⁴ See *Rebuilding trust in Europe: Three pathways*, McKinsey Global Institute, January 2018; and *Trust and public policy: How better governance can help rebuild public trust*, OECD Public Governance Reviews, March 27, 2017.

³⁵ *European business: Overcoming uncertainty, strengthening recovery*, McKinsey Global Institute, May 2017.

SIX MEGATRENDS COULD TEST THE RESILIENCE OF EUROPE'S INCLUSIVE GROWTH MODEL

The resilience of Europe's social contract may be tested by six global megatrends: ageing; digital technology, automation, and AI; increased global competition; migration; climate change; and shifting geopolitics. In this section, we simulate the likely long-term evolution of inclusive growth in the EU and its social clusters. Our analysis is based on a synthesis of external research and extends MGI's previous work on the major trends sweeping through the world economy in what we termed "no ordinary disruption" (see Box 1, "High-level methodology", and the technical appendix).³⁶ Of course, there is much uncertainty about each individual trend as well as their interconnections, and therefore our simulation is intended to give a rough "dimensionalisation" of the challenges and opportunities ahead in several scenarios rather than precise point forecasts.

Our model suggests that, overall, the six megatrends may put more pressure on inequality and institutional trust in the next decade rather than being a cause for relief.³⁷ The trends are likely to have different impacts depending on whether Europe responds to them vigorously or passively (Exhibit 6). All six play a role, but sometimes asymmetrically. Our analysis suggests that technology will be the largest swing factor and that further large impact is likely to come from ageing and globalisation.³⁸

For illustrative purposes, we have developed two contrasting scenarios. We call the first a denial scenario in which Europe takes no action to mitigate the impact of the trends. If this (unlikely) scenario were to unfold, Europe would, for instance, not counteract ageing demographics, and would block progress on digitisation and AI, risking losing competitiveness vis-à-vis China and the United States, the world's digital and AI leaders. It could also find itself at the mercy of significant economic risk linked to climate change and pollution, to take two examples. In our second, deliver scenario, Europe continues to pursue and scale up its current policies, and it develops new approaches that leverage existing assets and competencies to respond to newer trends such as the diffusion of AI. In this scenario, Europe continues to invest at the same pace in the circular economy, for example, and continues its path to decarbonisation according to the Paris Agreement. It also implements its objectives for the Digital Single Market and starts to diffuse AI technologies, achieving success in line with its existing progress in innovation, education, and digitisation.

For each of the six megatrends, we identify what we believe are the most significant mechanisms at work by which they have an impact on inclusive growth and other elements of the social contract. We also provide a high-level view of how those trends separately, and in combination, may affect the path of economic growth and inequality. Our focus is on sustaining inclusive growth.

³⁶ Richard Dobbs, James Manyika, and Jonathan Woetzel, *No Ordinary Disruption: The Four Forces Breaking All the Trends*, New York, NY: PublicAffairs, 2015. This book discussed four megatrends: urbanisation, accelerating technological change, an ageing world, and ever deeper and wider global connections in terms of trade in goods and services, finance, people, and data.

³⁷ Robert J. Gordon, "Secular stagnation: A supply-side view", *American Economic Review, Papers and Proceedings*, 2015, Volume 105, Number 5.

³⁸ MGI has published extensively on the role of technology. To read and download all reports, go to mckinsey.com/mgi/our-research/technology-and-innovation.

Exhibit 6

The impact of six megatrends on inclusive growth will depend on whether Europe chooses to respond to them.

Cumulative impact by 2030
(deviation from baseline scenario, average estimates)
Europe average

Positive ■ ■ ■ Challenging



SOURCE: McKinsey Global Institute analysis

Box 1. High-level methodology

We tested the resilience of the social contract by examining how a set of anticipated trends could affect the evolution and sustainability of Europe's inclusive growth path against an as-is baseline case, taking a perspective up to 2030. Through the model developed for this project, which uses estimates from previous MGI work and academic literature in reduced form, we provide early insights into the extent of pressure on the EU social contract and pinpoint sources of fragility. We judge the model to work "everything else being equal". The estimates that emerge from the model are not forecasts but should be considered as providing rough direction on how scenarios could unfold. We provide some sensitivity analyses to show the uncertainty of the results (see the technical appendix for more detail).

The model covers the EU-28 countries and aggregates for Europe based on the total income share of each country. We have developed scenarios as deviations to a baseline case that does not account for the influence of megatrends. The baseline is structured as a model of as-is growth with constant labour-to-population and capital-to-output ratios, and with a long-term trend (1996 to 2006) of total factor productivity growth for Europe of 0.8 percent a year.¹ This leads to average annual income growth for the EU-28 of 1.6 percent to 2030, in line with consensus estimates. The average incorporates differences among European countries with a range from 0.8 percent to 3.1 percent. The higher rate is achieved by countries with some combination of higher population growth, a lower labour share, and higher total factor productivity growth. In particular, Central and Eastern European countries have achieved long-term total factor productivity growth of 1.2 percent over the past 20 years, compared with only 0.5 percent in Western Europe.

Central and Eastern European countries' total factor productivity growth reflects beta convergence with the rest of Europe.²

We selected economic, social, and sustainability metrics that interlink with institutional trust and use these to assess the sustainability of the social contract.

Metrics. We compute four social indicators in addition to the typical economic indicator of income growth. Our main focus is on inclusive growth, and we therefore look at the distribution per quintile of income growth. We assess how inequality develops in absolute terms (proportion of population with declining income and increase in unemployment) as well as in relation to other citizens.³ For a relative measure, we look at both the Gini coefficient and the relative difference between top- and bottom-quintile earners. We also assess how economic indicators affect the dynamics of institutional trust.⁴ Finally, we estimate the additional public funding required to accommodate the megatrends. For sustainability and broad social dimensions, we consider the Social Progress Index.⁵

Megatrends. Leveraging and extending MGI's work on "no ordinary disruption", we selected six global trends that already have, and will likely continue to have, an impact on the EU: (1) the ageing of the population; (2) the diffusion of disruptive technologies; (3) the rise of competitors from emerging markets; (4) migration; (5) climate change; and (6) shifting geopolitics.⁶ Those trends correlate well with some of the headwinds highlighted by Robert Gordon in his discussion of secular stagnation.⁷ The validity of these six megatrends has been put to the test in a series of workshops at Friends of Europe.⁸

¹ Beñat Bilbao-Osorio and Eva Rückert, "Innovation, productivity, jobs and inequality", in *Science, research and innovation performance of the EU 2018: Strengthening the foundations for Europe's future*, European Union, 2018.

² See Marcin Grela et al., *Is Central and Eastern Europe converging towards the EU-15?*, NBP working paper number 264, Narodowy Bank Polski, 2017. The study makes clear that the convergence process has largely been driven by inward direct investment, but that this driver is running out of steam, making it necessary for Eastern Europe to scale up its own innovation and competitiveness. The total factor productivity growth we assume in the period to 2030 may thus be overstated for those countries.

³ See Rafael Di Tella and Robert MacCulloch, *Happiness adaptation to income beyond "basic needs"*, NBER working paper number 13539, December 2008; and Richard Layard, Guy Mayraz, and Stephen Nickell, *Does relative income matter? Are the critics right?*, CEP discussion paper number 918, Centre for Economic Performance, London School of Economics and Political Science, 2009.

⁴ Ronald Inglehart and Pippa Norris, *Trump, Brexit, and the rise of populism: Economic have-nots and cultural backlash*, Harvard Kennedy School faculty research working paper series RWP 16-026, August 2016.

⁵ For sustainability and broad social dimensions, we also have considered the Social Progress Index. However, the components of the index are difficult to predict, and we therefore do not report those metrics in this report. The Social Progress Index is published by the nonprofit organisation Social Progress Imperative (socialprogressindex.com). See Daniel Fehder, Michael Porter, and Scott Stern, "The empirics of social progress: The interplay between subjective well-being and societal performance", AEA papers and proceedings, American Economic Association, 2018, Volume 108.

⁶ Richard Dobbs, James Manyika, and Jonathan Woetzel, *No Ordinary Disruption: The Four Forces Breaking All the Trends*, New York, NY: PublicAffairs, 2015.

⁷ Robert J. Gordon, "Secular stagnation: A supply-side view", *American Economic Review, Papers and Proceedings*, 2015, Volume 105, Number 5.

⁸ Pascal Lamy, *Europe 2030: Towards a renewed European social contract*, #EuropeMatters, Friends of Europe, September 2018.

Box 1. High-level methodology (continued)

Links between variables. We include three main linkages between key metrics. First, between inequality and growth; we based our analysis on extensive research by academics and public institutions such as the Organisation for Economic Co-operation and Development (OECD) and the International Monetary Fund (IMF), which illustrate when and how inequality may slow growth potential.⁹ Second, between growth and government spending, according to Wagner's Law.¹⁰ And third, between changes in unemployment and trust in government.¹¹

Scenario building. We quantified the effects of the six megatrends using MGI's own research as well as a review and meta-analysis of the impact described in academic literature. The effects of those trends are differentiated depending on different scenarios of actions taken. For example, ageing may limit growth potential because of limited labour resources available, but this depressive effect may be mitigated in a scenario where participation rates and retirement ages go up or where large inroads have been made in AI and automation. Our aim is to provide a sense of contrast between inaction and action by European policy makers, and we therefore consider only two illustrative scenarios as deviations to the baseline case. We call the first of these a "denial" scenario in which European policy makers do nothing in response to the megatrends (in some cases, this scenario implies stopping what Europe is already doing). We call the second a "deliver" scenario, in which Europe delivers planned and needed measures. Among these measures, we include achieving the Digital Single Market, adjustment of national laws to extend retirement ages, and the Paris Agreement.¹² The model is a comparative static of the six megatrends. It does not incorporate risks of shocks such as a trade war, because forecasting such potential developments is subject to a great deal of uncertainty. Likewise, our model takes *ceteris paribus* assumption on other variables. For instance, we do not model step changes in monetary and fiscal policies. Also, investment

to output remains constant in our model baseline and deviates only according to trends such as a changing mix toward AI capital. Redistribution policies remain the same. Our goal is to isolate the new playing field facing Europe due to emerging forces.

Testing the robustness of results. We used sensitivity analysis as well as logic analysis ("what do you have to believe") to arrive at a more informed view of how the results work.¹³ We nevertheless acknowledge that our analysis relies on many assumptions. On estimating inequality, for example, we assume that wages will converge to economic equilibrium. However, this may take more or less time than expected. We also assume that skills upgrades and interfirm mobility happen in less than one year. We also assume that the current unemployment benefit ratio remains the same for any unemployed, and independently of their unemployment duration; however, benefits would decrease with time, and inequality may increase. We finally note that we only model wage income, and no other sources of revenue such as equity dividends or increasing housing assets because these are rather volatile. There may, however, be positive changes in returns on these other assets, boosting benefits particularly for those on higher incomes, and therefore increasing the inequality ratio. In our simulation of the impact of technology, real wages grow at 0.4 percent a year while employment should remain flat as a result of AI deployment and automation.¹⁴ This means that wage income might grow at half the pace of output growth; the delta is extra income accruing to those who have financed the extra investment in AI-based capital. Those returns are not necessarily "unfair" as they may be needed to repay both level and risk of those investments, especially when it comes to entrepreneurship. If those extra returns are positive and accrue to those at the higher end of the income scale, inequality may be higher than what we estimate in this paper.

⁹ "Does income inequality hurt economic growth?" *Focus on inequality and growth*, OECD Directorate for Employment, Labour, and Social Affairs, 2014, oecd.org/els/soc/Focus-Inequality-and-Growth-2014.pdf; and Federico Cingano, *Trends in income inequality and its impact on economic growth*, OECD social, employment, and migration working papers number 163, OECD, 2014.

¹⁰ Anisul M. Islam, "Wagner's law revisited: Cointegration and exogeneity tests for the USA", *Applied Economics Letters*, 2001, Volume 8, Number 8.

¹¹ Chase Foster and Jeffrey Frieden, "Crisis of trust: Socio-economic determinants of Europeans' confidence in government", *European Union Politics*, December 2017, Volume 18, Number 4. A bidirectional linkage between per capita gross national income and the Social Progress Index is also added as a sensitivity, but this effect is marginal and disregarded in our final estimates.

¹² *Shaping the Digital Single Market*, European Commission, ec.europa.eu/digital-single-market/en/policies/shaping-digital-single-market; Paris agreement, European Commission, ec.europa.eu/clima/policies/international/negotiations/paris_en.

¹³ We also used Monte Carlo simulations. The Monte Carlo approach is based on using the intercountry variance of scenario impact for the six trends, the range of estimated impact of the trends, and feedback loops from the academic literature, assuming a log normal distribution of impact among countries. The log normal reflects the fact that most of those trends may have some fat tails.

¹⁴ *Jobs lost, jobs gained: Workforce transitions in a time of automation*, McKinsey Global Institute, December 2017.

TREND 1: AGEING DEMOGRAPHICS

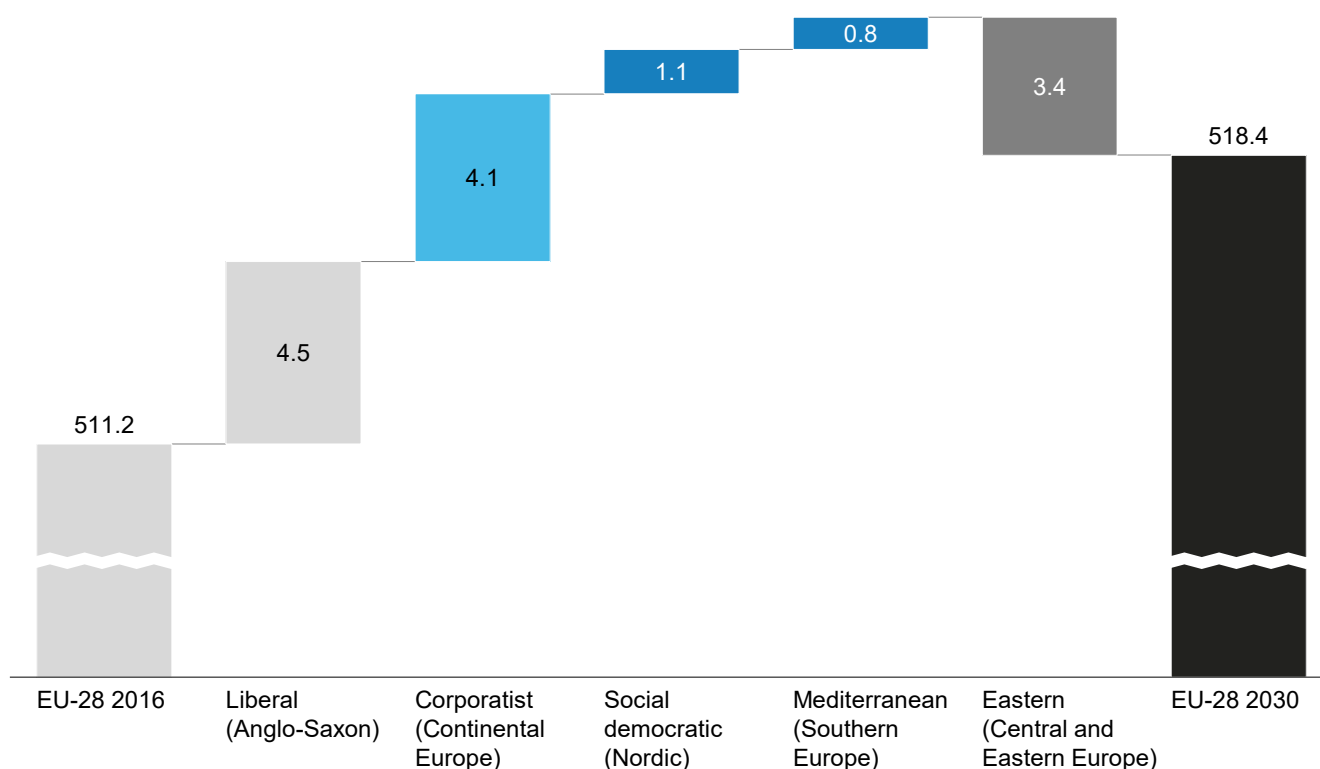
According to Oxford Economics, Europe’s population is expected to increase by only seven million people—from 511 million to 518 million—by 2030. In half of the EU-28 countries, including Germany, a large part of Central Eastern Europe, and Iberia, the population is expected to shrink (Exhibit 7). This weak population growth would age societies and reduce the labour force by 7 percent and the active labour force by 5 percent by 2030.

Exhibit 7

The overall EU-28 population is forecast to grow only marginally to 2030 but is expected to decline in Central and Eastern Europe.

Projected population change in the EU-28 by 2030

Million people



NOTE: This analysis adds four countries to the cluster classification: Ireland included in Liberal, Luxembourg in Corporatist, and Cyprus and Malta in Mediterranean.

SOURCE: Oxford Economics; McKinsey Global Institute analysis

Mechanics at work

If age-specific behaviour with respect to labour supply and savings were fixed, labour supply and per capita savings would tend to decline, lowering growth in per capita income.³⁹ However, ageing often leads to change in savings.⁴⁰ And the impact of a declining (or more slowly growing) working-age population from ageing on per capita employment has been partly compensated for by fewer young people due to declines in fertility and youth dependency ratios. However, in most OECD and European countries, declining fertility has already played out, and the ageing pressure on per capita growth is set to build up in years to come—in a ceteris paribus scenario where we don’t see continued rises in female

³⁹ David E. Bloom, David Canning, and Günther Fink, “Implications of population ageing for economic growth”, *Oxford Review of Economic Policy*, 2010, Volume 26, Number 4.

⁴⁰ David E. Bloom, David Canning, and Bryan Graham, “Longevity and life-cycle savings”, *The Scandinavian Journal of Economics*, 2003, Volume 105, Number 3.

participation and retirement ages. Finally, workers' productivity varies over the course of a working life. With a more mature labour force, there is a risk that, in a time of rapid technological change, although people gain experience by working, their skills can quickly become obsolete.⁴¹

The larger the share of elderly people, the more unequally income may be distributed.⁴² The primary channel through which inequality may rise is a decrease in revenue generation (after social redistribution) by the elderly compared with when they have been working. The wages of the working population relative to capital incomes and retirement incomes can also change as the labour supply shrinks. The latter effect depends on how labour demand is deployed in the economy; for instance, capital-biased technology change may reduce employment and limit rising inequality through ageing.

Estimated impact range

The estimate arising from our simulation suggests that ageing could reduce growth in per capita income by a maximum of 0.4 percentage point per year over the next 15 years in a denial scenario.⁴³ Further, the productivity effect may account for 30 percent of the total depressive effect, with the balance of 70 percent coming largely from a shrinking pool of workers after accounting for changes in participation. On average for Europe, our simulations suggest that the maximum impact by 2030 on the market quintile inequality ratio would be an increase of 0.1 point, with a maximum impact of 0.3 point on the market Gini coefficient. If the reduction in labour supply has a limited impact on wages, the overall effect on both inequality measures would likely be lower.⁴⁴

Europe's ageing could lead to an increase in the senior dependency ratio from 29 percent in 2017 to around 39 percent by 2030.⁴⁵ From a social contract perspective, our simulation suggests that this increase in the dependency ratio could potentially lead to a rise in public costs associated with a growing elderly population equivalent to 1 to 2 percent of GDP, with variations among countries depending on the evolution of retirement and healthcare policies.⁴⁶ In the past, people retired aged just past 60 and had only a few years left to live in retirement, and newcomers to the labour market could finance their pensions. However, the average life expectancy has increased by more than three years in Europe in less than 15 years, essentially driven by falling mortality among the old population (and not people dying earlier in life), while at the same time, the number of new entrants to the workforce has fallen.⁴⁷ These trends suggest that Europe will need to rethink the social contract in terms of how social contributions build up over the years.

⁴¹ Shekhar Aiyar, Christian Ebeke, and Xiaobo Shao, *The impact of workforce ageing on European productivity*, IMF working paper number 16/238, 2016. See also *Skills matter: Further results from the survey of adult skills*, OECD Skills Studies, 2016.

⁴² Zhi Luo et al., "Ageing and inequality: The link and transmission mechanisms", *Review of Development Economics*, 2018, Volume 22, Number 3

⁴³ This effect is reduced in a deliver scenario as a function of how strong changes in the retirement age are.

⁴⁴ In general, the estimate is that a one-point increase in the dependency ratio leads to a one-point increase in the difference in income between workers and pensioners. Given that pensioners are overrepresented at the low end of the income distribution, an increase of one point in the dependency ratio increases the Gini coefficient by 0.5 point, and the ratio of the top 20 percent to the bottom 20 percent by about 1 percent. These average effects vary proportionately, based on the ratio of income resources between retirees and workers, and based on the wage premium elasticity to labour supply.

⁴⁵ Measured as the percentage of people older than 65 compared with people aged between 15 and 64.

⁴⁶ *The 2018 ageing report: Economic and budgetary projections for the EU member states (2016–2070)*, European Commission, May 25, 2018.

⁴⁷ Eurostat for current EU membership.

TREND 2: DIGITAL TECHNOLOGY, AUTOMATION, AND AI

As general-purpose technologies, ICT technologies boosted economy-wide productivity—and economic—growth. The same may prove to be the case as AI technologies advance and diffuse over the next few decades in European economies. The result may well be more positive than suggested by the view of some of the public that these technologies will substitute jobs and polarise wages with no broader upside.⁴⁸ However, a timing issue is likely to arise, with costs and disruption incurred in the short term and the significant potential of AI to boost productivity, employment, and growth appearing only in the medium to long term.⁴⁹

Mechanics at work

Automation and AI have large potential to increase per capita GDP growth. The main channels for economic growth arise from the substitution of human tasks by AI at the same or higher quality but at a lower cost than wages, as well as the ability of AI to power the development of a wide range of new, innovative products and services. Regarding the latter, the potential of innovations using AI is already largely visible today with the emergence of the driverless car, the development of intelligent home devices, and AI-based research on genomics. Regarding the former—the automation of jobs—research recognises that jobs typically consist of many tasks, and automation technology is more likely to affect the mix of activities within a job than to replace full occupations. On average, in developed countries, the study finds that 25 to 30 percent of existing jobs run the risk of 70 percent of their tasks being automated. On average, in Europe, we compute that 45 percent of full-time equivalent (FTE) tasks can be technically automated with today's technology.⁵⁰

Inequality may emerge through the combination of two main channels: (1) automation and the substitution of labour, and (2) corporate diffusion dynamics leading to competitive disadvantage among nonadopting firms. On the first, the reduction in tasks directly reduces employment and possibly real wage growth if automation does not lead to significant productivity effects through the use of AI and robotics. In general, occupations composed of more repetitive and nondigital tasks will typically be filled by workers with low education and skills who will therefore be the first to experience pressure on their wages.

On the second, we find that a large part of gains from AI comes through a business-stealing or cannibalisation effect (an effect already observed with previous versions of digital technologies) and the emergence of digital native companies that have been gaining momentum at the expense of incumbents.⁵¹ This business-stealing risk might be high enough—or perceived to be high enough—for a competitive race to emerge in the diffusion of AI technologies.⁵² However, many companies may still lack the abilities, the skills, and the will to absorb these technologies, which require new IT architecture, the development of new talents, and incentives to self-cannibalise companies' own business, for instance.

⁴⁸ Those social concerns among citizens have been well documented. See, for instance, Thomas G. Dietterich and Eric J. Horvitz, "Rise of concerns about AI: Reflections and directions", *Communications of the ACM*, 2015, Volume 58, Number 10; and Irmgard Nübler, *New technologies: A jobless future or golden age of job creation?*, ILO working paper number 13, International Labour Organization, November 2016.

⁴⁹ An S-curve pattern of AI adoption is likely—a slow start due to substantial costs and investment associated with learning and deploying these technologies, and then an acceleration driven by the cumulative effect of competition and an improvement in complementary capabilities. The risk is that this "slow burn" impact deters companies and countries from making the necessary investments, meaning they miss out on the benefits available further down the road. The fact that it takes time for productivity to unfold may be reminiscent of the Solow Paradox. The Solow Paradox is a phenomenon in which increased investment in IT is not visible in productivity statistics. For an in-depth debate, see Mekala Krishnan, Jan Mischke, and Jaana Remes, "Is the Solow Paradox back?", *McKinsey Quarterly*, June 2018. See *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, September 2018.

⁵⁰ *A future that works: Automation, employment, and productivity*, McKinsey Global Institute, January 2017; and *Skill shift: Automation and the future of the workforce*, McKinsey Global Institute, May 2018.

⁵¹ Jacques Bughin and Nicolas van Zeebroeck, "The best response to digital disruption", *MIT Sloan Management Review*, April 6, 2017.

⁵² Jacques Bughin, "Wait-and-see could be a costly AI strategy", *MIT Sloan Management Review*, June 15, 2018.

Companies that use AI for more innovative services and are first movers in absorbing AI are most likely to increase both real wages and employment. AI-resistant companies may face high competitive headwinds over the long term and may have to shrink. Low-skill workers in AI-innovative firms may therefore, at least partly, be protected against the risk of rising inequality, while those in less innovative firms may face yet more pressure.⁵³ Those mechanics have already been in force in recent years when most of the growing inequality within countries is reported to have been driven by an increase in wage inequality among workers, compounded by increased disparity in the performance of firms.⁵⁴

Estimated impact range

Enablers such as innovation ability and the technological skills of the workforce affect the pace and size of impact of AI diffusion. If European countries leverage their current competencies and assets in these enablers, we estimate that about one-third of European companies may have fully absorbed the range of current AI technologies and automation by 2030. The impact on per capita income could be higher than one percentage point a year between now and 2030 after taking into account transition costs, such as piloting of technology, training costs linked to upskilling of the workforce, and costs of terminating the employment of the obsolete portion of the existing workforce.⁵⁵

This boost in growth would be material—roughly twice the impact electricity had on Europe between 1920 and 1970—and would nearly mitigate the aggregate negative growth impact of the six megatrends if no action is taken to counter them or leverage the opportunities they offer.⁵⁶ However, this upside depends on whether Europe actually executes fully on its enablers, which will not be easy. China and the United States currently lead the AI supply chain, and skills need to shift most in categories where Europe already faces signs of shortages.⁵⁷ Among the key sensitivities, a decline in the pace of diffusion and in innovative ability could each lead to about the same proportional decline in the impact of AI on total cumulative GDP growth by 2030, according to our simulations. A 10 percent shortfall in appropriate skills could reduce the impact by about 5 percent.⁵⁸

The growth potential from AI is likely to be associated with major disruptions that may affect inequality as these technologies diffuse. This diffusion entails a major shift in companies' profit distribution as a result of a significant business-stealing effect in favour of companies adopting AI and gaining competitive advantage.⁵⁹ Diffusion also leads to a redistribution of labour demand in favour of workers based on appropriate skills to operate in this new technology environment.

⁵³ Those findings are not peculiar to AI. Highly R&D intensive firms pay higher wages on average, and this premium tends to be higher for lower- than higher-skill workers. See Philippe Aghion et al., *Innovation, firms and wage inequality*, March 2017.

⁵⁴ Chiara Criscuolo, "Slow and divided: What policies can lift economies and restart engines of growth for all?" in *Science, research and innovation performance of the EU 2018: Strengthening the foundations for Europe's future*, European Union, 2018.

⁵⁵ For details of the MGI model on the impact of AI on growth and wages, see *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, September 2018.

⁵⁶ Antonin Bergeaud, Gilbert Cette, and Rémy Lecat, *The role of production factor quality and technology diffusion in 20th century productivity growth*, Banque de France working paper number 588, April 2016.

⁵⁷ *Skill shift: Automation and the future of the workforce*, McKinsey Global Institute, May 2018; and *Superstars: The dynamics of firms, sectors, and cities leading the global economy*, McKinsey Global Institute, October 2018.

⁵⁸ *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, September 2018.

⁵⁹ *Ibid.*

Academics have emphasised the interrelationship of inequality and technological diffusion for many years, with the seminal work by Nelson and Phelps demonstrating that higher-skill workers will be the first to benefit from corporate adoption of technologies.⁶⁰ In general, however, rising inequality is not necessarily permanent; prospects for inequality will depend on the mechanisms of diffusion, the shift in and upgrade of workers' skills, and whether technology shifts still enable all workers to obtain employment at the same real wage. Such effects have been modelled recently in analysis that has found empirical support for the dynamics of technology diffusion, inequality, and education changes.⁶¹ In our simulation, we also find that the effect on inequality is roughly bell-shaped with the amount of investment in AI. If the EU declines to invest in AI, it will face greater global competition from more AI-savvy countries such as the United States and China. This will result in pressure on lower-skill jobs, thereby increasing income inequality. In our simulation, the impact could be about a 0.4-point increase in the quintile inequality ratio.

In contrast, if the EU decides to boost the diffusion of AI, the competitive threat from the world's AI leaders would diminish as Europe catches up with them. However, income inequality could rise because of more competition within Europe and smarter automation. The more AI diffusion spreads, the more competitive advantage erodes, and the more automation of jobs follows. By 2030, when close to 50 percent of companies might be expected to have diffused AI in our simulations, the quintile ratio of market inequality in Europe could increase by about 0.9 point. However, when diffusion has reached its peak—typically at just above the 50 percent of firms—inequality may also start to plateau and then decline as competitive advantage starts to shrink faster than gains from the automation of labour. Europe may be close to the peak of rising inequality in the deliver scenario by 2030.

Firms will perform differently, too.⁶² Innovative European companies that invest early in the full range of AI technologies could potentially sustain 3.5 times the productivity growth rate and more than 6 times the profit growth of companies that adopt and diffuse AI later and only partially by 2030. Companies that do not adopt AI seem set to shrink, with lower revenue, declining labour productivity, and negative profit growth (Exhibit 8).⁶³

The top 5 percent “frontier” firms might accumulate more than 40 percent of additional labour productivity growth versus laggard firms by 2030. As a useful benchmark, this wedge is slightly larger than what has been documented for corporations in both service and

⁶⁰ See Richard R. Nelson and Edmund S. Phelps, “Investment in humans, technological diffusion, and economic growth”, *The American Economic Review*, 1966, Volume 56, Number 1/2. A series of subsequent papers found a positive link between technological progress and inequality in the United States during the 1980s and 1990s. See Oded Galor and Omer Moav, “Ability-biased technological transition, wage inequality, and economic growth”, *The Quarterly Journal of Economics*, 2000, Volume 115, Number 2; and Chinhui Juhn, Kevin Murphy, and Brooks Pierce, “Wage inequality and the rise in returns to skill”, *Journal of Political Economy*, 1993, Volume 101, Number 3.

⁶¹ For a powerful demonstration of this effect, see Philippe Aghion, “Schumpeterian growth theory and the dynamics of income inequality”, *Econometrica*, 2003, Volume 70, Number 3. In an extensive study, Josh Hall demonstrated that more technology leads to higher disparity, but that disparity may cancel out depending on the how deep and fast education shifts in response to new technologies. See Joshua D. Hall, *The diffusion of technology, education and income inequality: Evidence from developed and developing countries*, November 5, 2009.

⁶² The difference between winners and losers from AI diffusion is likely to vary according to the sector. For instance, the consumer packaged goods sector, which has a high degree of competition and more AI-based labour automation, may experience higher variations between winners and losers. In a sector like construction where competition is limited but there is more labour automation, there may be less asymmetry. In education where automation and innovation are relatively limited, the variation in impact on players is likely to be lower. In the technology, media, and telecom sector, which has more competition and less automation, there is likely to be more asymmetry between winners and losers.

⁶³ Nonperforming firms have nowhere to hide. As the diffusion of AI reaches full force, profits of nonadopters could shrink by as much as 10 percent by 2030. See *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, September 2018.

manufacturing in OECD countries in the same period, between 2000 and 2012 (13 years).⁶⁴ Here, the estimated effect is exclusively due to the diffusion of AI technology.

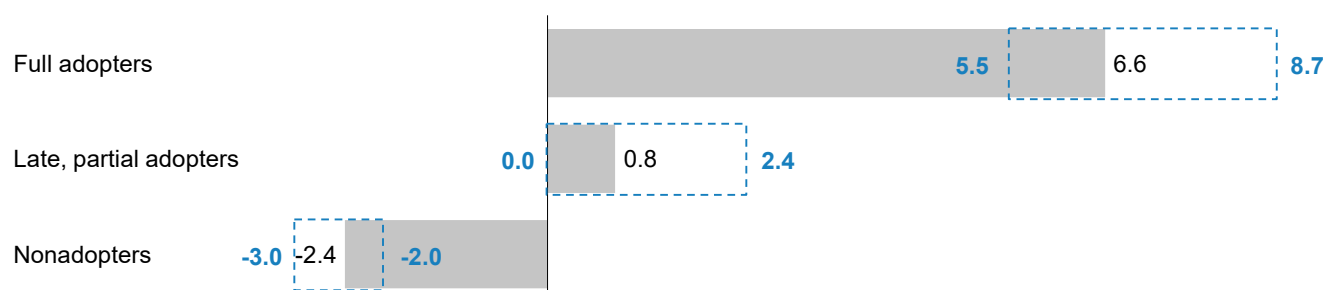
Exhibit 8

Leading AI adopters in Europe may achieve healthy profit growth, while profits of late, partial, and nonadopters could decline.

Cash flow growth of European companies due to AI adoption

%, estimated per year, 2018–30

 Range¹



¹ The range of the values is based on the distribution of AI adoption by countries and sectors. Values to the left of the range indicate minimum values. Values to the right of the range indicate maximum values.

SOURCE: McKinsey Global Institute analysis

These effects are likely to spill over into the distribution of wages, as corporate performance will drive demand for labour in addition to the displacement mix of labour through automation (the extent of which depends on companies investing more or less intensively in AI). By 2030, we find that the top 10 percent of European wage earners could increase their real wage income by 3 percent a year versus baseline through AI adoption.⁶⁵ The lowest decile could experience a decline in real wage income relative to baseline by 0.6 percent annually. This effect is more than double the impact observed in recent decades in EU-28 economies (Exhibit 9).⁶⁶

Real wages may decline for 30 percent of workers who combine the wrong mix of higher risk of automation and being hired by companies that are not adopting AI and being competed away by early AI adopters. Over time, this effect may dissipate as nonadopting companies catch up or disappear.⁶⁷

The average impact of AI estimated by MGI may be optimistic. Concerns include the possibility that companies will not reap as much of the innovation benefit as we suggest, and that the addition of skills and mobility will not happen as speedily as anticipated. In those cases, the boost to per capita income may be lower than computed, and we take this into account in the sensitivity of our scenarios.

⁶⁴ Dan Andrews, Chiara Criscuolo, and Peter Gal, *The best vs. the rest: The global productivity slowdown hides an increasing performance gap across firms*, Vox, March 27, 2017.

⁶⁵ There will likely be excess demand for labour skills in frontier firms, leading to a war for talent that the market will need to clear. We do not include this effect in our simulations. For more on the skills landscape, see *Skill shift: Automation and the future of the workforce*, McKinsey Global Institute, May 2018.

⁶⁶ See Michael Forster, *Divided we stand: Why inequality keeps rising*, OECD Social Policy Division, presentation, March 22, 2012, oecd.org/els/soc/49170768.pdf; and *World Economic Outlook: Globalization and inequality*, International Monetary Fund, October 2007. See, in particular, Figure 4.9 in Chapter 4.

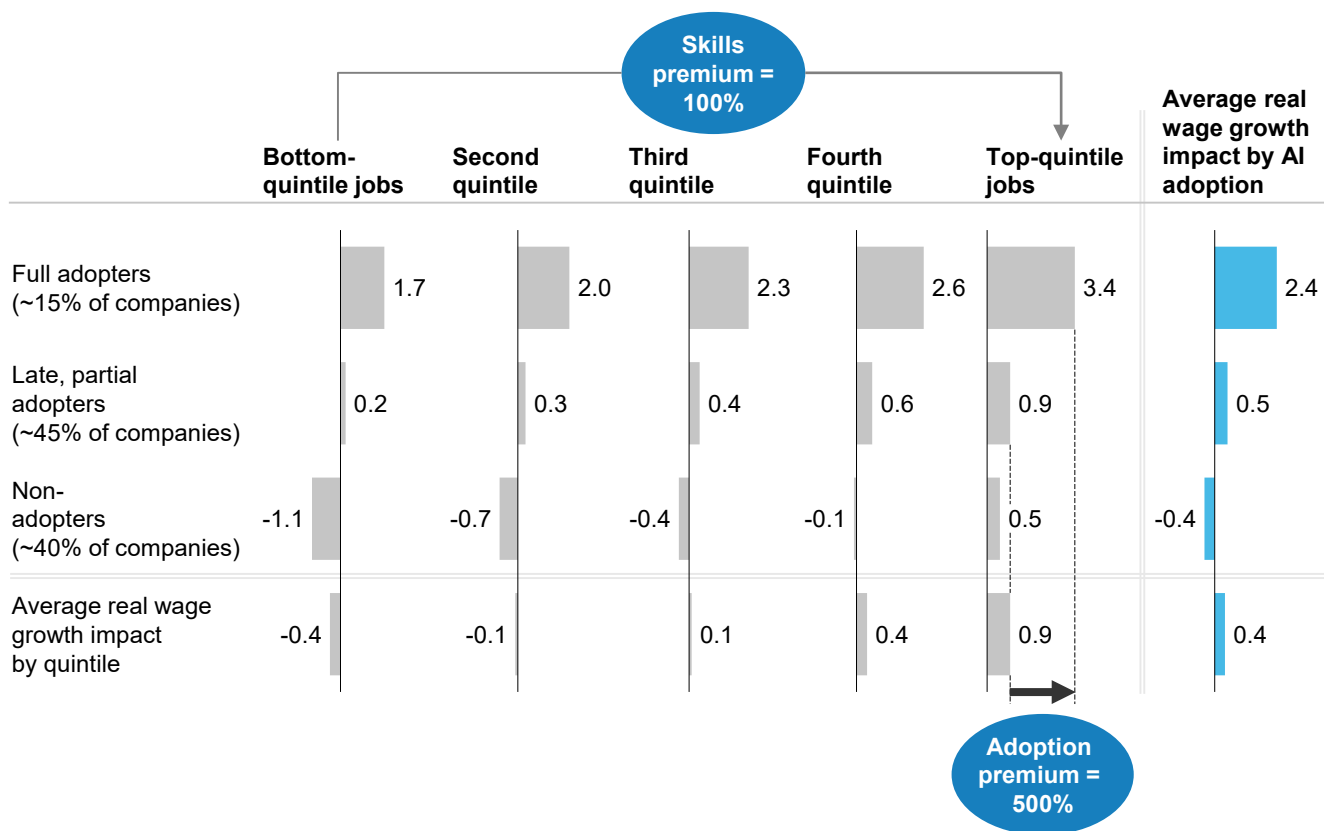
⁶⁷ This effect may appear large, but median real wage growth was zero in many European countries between 2008 and 2013 in manufacturing, and even negative in services (outside finance). See Chiara Criscuolo, “Slow and divided: What policies can lift economies and restart engines of growth for all?” in *Science, research and innovation performance of the EU 2018: Strengthening the foundations for Europe’s future*, European Union, 2018. Moreover, the effect here is only the impact of AI, and AI is only one of the megatrends. In the deliver scenario, responding positively to the other megatrends may produce 0.5 point of additional income growth, leaving about 5 to 6 percent of the active working population at risk of secular pressure on real wage growth.

Exhibit 9

Real wages will evolve as a function of skills and corporate AI adoption.

Effects of AI adoption on real wage growth, EU-28¹ under the deliver scenario

Estimated incremental annual real wage growth, %, 2017-30



1 Estimates based on average AI diffusion curve in Europe and ventilation of average automation substitution potential (45%) across job structure and job distribution by firms in the EU-28.

SOURCE: O*NET; Eurostat; McKinsey Global Institute analysis

In parallel, however, inequality may also be higher than anticipated, and it may increase disproportionately if there is friction.⁶⁸ It is therefore critical that friction does not build up and that economies invest in making the transition smooth. MGI has estimated in previous research that, in 2025, European governments may need to increase annual spending on unemployment benefits and reskilling programmes by an average of 0.5 to 1 percent of GDP.⁶⁹ In general, the extent of the skill shift needed is likely an order of magnitude larger than in the past, and it may require supplementing the external labour market with internal lifelong learning tools. We have already seen major skill-upgrade programmes at high-tech and telecom companies such as SAP as they diversify into AI.⁷⁰ In the past, the social contract between European firms and workers has been managed through union-firm negotiations and largely covered wages and labour. In the future, the parameters may need to change to include the provision of lifelong learning and, in some cases, to

⁶⁸ If half of jobs substituted are not reengaged, 5 percent more of the working population may be at risk by 2030; market income inequality in Europe could increase by between 7 and 12 percent.

⁶⁹ Higher tax revenue from corporations and increased wages from additional growth is only expected to materialise later, leaving a funding gap. See *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, September 2018.

⁷⁰ *Skill shift: Automation and the future of the workforce*, McKinsey Global Institute, May 2018.

take into account a changed capital-labour ratio.⁷¹ As the digital economy spreads, union membership is declining, and therefore an adjusted social contract may need to add ways of protecting workers in the gig economy.⁷²

TREND 3: INCREASED GLOBAL COMPETITION

Globalisation has many effects on national economies. While globalisation should increase global economic activity through specialisation, reallocation, and spillover effects from economic activity and innovation, competition may also increase and give rise to inequalities because of varying degrees of exposure to globalisation.⁷³

Mechanics at work

The new growth theory of international trade suggests that global economic integration and cross-border spillovers from innovation are important positive channels for growth.⁷⁴ MGI research has emphasised that about 10 percent of global GDP in the past 30 years has come from additional economic activity associated with globalisation. To date, one-third of this effect has been linked to the rapid growth of cross-border data flows, with the remainder coming largely from additional trade and foreign direct investment (FDI) flows.⁷⁵ This effect will continue, and is part of our base case.

Although Europe has a very large trade surplus in goods (much higher than its trade deficit in services), Europe's balance—particularly with Asian economies—is worsening.⁷⁶ Europe is suffering from an increasingly negative balance of digital trade and services, especially with respect to the United States. This suggests risks to Europe's future trade competitiveness.

The Stolper-Samuelson theorem suggested in 1941 has long been the theoretical foundation of the link between globalisation and income inequality.⁷⁷ The theorem suggests that trade increases the wages of those with the most abundant skills at the expense of those with less abundant skills. In developed countries where higher skills are more plentiful, increasing inequality may arise from more openness to trade. Since the publication of the theorem, however, globalisation has significantly changed, shifting towards a greater weight of capital flows, like FDI, and recently to data flows. FDI inflows from emerging economies to Europe often aim to leverage high skills and gain access to technology, placing an additional premium on those skills. Cross-border data flows are correlated with higher and more digital-savvy skills.

Estimated impact of increased global competition

In broad terms, the impact on European growth of globalisation is likely to depend on the EU's participation in global flows as well as its ability to compete with developing and developed economies. In a simplified case, if Europe were to experience a deterioration in its trade balance in line with recent import-export trends with emerging economies, and if that were to translate into growth pressure, our simulation would show a maximum

⁷¹ For examples of how discussions between firms and unions are beginning to include lifelong learning, see *Contribution of collective bargaining to continuing vocational training*, European Foundation for the Improvement of Living and Working Conditions and European Centre for the Development of Vocational Training, 2009. Also see emerging manifestos including, for instance, *The case for a refreshed approach to unions and collective bargaining to support a stronger UK economy*, ResPublica, respublica.org.uk/our-work/publications/new-bargain-people-productivity-prosperity/.

⁷² For further discussion, see, for instance, *The European Commission's half-finished digitalisation strategy: A critical assessment by UNI Europa*, UNI Europa, 2015, uniglobalunion.org/sites/default/files/public_shared/files/uni_europa_assessment_digitalisation_strategy.pdf.

⁷³ Our simulation does not include the potential impact of a trade war.

⁷⁴ Robert J. Barro and Xavier Sala-i-Martin, "Convergence", *Journal of Political Economy*, 1992, Volume 100, Number 2.

⁷⁵ *Digital globalization: The new era of global flows*, McKinsey Global Institute, March 2016.

⁷⁶ *The EU in the world*, 2016 edition, Eurostat, ec.europa.eu/eurostat/documents/3217494/7589036/KS-EX-16-001-EN-N.pdf/bcacb30c-0be9-4c2e-a06d-4b1dae493e.

⁷⁷ Wolfgang F. Stolper and Paul Samuelson, "Protection and real wages", *Review of Economic Studies*, 1941, Volume 9, Number 1.

0.3 percentage point drag on per capita income. Of course, if Europe managed to exploit other drivers of growth by, for instance, raising domestic investment, including inward FDI, the impact could shrink or even turn positive. For our average simulation, we therefore acknowledge that we paint a more conservative picture than our base case. In the sensitivity scenario, we also consider a broader range of impact with no, or positive, impact versus the base case.

Inequality may increase: the top-to-bottom quintile ratio may increase by about 0.3 point. A similar level of impact was observed in developed countries especially when global trade took off, and certain parts of manufacturing shifted from Western economies to developing Asian countries including Japan and, later, to China and South Korea.⁷⁸

TREND 4: MIGRATION

Migration from outside Europe is heavily debated, not least because of the significant portion of migrants who are refugees. In pure economic terms, the impact of migrants on inclusive growth depends on the skills they bring with them and which are required to successfully integrate them into the receiving labour market; given high productivity levels and specific skills needs in many European nations, the skills required can also be high.

Mechanics at work

As Europe ages, inward migration may, to an extent, help to alleviate labour-market shortages in the period to 2030. Today, 78 percent of immigrants are economically active and can help plug the gap as long as they are integrated into European economies successfully and secure jobs.⁷⁹ However, economic migrants into Europe have about 30 percent lower wages and 10 percent higher unemployment than the native population after five to six years. Refugees fare worse, with up to 50 percent unemployment rates after five to six years and 30 percent after 15 years.⁸⁰ In a scenario in which refugees are not integrated effectively, inequality could well rise.

Estimated impact of migration

The impact of immigration on inequality and per capita income in Europe may, on average, be immaterial given that cross-border mobility is still limited compared with other types of flows (that is, goods, services, finance, and data). Currently, annual migration to Europe accounts for only around 0.2 percent of the total population of the region.⁸¹ We note that inward migration has recently been very unevenly distributed across Europe, with most going to Austria, Germany, and Sweden. The flow of migrants to Europe is now declining, and some migrants, mostly refugees, may return to their countries of origin. By 2030, new non-European migrants—especially non-refugees—could account for about 2.5 percent of additional population, and this could, according to our simulation, mean an additional 0.1 percentage point of compound annual per capita GDP growth, and a 0.1 point increase in inequality.⁸² We note that if refugees were to account for a larger share of migrants, per capita income growth could suffer and turn negative; we allow for this in our sensitivity analyses. There might also be impact from within-EU migration, for instance if brain drain leads to rising inequality across countries, but we have not modelled that effect.

⁷⁸ “Globalization and inequality”, in *World Economic Outlook*, International Monetary Fund, October 2007.

⁷⁹ The primary issue around ageing populations is a rise in dependency rates—that is, the number of retirees that each active worker must support. As the number of retirees is set to rise rapidly, the dependency rate cannot be stabilised in any reasonable immigration scenario. Even if the entire decline in the working-age population were compensated for by immigrant workers, pension systems would still come under pressure.

⁸⁰ *Europe’s refugees: Refocusing on integration*, McKinsey Global Institute, May 2018.

⁸¹ Europe has welcomed two million migrants in recent years; the EU-28 has about 500 million inhabitants. Most of the migrants came to only a few countries, with Germany the largest recipient. German federal budget spending on refugees in 2017 of €21 billion was higher than spending on education.

⁸² Total stock of 2.5 percent by 2030 means 1.5 percent extra working labour at 70 percent productivity (reflecting the wage gap), as well as at 90 percent of employability versus average population (reflecting the unemployment difference between migrants and the average European population). Maximum induced growth will be 0.9 point of growth by 2030, built up over time.

MGI research has found that successfully integrating into the labour market only those refugees who have arrived in Europe since 2005 could add around €70 billion to €80 billion to annual GDP by 2025, or in the range of 0.5 percent of total European GDP, in the deliver scenario.⁸³

TREND 5: CLIMATE CHANGE AND POLLUTION

Clear ecological risks are linked to the current level of resource depletion and the evolution of carbon emissions. In economic terms, the answer to the question of whether the benefits of avoiding these risks will outweigh the likely substantial cost of cutting emissions is slowly being settled. There is also evidence that pollution tends to affect lower-income groups more than higher-income groups.⁸⁴

Mechanics at work

Global warming over the past ten years has boosted the global average temperature by about 0.9 degree Celsius compared with preindustrial temperatures.⁸⁵ The average temperature increase for the European land area was even higher, at 1.6 degrees Celsius.⁸⁶ This level is already three-quarters of the maximum warming compatible with the EU's climate stabilisation target. Without action, the global temperature is likely to continue to increase relatively quickly across the board.⁸⁷ In the winter, the strongest warming appears likely in northeastern Europe and Scandinavia, while Southern Europe may suffer the most in the summer.⁸⁸

Predicted effects include ecological risks (for instance, land destruction and damage to health from heat waves as weather patterns change) as well as risk of economic disruptions and additional costs associated with measures to mitigate climate change (reducing emissions), and adaptation (handling the adverse effect of climate change). Typical costs could particularly affect more climate-sensitive sectors, especially agriculture, coastal real estate, and tourism.

Existing technologies and actions to abate emissions could be deployed to prevent the two degrees Celsius increase in the global temperature being reached, but the economic costs associated with supporting the roll-out of those technologies are material. There is, nevertheless, a business opportunity from investing in the circular economy to limit other pollution and waste.⁸⁹

Climate change may also boost inequality as migrating to green energy typically affects those on lower incomes most, as energy is a necessary good and takes a higher share of income for less wealthy households. Pollution can also increase inequality through differentiated effects on health.

⁸³ *Europe's refugees: Refocusing on integration*, McKinsey Global Institute, May 2018.

⁸⁴ See Nicholas Z. Muller, Peter Hans Matthews, and Virginia Wiltshire-Gordon, "The distribution of income is worse than you think: Including pollution impacts into measures of income inequality", *PLoS One*, 2018, Volume 13, Number 3.

⁸⁵ Daniela Jacob et al., "Climate impacts in Europe under +1.5°C global warming", *Earth's Future*, 2018, Volume 6, Number 2; and *IPCC special report on global warming of 1.5°C*, Intergovernmental Panel on Climate Change, October 8, 2018.

⁸⁶ Carmen Cianfrani et al., "More than range exposure: Global otter vulnerability to climate change", *Biological Conservation*, 2018, Volume 221.

⁸⁷ Alexander R. Barron et al., "Policy insights from EMF 32 study on US carbon tax scenarios", *Climate Change Economics*, 2018, Volume 9, Number 1.

⁸⁸ Daniela Jacob et al., "Climate impacts in Europe under +1.5°C global warming", *Earth's Future*, 2018, Volume 6, Number 2; and *IPCC special report on global warming of 1.5°C*, Intergovernmental Panel on Climate Change, October 8, 2018.

⁸⁹ *Growth within: A circular economy vision for a competitive Europe*, Ellen MacArthur Foundation and McKinsey Center for Business and the Environment, June 2015.

Estimated impact of climate change and pollution

Considerable uncertainty surrounds the economic impact of global warming. One rule of thumb seems to be that 1 degree of warming would lead to a roughly 0.1 percentage point decrease in GDP growth—as long as the world does not hit the threshold of overheating.⁹⁰ This threshold could be hit by 2045 in Europe in the most conservative scenario, but as soon as 2030. In our model, we assume that the world reaches 1.5 degrees Celsius of extra heat by 2030, leading to additional negative pressure on growth of 0.15 percent a year from today.⁹¹

Commitments to the Paris Agreement imply the abatement of 80 to 95 percent of current emissions by 2050. In industries such as cement, chemicals, and automotive, achieving these targets could potentially cost 0.4 to 0.8 percent of GDP a year; projecting these sector costs to the overall economy, the cost could be 1 to 3 percent of GDP a year.⁹² These costs would be borne by companies and could lead to lower productivity, higher prices, import substitution, and higher investment.

Moving to a circular economy could, however, boost growth (after costs incurred during the investment stage). Assuming it maintains its current pace of investment, our simulation suggests that Europe could potentially achieve an additional 4 percent of GDP from this shift by 2030.⁹³

The impact of pollution can act like a regressive tax, boosting top-to-bottom quintile inequality ratio by some 0.3 point in our rough simulation.⁹⁴ This estimate includes the differentiated effects on higher healthcare costs from pollution from the cited literature, but excludes the mortality-rate effects.

TREND 6: SHIFTING GEOPOLITICS

In recent years, international disputes relating to, for instance, cybersecurity, trade tariffs, and tax competition have been increasing. There have even been threats of potential physical conflict. If such tensions were to continue, Europe would need to spend more on defence and security. In our simulations, we consider only effects on economic growth, as the costs might be relatively uniformly distributed among the entire population of Europe, leaving inequality unaffected.

In our simulation, we assume that EU members of NATO fulfil their commitment to spending 2 percent of GDP on defence. Countries that spent below this will have to spend more to reach the target in the next three years. Further, the cost of dealing with cyberattacks was already around 0.4 percent of EU GDP in 2014, and it is expected to quadruple by 2019.⁹⁵ As comparison and context, consider that cybersecurity spending by the US government was an estimated \$13.3 billion in 2015, up from \$8.6 billion in 2012. Although it is very difficult to gauge the economic cost of cyberattacks, in 2014 the cost of cybercrime and cyberespionage ranged from an estimated 0.1 percent or less of GDP in Japan to

⁹⁰ Daniela Jacob et al., “Climate impacts in Europe under +1.5°C global warming”, *Earth’s Future*, 2018, Volume 6, Number 2.

⁹¹ Ibid.

⁹² *Decarbonization of industrial sectors: The next frontier*, McKinsey & Company, June 2018.

⁹³ The full opportunity is about 11 percent, but this would require investment of 2 percent a year of GDP—that is, an estimated €108 billion a year to maximise recycling, and €180 billion a year for renewables. See *Growth within: A circular economy vision for a competitive Europe*, Ellen MacArthur Foundation and McKinsey Center for Business and the Environment, June 2015. Also see Werner Hoyer, *Closing Europe’s investment gaps*, GLOBSEC Tatra Summit, High Tatras, Slovakia, October 28, 2017; and William A. Brock and M. Scott Taylor, *The green Solow model*, NBER working paper number 10557, June 2004.

⁹⁴ The larger impact comes from mortality rates. If we exclude this, the effect is more in the range above. See Nicholas Z. Muller, Peter Hans Matthews, and Virginia Wiltshire-Gordon, “The distribution of income is worse than you think: pollution impacts into measures of income inequality”, *PLoS One*, 2018, Volume 13, Number 3.

⁹⁵ *Building an effective European cyber shield: Taking EU cooperation to the next level*, European Policy Strategy Centre strategic notes, 2017, Number 4.

1.6 percent of GDP in Germany.⁹⁶ We assume that these costs may continue to increase at 0.2 percentage point of GDP a year to 2030, and that most of these costs will add to production inputs rather than raising final output.

THE SIX MEGATRENDS INTERACT WITH GROWTH AND INCLUSION

The six megatrends are largely playing out in parallel, and they interact with one another. Similarly, as discussed, inequality and growth are interdependent. In this research, we focused only on the most material second-order effects.

In a globalised world, investing too little or too late in disruptive technology may hurt the competitiveness of industries exposed to international competition. Consider a denial scenario in which Europe has blocked the development of all new AI technologies. While the bulk of cross-border activities happen within Europe, Europe may face extra competition from other continents using AI technologies. According to our simulations, related revenue loss incurred by European firms could have a negative impact on GDP growth of around 0.2 percentage point a year in such a scenario. The more exposed a country, the larger this impact. For a smaller economy such as Belgium, the effect could be double each year at 0.4 point of GDP growth.⁹⁷ An ageing population is typically less agile and less able to upgrade skills, and has a lower ability to diffuse new technology and green business models. In Europe, according to our simulation, ageing could potentially reduce the impact on economic growth through those two effects by about 0.1 point per year in the deliver scenario. This combined effect would likely be larger in countries that are experiencing the most significant population decline and ageing, such as Germany and the Baltic countries.

Inclusion and growth can be dependent on each other. Inequality can be negative for growth when it undermines the social consensus and reduces the capacity of average households to consume.⁹⁸ However, inequality can also boost growth as it provides stronger incentives for innovation, entrepreneurship, and risk.⁹⁹ How each effect plays out is a matter of empirical evidence.¹⁰⁰ The most recent sophisticated analyses conducted by the IMF suggest that inequality reduces growth when inequality is at a sufficiently high level—that is, above a net Gini coefficient of 0.30. In practice, this implies that the depressive effect of inequality on growth is now the rule in Europe on average; however, the effect is much stronger for the Mediterranean cluster than for the Nordic countries. In this research, we draw on recent studies that demonstrate that an increase of one basis point in the market Gini leads, on average, to a decline of 0.7 basis point in the annual growth of per capita average income in Europe.¹⁰¹ Today, inequality already exhibits a negative correlation with per capita income across European countries (Exhibit 10).

⁹⁶ Barry B. Hughes et al., “ICT/cyber benefits and costs: Reconciling competing perspectives on the current and future balance”, *Technological Forecasting and Social Change*, 2017, Volume 115.

⁹⁷ In a deliver scenario, Europe (and each of the European countries) may benefit from diffusing AI slightly faster than its trade partners. In general, Europe will gain a small advantage against the rest of world outside China and the United States. Within Europe, small, open economies are also more digitised and AI-savvy; what they lose from not investing, they regain in GDP growth with better terms of trade within and outside Europe.

⁹⁸ For this line of argument, see, among others, Alberto Alesina and Roberto Perotti, “Income distribution, political instability, and investment”, *European Economic Review*, 1996, Volume 40, Number 6; Alberto Alesina and Paola Giuliano, “Culture and institutions”, *Journal of Economic Literature*, 2015, Volume 53, Number 4; and Luigi Guiso, Paola Sapienza, and Luigi Zingales, “Corporate culture, societal culture, and institutions”, *American Economic Review: Papers and proceedings*, 2015, Volume 105, Number 5.

⁹⁹ Hongyi Li, and Heng-fu Zou, “Income inequality is not harmful for growth”, *Review of Development Economics*, 2002, Volume 2, Number 3.

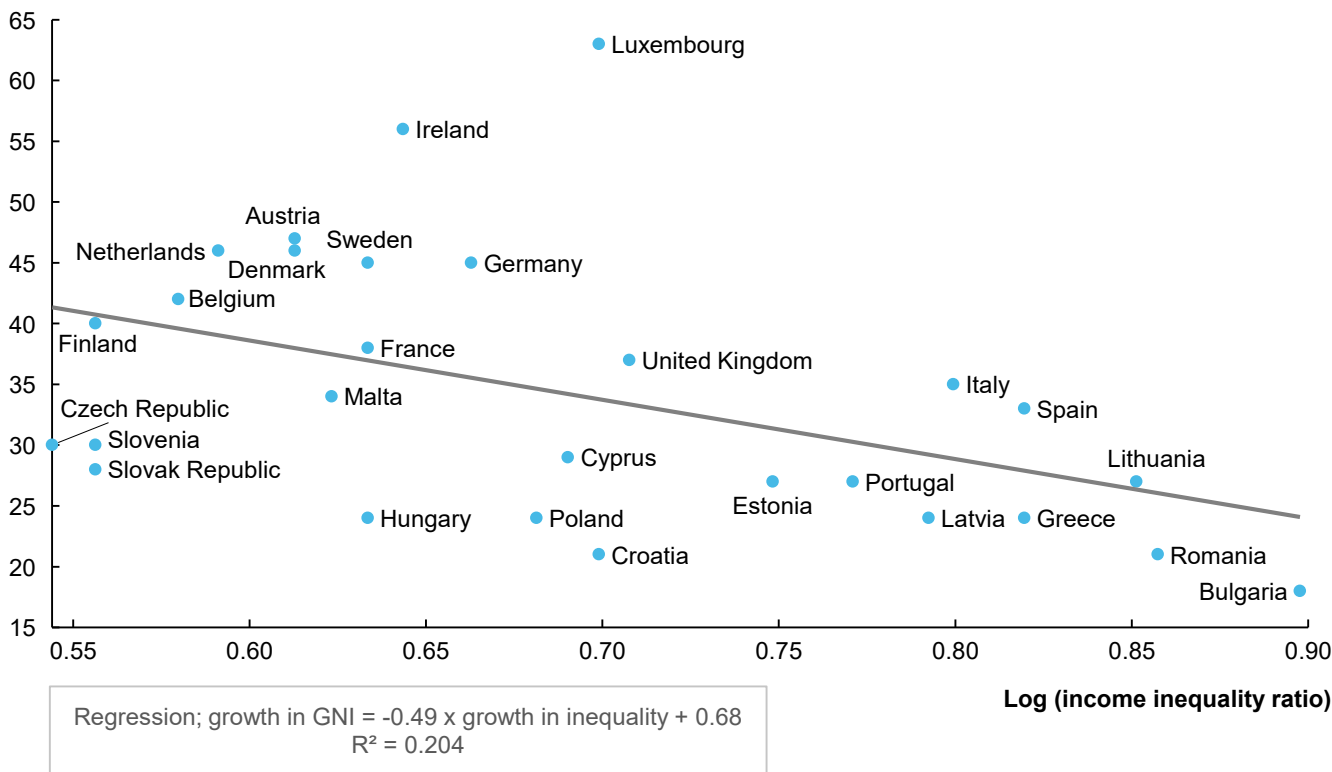
¹⁰⁰ Kristin J. Forbes, “A reassessment of the relationship between inequality and growth”, *American Economic Review*, 2000, Volume 90, Number 4.

¹⁰¹ Francesco Grigoli, Evelio Paredes, and Gabriel Di Bella, *Inequality and growth: A heterogeneous approach*, IMF working paper number 16/244, December 16, 2016.

Exhibit 10

Per capita market income and inequality are negatively correlated in the EU.

Log (per capita GNI)
2017 €¹



¹ Converted from international dollars in PPP to euros using the average exchange rate for 2017 (\$1 = €0.89).

SOURCE: World Bank; World Development Indicators; Oxford Economics; EIU ViewsWire; Eurostat; McKinsey Global Institute analysis

THE MEGATRENDS MEAN EUROPE MAY FACE HIGHER INEQUALITY AND MORE DIVERGENCE

In our baseline scenario, Europe would experience average annual per capita income growth of 1.6 percent (see Box 1, above). Is this baseline growth trajectory sufficient to sustain inclusive income growth if we also take into account the impact of the megatrends? And if not, will Europe’s growth plan be compatible with inclusion and be accepted by its citizens?

To answer these questions, we have aggregated five of the six megatrends and their impact on per capita income and funding costs, where we have been able with sufficient confidence to quantify that impact. We exclude the impact on income growth from shifting geopolitics because we do not have a strong analytical base to judge its effects, but we still include baseline costs of geopolitical risk such as investing in sufficient cybersecurity protection.

As noted in Box 1, we simulated the potential effect of each trend individually and combined them for all European countries in two illustrative scenarios: denial and deliver. In this paper, we report only the average of our simulation, but we have used sensitivity analyses to gauge the plausibility of our estimates.¹⁰² With those sensitivities, the denial scenario may lead to

¹⁰² We mostly use Gaussian probability distributions around the base-case impact for each trend and feedback loops.

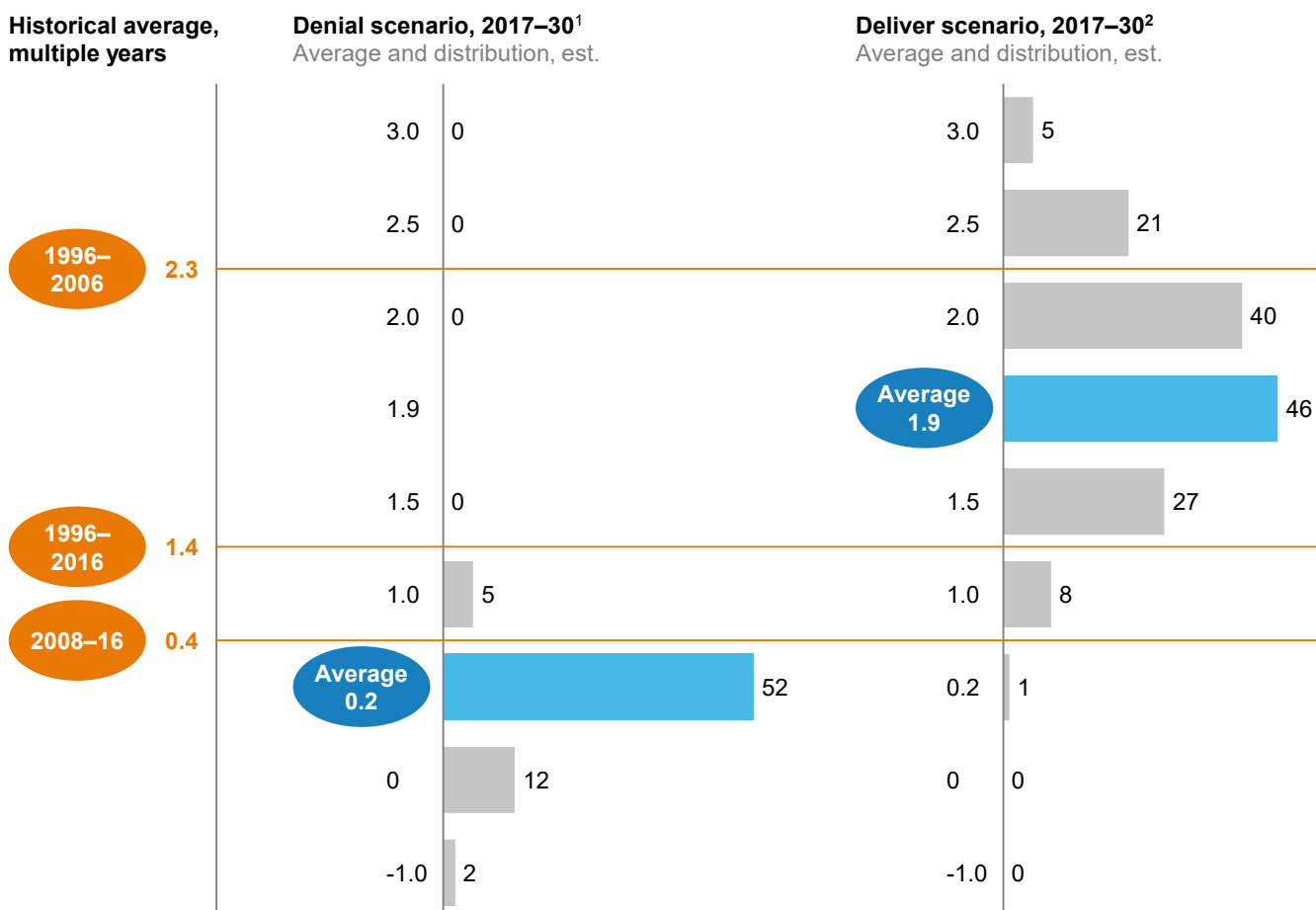
per capita income growth of between zero and 1 percent a year, with an average of 0.2 percent. In the deliver scenario, our results suggest that annual per capita income growth could be between 1.2 and 2.5 percent a year, with an average of 1.9 percent (Exhibit 11).

Exhibit 11

European inaction on megatrends could lead to secular stagnation; action could lead to growth of around two percent.

Per capita GNI growth, EU-28

Probability distribution of scenario simulation results, %



1 The denial scenario: Europe does not take action to mitigate the impact of megatrends.

2 The deliver scenario: Europe continues to pursue, and scale up, current policies and develops new approaches that leverage existing assets and competencies to respond to newer trends such as the diffusion of AI.

NOTE: Not to scale.

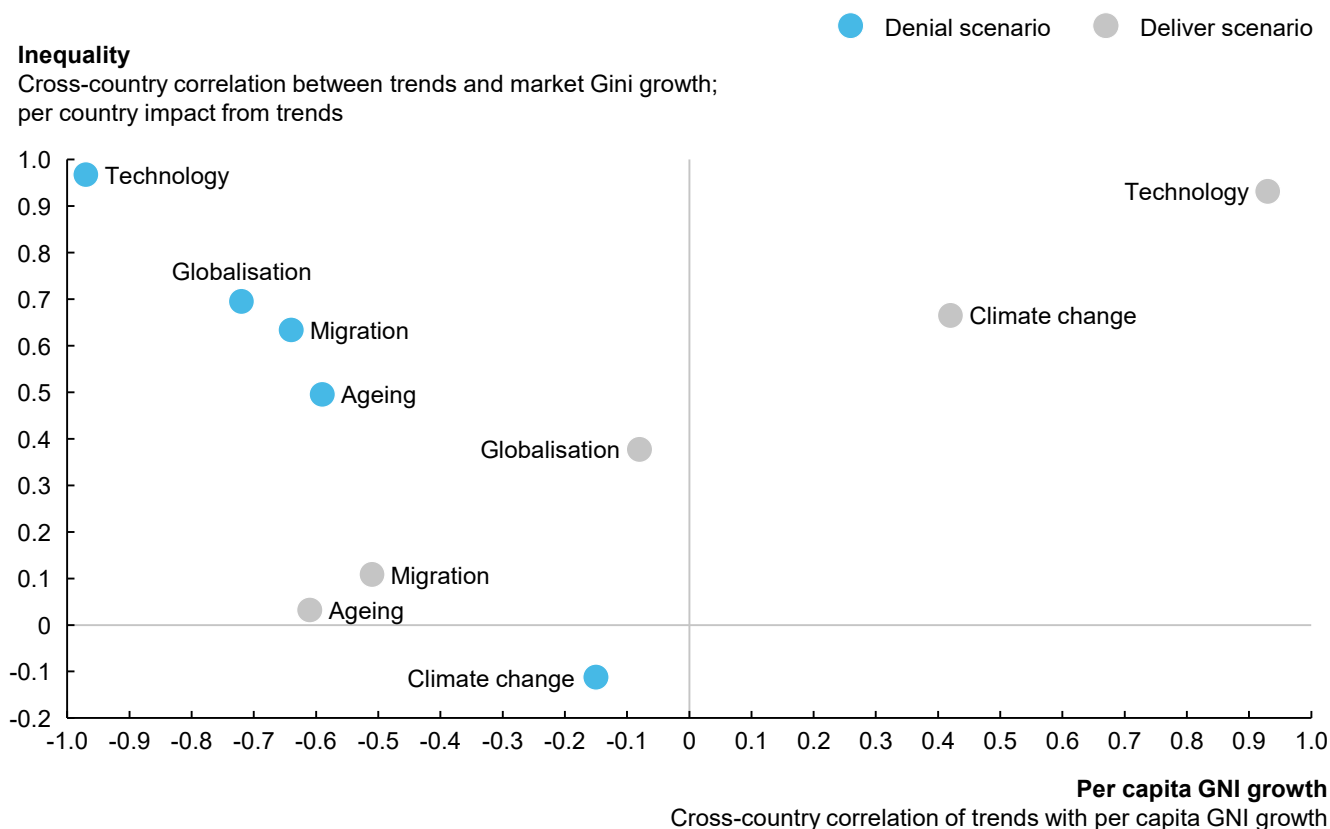
SOURCE: World Bank; World Development Indicators; McKinsey Global Institute analysis

EUROPE IS NOT SET FOR A QUIETER LIFE WITH INEQUALITY RISING IN BOTH DENIAL AND DELIVER SCENARIOS

The six megatrends are likely to have a material, yet asymmetric, effect on the inclusive growth of European economies for the period to 2030 (Exhibit 12). Our simulation suggests that, in a deliver scenario, the main influence on countries' per capita income growth would arise from technology (correlation coefficient of 0.93 between country growth and how AI will put pressure on country competitiveness) followed by climate change. Similarly, the major influence depressing countries' per capita income growth in a denial scenario is the simulated impact from technology competition, increased global competition, and ageing demographics.

Exhibit 12

Each megatrend has a different impact on income growth in European countries.



SOURCE: McKinsey Global Institute analysis

In terms of income inequality, in both denial and deliver scenarios, technology has the largest impact.¹⁰³ Globalisation and, to a lesser extent, migration may add to inequality in a denial scenario. In a deliver scenario, inequality also grows with climate change as the result of sectors rebalancing in a drive towards the circular economy. The burden of climate change on income inequality is lower in the denial scenario, as it affects inequality only at the end of the period covered in the simulation to 2030 when the ceiling of two degrees Celsius is broken. A large part of the inequality effect is not through direct income but through other welfare costs, not included in this paper (risks to health being an example).

Whatever the scenario and whatever the sensitivity of impact from the megatrends, the implication of the trends playing out in combination is that Europe may face a sustained increase in inequality. Our simulations suggest that rising inequality could weigh on growth in both scenarios, reducing growth momentum by between 0.1 point in the denial scenario and 0.3 point a year (at worst) in the deliver scenario by 2030. To put this in context, the effect in the latter case is as large an impact on real per capita income growth in Europe as is expected from ageing, or as the impact of ICT on growth in the early 1980s. However, we note that this impact is likely to be an upper bound, as we expect the diffusion of automation and AI to reduce inequality after peak diffusion of above 50 percent of firms.

¹⁰³ The impact of automation and AI on inequality depends on four variables: (1) the state of adoption of AI in an economy, which determines asymmetry between winners and losers and risk from international competition; (2) the extent of labour automation and how it is distributed among the population; in MGI's future of work model, automation has double the effect on those at the low end of the skills spectrum than those at the high end; (3) equilibrium real wage formation—wages should follow productivity gains, minus the productivity coming from AI-based automation; and (4) the share of innovation, which affects how much benefit firms gain from AI.

The denial scenario: Standstill is not an option if Europe is to avoid stagnation and an unsustainable social contract

A denial scenario needs to be avoided if Europe is to escape stagnation and wishes to maintain its current social contract. Our simulation suggests that the strength of the headwinds induced by the megatrends could be sufficiently large to reduce baseline income growth from an average of 1.6 percent per year to 0.3 percent (an 85 percent drop), not accounting for the likely depressive effect of rising inequality on income growth, or 0.2 percent including those effects.

Given their mix of exposure to the megatrends, the Corporatist and Mediterranean clusters may even experience negative income growth. Countries that may face the highest risk of this occurring are Italy, Spain, and the Benelux countries. All of these are ageing more rapidly than the EU-28 average. Benelux countries would be vulnerable because they are small, open economies, facing headwinds from globalisation, reinforced by increased competition through technology. Italy and Spain could face some significant risks from climate change, but these risks may materialise over a longer timeframe (after 2030) than rising competition from globalisation and technological change, which is beginning to have an impact now.

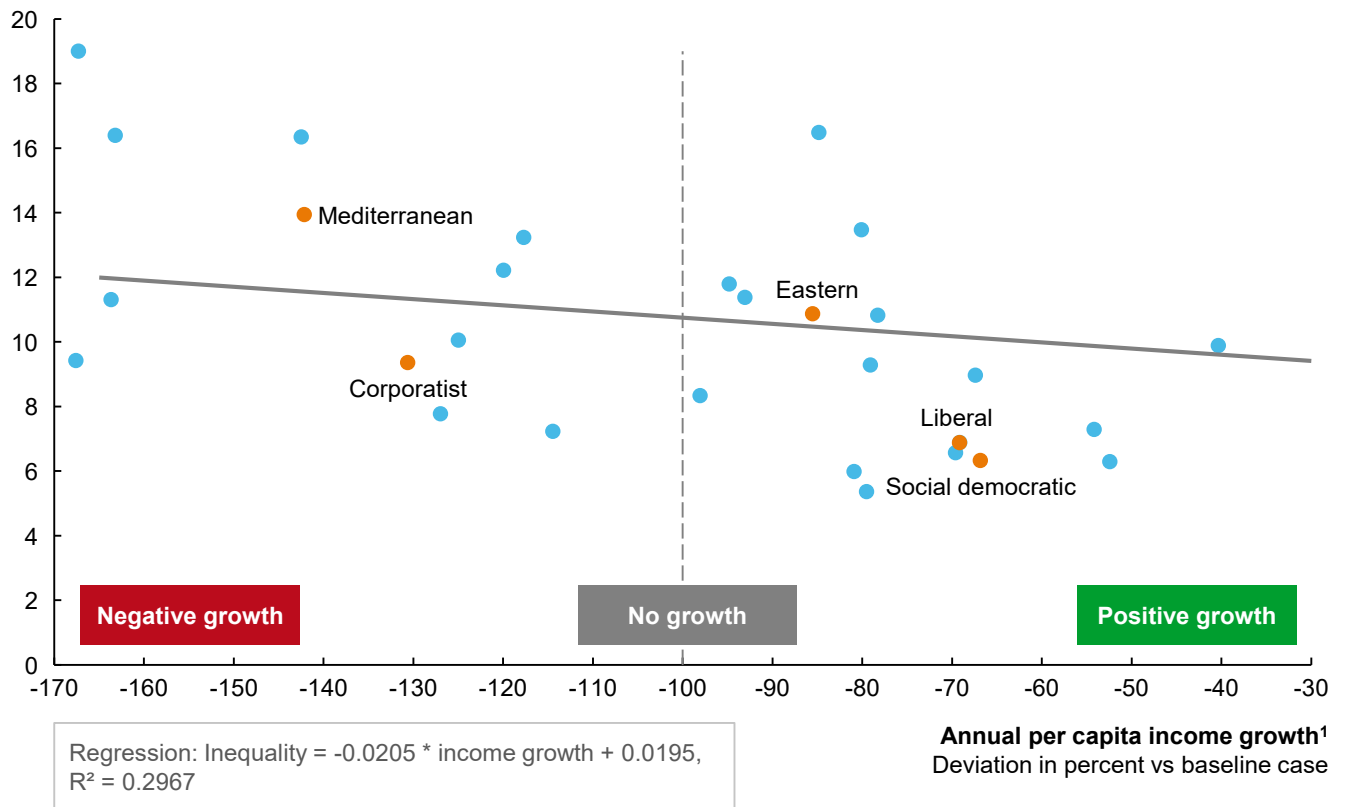
In this scenario, the market inequality ratio would rise—and rise even more the more negative prospects for income growth are. The rise is somewhat similar to what was observed in Europe between 2007 and 2013 (Exhibit 13).

Exhibit 13

Denying megatrends significantly reduces inclusive growth prospects.

Change in quintile inequality ratio (market income)

Deviation in percent from baseline case, accumulated by 2030



1 Base case.

SOURCE: MGI Europe Matters model, McKinsey Global Institute analysis

It would be difficult to sustain employment growth, and any increases in unemployment would further add to inequality strains and undermine trust. Under ceteris paribus assumptions, including the same investment rate, unemployment could, on average, rise in this scenario by an additional 0.4 point of the working population each year, and up to 0.6 point a year in Southern Europe. This would add to a level of unemployment that is already high. At given replacement rates (between 40 and 60 percent of wages being paid in unemployment allowance) and a typical mix of income (80 to 90 percent of income comes from wages for citizens at below median incomes), unemployment would lead to people being worse off in income terms. Moreover, unemployment causes emotional stress and typically undermines trust in institutions. Everything else being equal, this could lead to trust being positive for only one-third of the population across Europe—and possibly positive for only one citizen in eight in the Mediterranean cluster. This would clearly undermine social stability and risk fuelling a further rise in populism.¹⁰⁴

A final reason that the denial scenario does not seem sustainable is that it could entail extra costs required for financing pensions, healthcare, and increased unemployment in the neighbourhood of €1,350 per capita, or 9 percent higher than today in real terms, in our simulation. On average (and all the more for countries with negative growth prospects), this would be more than the amount of additional gross income generated by anaemic growth. There would, therefore, clearly be questions about where the funding would come from, underlining the risk to the welfare-like social contract in Europe.

The deliver scenario: Under careful management, Europe on average could sustain inclusive growth

In our deliver scenario, our simulations suggest that Europe could produce more income growth than in the baseline case. Countries with the largest upside are those in the Social democratic cluster (Northern Europe) and Continental Europe, notably Benelux. This is partly because they have the ability to mitigate the strongest headwinds in the denial scenario, and partly because these countries will benefit from a large upside through the diffusion of AI technologies. Southern Europe may find it the most difficult to reap an equivalent upside. In total, the EU could achieve annual average per capita income growth of 1.9 percent between 2017 and 2030, taking into account the negative effect of increased inequality on growth prospects. Note that inequality increases may be lower for countries with higher growth; these nations, like the Nordic countries, tend to be digital front-runners best placed to capture the opportunities from AI, and as technology has already diffused in these economies to a greater extent, the risk of vast differences in firm performance and wages seems lower than in lagging countries (Exhibit 14).

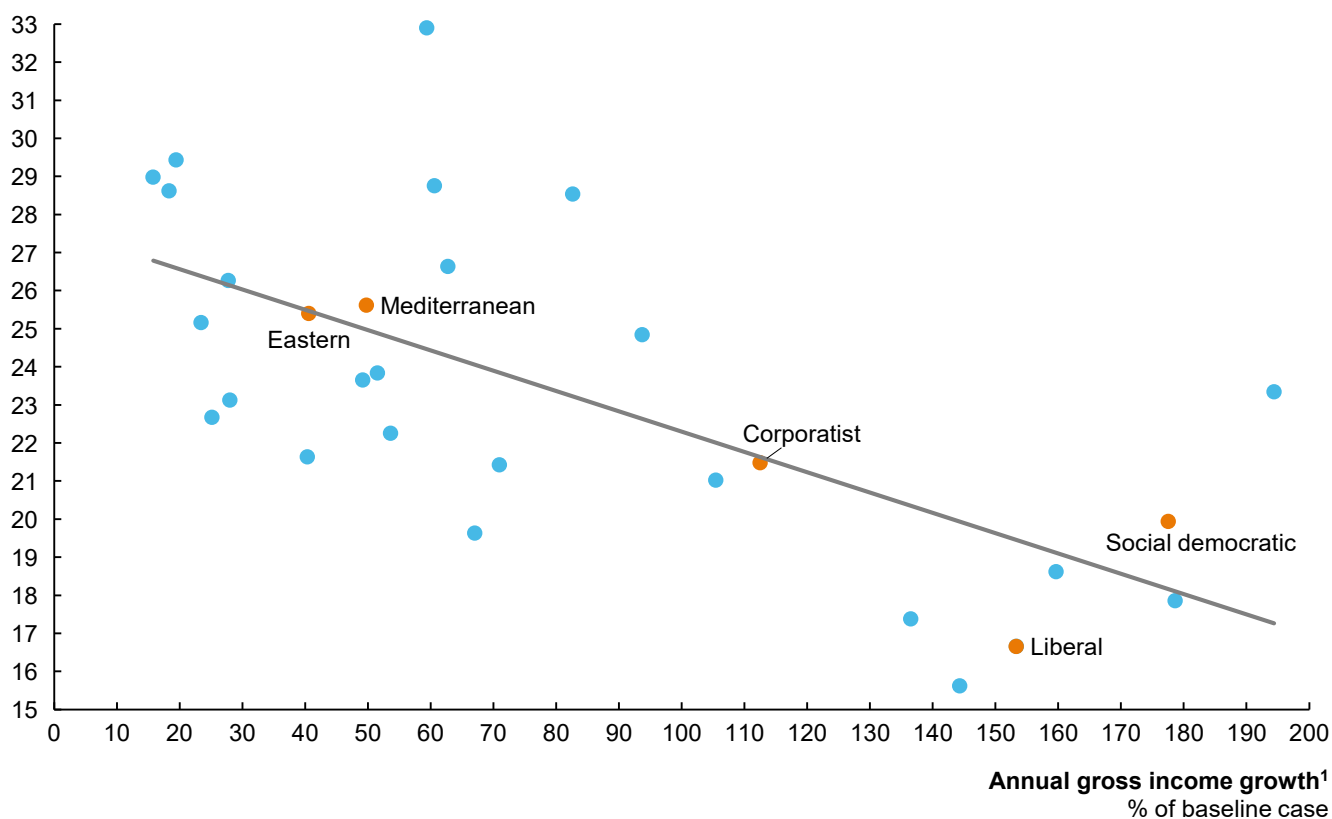
¹⁰⁴ This risk may also be compounded by the risk of large migration from Africa in the long term, passing through the south of Europe as a first bridge to the rest of the region. This political risk is plausible but beyond the scope of this research.

Exhibit 14

Delivering on the megatrends may boost inequality, but the path will be smoother for higher-growth countries.

Change in quintile inequality ratio (market income)

Deviation in percent from baseline case, accumulated by 2030



1 Estimates from the MGI Europe Matters model; compares the deliver and denial scenarios; 100 = 1.6% real GNI growth in the baseline scenario.

SOURCE: MGI Europe Matters model; McKinsey Global Institute analysis

Nevertheless, even in this scenario, we see three key challenges.

- **Need for increased public social funding.** Funds are needed to support, for instance, additional temporary unemployment during the transition towards a green and more AI-based economy, and the skills development required to respond to new technology. We do not include healthcare costs in this analysis. On average, we estimate that additional funding of about €1,000 per capita will be needed (excluding the impact on healthcare costs)—but note that this is lower than in the denial scenario as fewer funds are needed for rising pensions and unemployment. The additional spending needed would be 10 percent of the increase in gross per capita income between now and 2030, so financing would seem to be feasible.
- **Increased inequality.** Everything else being equal, in this scenario, income inequality will increase. Nevertheless, average inequality within Europe in 2030 may still be lower than the current level in the United States and may match the pace of increase between 1975 and 1995 in Germany and Sweden, when these countries were absorbing the shock of two oil crises and the need to adjust to the early development of manufacturing globalisation and ICT.¹⁰⁵ Shifting some €1,200 of additional per capita disposable income from the top 20 to the bottom 20 percent of households by income would bring

¹⁰⁵ According to WIID data, the net Gini coefficient in Italy went from 0.30 to 0.38 and the German Gini from 0.27 to 0.37 between 1970 and 2000. Sweden's Gini went from 0.22 to 0.30 between 1975 and 2000.

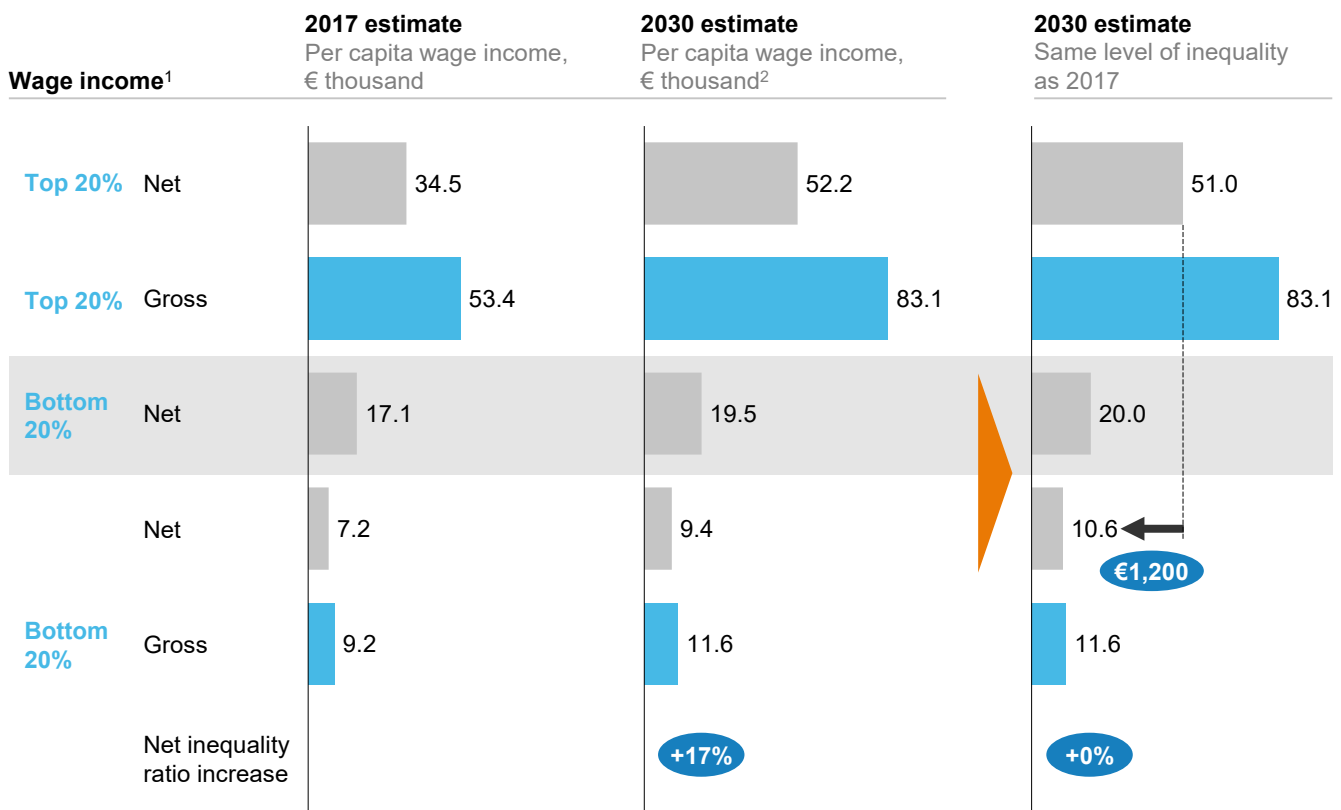
the quintile inequality ratio back to its 2017 level (Exhibit 15). Other ways to rebalance inequality include stepping up innovation and upgrading skills, while facilitating churn among nonadopting firms, likely blocking effective use of capital and resources. The share of capital sunk in nonperforming firms could be as much as 15 percent in the Southern Europe cluster, and in the range of 7 to 10 percent in the Corporatist and Social democratic clusters. This has limited growth in employment by between 2 and 4 percent, according to recent OECD analysis.¹⁰⁶

- Citizens' trust and support.** There is a risk that citizens (at least some vocal groups of citizens) perceive that the baseline case of 1.6 percent per capita income growth per year as in the past is sustainable without the policy actions needed for the deliver scenario, in consequence assuming that a deliver scenario provides minimal upside versus the base case, yet a substantial risk of rising inequality.¹⁰⁷ Such perceptions could undermine public support for active policies across Europe to counteract the megatrends. European governments would need to persuade citizens that the baseline scenario would not be a good bet, and that the megatrends could condemn Europe to the denial scenario. Policy makers also need to ensure that the growth (and jobs growth) promised by the deployment of AI and the circular economy actually materialise.

Exhibit 15

A transfer of net income of €1,200 may stabilise inequality if the EU has a successful deliver scenario.

ESTIMATES



1 Net income after tax and transfers.

2 Equivalised income in PPP.

SOURCE: McKinsey Global Institute analysis

¹⁰⁶ Müge Adalet McGowan, Dan Andrews, and Valentine Millot, *The walking dead? Zombie firms and productivity performance in OECD countries*, OECD Economics Department working paper number 1372, OECD Publishing, 2017, OECD.org.

¹⁰⁷ In theory, the deliver scenario would provide enough income growth for the top 20 percent of income earners to support the policies. However, if those policies delivered only 50 percent of the potential, necessary transfers from the top 20 percent may incline them to vote for the status quo.

SOCIAL CLUSTERS AND COUNTRIES RUN THE RISK OF FURTHER DIVERGENCE

Another significant challenge facing the EU-28 is continued social divergence within the region in light of expected slower per capita income growth in Southern Europe and a larger increase in inequality there. Southern Europe, especially Italy and Spain, and the Benelux countries are the regions most sensitive to headwinds arising from the megatrends. Even in a deliver scenario, Southern Europe is challenged by its demographics and, on average, seems to have lower potential to benefit from technology. This technology divide is already visible in the case of current digital technologies and will likely continue with respect to new advanced technologies such as AI because of less availability of human capital and high-tech innovation. Southern Europe typically ranks lower on those dimensions than, say, Northern Europe's digital front-runners.

Our estimate suggests that the cluster of Mediterranean countries may generate less than 1.5 percent of per capita income growth, compared with more than 2 percent in the other European clusters.

Furthermore, Southern Europe has one of the lowest levels of social coverage and is therefore already the region with the most unequal distribution in disposable income. There is a risk that this inequality may continue to increase at a faster rate than in any other European cluster. The Mediterranean cluster may come close to hitting a net Gini of 0.39, or a possible 10 basis points more than in the Social democratic cluster composed of the Nordic countries, which has a Gini of about 0.285 (Exhibit 16).

Exhibit 16

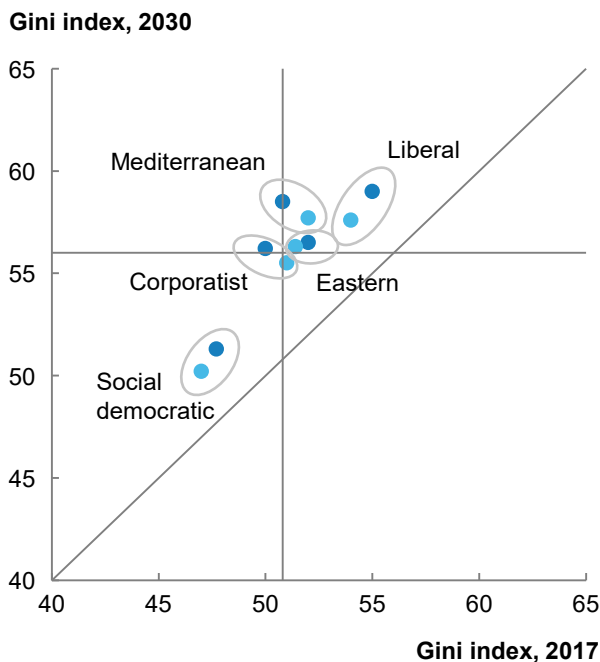
Social divergence may spread within the EU-28 even in a deliver scenario.

ESTIMATES

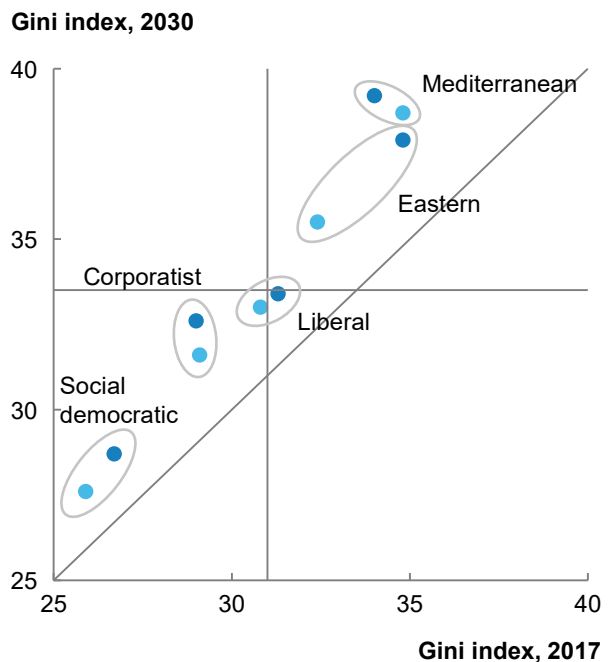
Deliver scenario
%

● Average within clusters ● Median within cluster

Market Gini index 2030¹



Net Gini index 2030²



1 Before taxes and transfers: Gini index on wage income only.
2 After taxes and transfers

SOURCE: World Bank; Eurostat; McKinsey Global Institute analysis

At those levels of growth and inequality, a transfer from the top 20 percent to converge to the average of inequality in Europe implies that all extra income growth would have to be redistributed to the bottom of the population. This would seem unlikely to be implementable.

ACTION IN THREE AREAS IS REQUIRED TO STRENGTHEN EUROPE'S INCLUSIVE GROWTH MODEL

MGI's scenarios have emphasised that the European inclusive growth model is likely to remain under challenge over the next decade and may be sustained only if carefully managed. In this section, we suggest three areas where European countries, the EU, and the private sector will need to act—sometimes in concert—to bolster the resilience of Europe's inclusive growth model. We have focused on these three areas because they are important catalysts to support the welfare model and because current gaps in Europe urgently need to be filled. The suggestions home in on what can be done to strengthen inclusive growth rather than, for instance, stimulating demand in response to low investment intensity, or reexamining social security provision or the way politics is conducted. We chose this focus not because these broader policies are unimportant, but because fixing the economy is required to ensure that the social contract is resilient.¹⁰⁸

The three crucial areas where improvements are required to strengthen the European inclusive growth model are:

- 1. Ensure the full execution of the deliver scenario**, especially by focusing on innovation and human capital.
- 2. Support measures to reduce inequality** and engage in a dialogue for improved social convergence within Europe.
- 3. Update the parameters of Europe's social contract** to accommodate the execution of the deliver scenario while rebuilding citizens' trust in institutions to ensure that they support necessary policy measures.

¹⁰⁸ For a discussion of the need for demand-driven policies to break the hysteresis in low business investment, see *A window of opportunity for Europe*, McKinsey Global Institute, June 2015.

1. FULLY EXECUTE A DELIVER SCENARIO

Achieving sufficient economic growth is a requirement for inclusive growth to be sustained in light of the six megatrends we discuss in this paper. In particular, Europe may need to deliver on its reform and ambition regarding the Digital Single Market, the Paris Agreement, and pension reform, to name but three. It is welcome that, in recent years, Europe has reiterated its commitment to those policies and reforms. Indeed, many European nations, including Denmark, Ireland, and the Benelux countries, have proven that they can deliver reforms (even if expectations of returns from reform have not yet fully been met).¹⁰⁹ The EU's signature project, the Single Market, has delivered many successes but is not complete—today, only 65 percent of total benefits have been captured in the most optimistic estimates.¹¹⁰

Achieving growth in—or even beyond—the deliver scenario would require Europe to make progress in areas where headway has stalled in recent years, such as scaling and delivering innovation and diffusion, and boosting human capital. It is imperative that Europe (1) increases its competitiveness in research and development in key growth areas, most importantly in AI and other digital technologies; (2) enables growth of competitive EU companies in this new environment; (3) triggers further investments in a low-carbon economy; and (4) modernises education and training systems to enable the significant shift in skills that is likely to be necessary.¹¹¹

Increase scale in R&D in AI and other digital technologies

Ramping up innovation capabilities and accelerating diffusion of innovations appear critical to respond to all megatrends—in healthcare to deal with ageing, in clean tech to enable climate-change and pollution mitigation, and in advances in digital technologies and AI to make the most of the opportunities they offer. Innovation is fundamental as it often correlates with higher employment opportunities.¹¹²

The EU has displayed significant ambition to enable innovation through Horizon 2020 and Horizon Europe. However, Europe is currently being outperformed in private R&D investment by about \$90 billion or 0.5 percent of GDP compared with the United States, and it has also fallen behind China in share of GDP terms.¹¹³ The difference primarily stems from the gap in private tech spending on R&D. Consider that four Silicon Valley giants alone spend more than all of Europe combined in this area.

This situation can, for example, be observed in AI-related technologies: the region has made some, but not large enough, progress. European Industry 4.0–related patents increased 12-fold between 2010 and 2015.¹¹⁴ The European Commission has announced its intention to invest some €2.6 billion in AI and robotics development as part of its Horizon 2020 plan.

¹⁰⁹ The IMF reports that those countries faced severe macroeconomic crises including declines in real GDP, high unemployment (16 percent in Ireland), and large fiscal deficits. Countries responded with a combination of labour-market, product-market, and fiscal reforms, and long-term reduction in government spending. In all cases, growth accelerated in the wake of the reforms. The countries also enjoyed employment booms. The success of reform was linked to the continuation of the programme even after economic outcomes started to improve, and to a collaborative approach to the reform process. Interestingly, those reforms did not sacrifice social cohesion. See Anthony Annett, “Reform in Europe: What went right?” *Finance and Development*, 2006, Volume 43, Number 3.

¹¹⁰ Ilzkovitz et al. estimated that progress on the Single Market between 1992 and 2006 helped to generate 2.2 percent of additional income in 2006, even if earlier studies such as the Cecchini report in 1988 forecast gains in the range of 4 to 5 percent. See Fabienne Ilzkovitz et al., *Steps towards a deeper economic integration: The Internal Market in the 21st century*, European Commission, European economy economic papers number 271, January 2007.

¹¹¹ *Skill shift: Automation and the future of the workforce*, McKinsey Global Institute, May 2018.

¹¹² There is now a firm consensus that research-driven innovation is a major force shaping growth and employment. See Raquel Ortega-Argilés et al., *Is corporate R&D investment in high-tech sectors more effective? Some guidelines for European research policy*, IZA Department Paper number 3945, 2009.

¹¹³ *A window of opportunity for Europe*, McKinsey Global Institute, June 2015.

¹¹⁴ Zana Diaz-Williams, *Industrial technology trends: Industry 4.0 related patents have grown by 12x in 5 years*, IOT Analytics newsletter, March 1, 2016.

This is welcome, but to put the initiative in context, it is only just larger than China's spending of \$2.1 billion on a single AI technology park in a western suburb of Beijing.¹¹⁵

Today, many European countries are rushing to develop their AI strategy. There may be an opportunity for Europe to create a better pooling of resources to achieve scale comparable with the United States or China. This could be orchestrated by European institutions and replicate the successful development of world-class R&D centres, such as US-based DARPA or CERN in Europe, in the area of AI and other digital technologies.

Enable growth of competitive EU companies

Europe's technological advantages lie in aerospace, automotive, pharmaceuticals, and telecom equipment, in contrast to the United States, which focuses on a wide range of booming new sectors such as biotechnology, internet, software, and semiconductors.¹¹⁶ Europe's weak competitiveness in R&D in AI and other digital technology has translated into few globally competitive companies in the sector. Given that many of the digital goods and services offered do not require a significant footprint in the country where the goods and services are consumed, the implications about the localisation of value added and jobs are significant. In simple terms, compared with the United States and China, only a small share of AI-related jobs and value added occurs in Europe. Among the global top ten tech firms listed by *Forbes* in 2018 are seven US-based and three Asian companies.

On current evidence, Europe looks set to lose the race, particularly in digital innovation. Winner-take-most dynamics create an advantage for large markets (yet Europe is fragmented), for large players (Europe trails in generating unicorns), and for amassing large data sets. Consider that half the global population uses one of the services provided by US tech giants Amazon, Facebook, Google, and Apple, which spent a combined \$46 billion on R&D in 2016. In China, Tencent and Alibaba alone have backed 43 percent of all Chinese unicorns.

Various proposals have been made (and partly implemented) to support the growth of EU-based tech companies. Experimentation should continue, including, for instance, innovation competitions such as the ones conducted by JEDI in Europe, as well as various attempts to support incubation and growth of smaller firms or to foster cross-European collaboration (for instance, the European Automotive-Telecom Alliance). Moreover, Europe could use its leadership in e-government services—according to the United Nations E-Government Survey 2018, Europe has five of the top ten leading countries in e-government development—to consolidate some of the offerings and create sizeable enough demand to promote the growth of a globally leading government technology industry in Europe. To date, these ideas have often not been translated into concrete concepts or have been executed only on a national level. Experimentation at the national level monitored at the European level could translate into a comparative advantage for Europe when success factors are analysed and lessons shared across borders. Joining forces across European borders to compete on tech globally is likely to be the most effective strategy.

Another major issue has been the slow rate of technology diffusion within firms in Europe, which helps explain the continent's recent productivity weakness. Laggard firms typically justify their slow pace of adoption by citing a series of bottlenecks, including, for instance,

¹¹⁵ Christina Larson, "China's massive investment in artificial intelligence has an insidious downside", *Science*, February 8, 2018.

¹¹⁶ Reinhilde Veugelers and Michele Cincera, *How to turn on the innovation growth machine in Europe*, in "The impact of Horizon 2020 on innovation in Europe", *Intereconomics*, 2015, Volume 50, Number 1.

organisational capabilities and new digital skills required. However, such constraints are likely to be more acute for the next set of technologies such as AI.¹¹⁷

Many policy experiments ongoing in EU member states can be used to stimulate new competencies and the diffusion of technologies. One example is the Intellectual Capital Statement programme in Germany, with the initiative “Fit for the Knowledge Competition” whose aim is to support knowledge management in small and medium-size enterprises.¹¹⁸

Trigger further investment in a low-carbon economy

There is also large growth potential for Europe from investing significant amounts in the circular economy, which could result in productive gains twice the size of those included in our deliver scenario for this trend. McKinsey research with the Ellen MacArthur Foundation found that adopting circular economy principles could boost the average disposable income for EU households by €3,000, which is 11 percent higher than our 2030 estimates in the deliver scenario.

Action on this front is vital if Europe is to move closer to achieving the Paris Agreement, but also to secure sustainable supplies of energy—and save on cost at the same time. Europe is already discussing a number of proposals, including different carbon-pricing approaches and taxation. Its energy intensity varies enormously from country to country, with lagging countries as much as five times as energy-intensive as leading ones within each economic sector, giving them enormous scope for improvement. However, across Europe there is an opportunity to lower energy costs by fully integrating electricity and gas networks and markets and by establishing a pan-European framework for increasing the supply of new energy sources, including renewables and unconventional hydrocarbons. It would seem like common sense to locate the generation of solar power in sunny Southern Europe, while most demand for solar installations is actually in Germany. A European Parliament study found that had German solar capacity been located in Spain, additional electricity worth €740 million would have been generated in 2011 alone.¹¹⁹ The change required is systemic, and Europe needs a shared agenda in all sectors and policy areas. Europe needs to develop materials that preserve value; design initiatives at the city, national, and European levels that enable circular-business opportunities; and develop a new governance framework to drive efforts. The good news is that essential enablers are maturing and scaling up fast.¹²⁰

Modernise education and training systems to enable the required skill shift

Education and reskilling should be a major priority for the decade ahead. While Europe has a reputation for having strong human skills, the latest results from the OECD’s Survey of Adult Skills and Programme for International Student Assessment show that European adults and students alike are not increasing their scores; indeed, in the case of students, European scores are declining relative to most peers in other OECD countries.¹²¹

Europe needs to be successful in its skills development if it is to achieve more growth from innovation in AI and green technologies, ensure that workers (particularly older ones) can

¹¹⁷ See *Stimulating digital innovation for growth and inclusiveness: The role of policies for the successful diffusion of ICT*, OECD draft background report for Ministerial Panel 1.2, May 27, 2016; and Mélanie Cardona, Tobias Kretschmer, and Thomas Strobel, “ICT and productivity: Conclusions from the empirical literature”, *Information Economics and Policy*, 2013, Volume 25, Number 3.

¹¹⁸ Alexander Ebner and Fabian Bocek, *Best practices as to how to support investment in intangible assets*, WWW for Europe working paper number 101, June 2015.

¹¹⁹ Veit Böckers, Justus Haucap, and Ulrich Heimeshoff, *Benefits of an integrated European electricity market*, Düsseldorf Institut für Wettbewerbsökonomie discussion paper number 109, September 2013.

¹²⁰ *Growth within: A circular economy vision for a competitive Europe*, Ellen MacArthur Foundation and McKinsey Center for Business and the Environment, June 2015.

¹²¹ *PISA 2015 results (Volume 1): Excellence and equity in education*, OECD, December 6, 2016; and Ellen Scully-Ross, “Adult education for employment in the global economy”, in *Mapping the field of adult and continuing education: An international compendium*, Volume 4, Alan B. Knox, Simone C. O. Conceição, and Larry G. Martin, eds., Sterling, VA: Stylus Publishing, 2017.

find new jobs if theirs are displaced by automation relatively quickly, and limit the extent of rising inequality arising from the development of significant wage premiums for those with higher skills.

MGI analysis in 2018 identified large impending shifts in the skills that labour markets are likely to demand in the automation and AI era.¹²² Through 2030, the time spent using advanced technological skills could increase by about 40 percent in Europe. Almost everyone needs to develop basic digital skills for the new age of automation. Among 25 skills analysed, working time employing digital skills is set to grow in Europe by 65 percent by 2030. Between 2016 and 2030, demand for social and emotional skills may grow by 22 percent across European industries. Demand for entrepreneurship and initiative taking is likely to grow at 32 percent over this period. Demand for skills in leadership and managing others may also grow strongly. Demand for higher cognitive skills, such as creativity, critical thinking, decision making, and complex information processing, could grow by an estimated 14 percent in Europe from an already relatively high level. However, basic data input and processing skills may fall by 23 percent in Europe, and demand for most physical and manual skills could decline by 16 percent between 2016 and 2030.

Although Europe has many public initiatives to scale up skills development, it still lags behind some other leading countries. Consider Singapore, for instance, whose Skills Future programme grants about two million citizens about \$345 towards training courses provided by 500 approved institutions. The programme has additional subsidies for people over the age of 40 and offers individual career and skill ladders targeting citizens in low-wage occupations, developed in collaboration with unions and employers.¹²³

Europe will need to work on school education systems, expand lifelong learning, and invest in reskilling current employees in the following areas:

- **School education.** Many European companies are showing initiative in building the skills relevant to their needs, but governments need to weigh in with reforms to educational content and delivery so that the system produces people with the technological, cognitive, and social and emotional skills that are likely to be most in demand.
- **Lifelong learning.** A one-shot education in childhood is no longer likely to be sufficient to equip people with the ever-changing skills they will need to present an attractive profile to employers and maintain it. There will need to be more emphasis on, and provision of, lifelong learning.
- **Reskilling current employees.** The pace of change is likely to be too rapid for natural attrition, and therefore companies, employees, and the public sector will need to invest in reskilling current employees. SAP, for instance, plans to retrain up to half its current workforces.¹²⁴

¹²² *Skill shift: Automation and the future of the workforce*, McKinsey Global Institute, May 2018.

¹²³ *Digitally enabled automation and artificial intelligence: Shaping the future of work in Europe's digital front-runners*, McKinsey & Company, October 2017.

¹²⁴ *Ibid.* MGI has written extensively about the skills development needed in the technology age. See, for instance, *A future that works: Automation, employment, and productivity*, McKinsey Global Institute, January 2017; and *Jobs lost, jobs gained: Workforce transitions in a time of automation*, McKinsey Global Institute, December 2017.

Such efforts are likely to take place largely at the national level. However, sharing best practice across Europe is likely to increase the return on the required investment.

2. COMPLEMENT GROWTH WITH IMPROVED MEASURES TO PROMOTE INCOME EQUALITY WITHIN AND ACROSS COUNTRIES

Income inequality needs to be tackled on two levels: within European countries and among them. Within countries, the least controversial approach to countering increasing income inequality is to make sure that as many people as possible get a chance to receive an income in the first place. This requires increasing employment rates (that is, a high share of the working-age population being employed), which also helps to counter the effect of ageing on public budgets. The main reforms required in this context are those described earlier for education and training, as well as reforms that enable an increase in female labour-market participation and higher retirement ages.

Our work indicates, however, that achieving high employment rates alone will likely not be enough to counter the trend towards higher income inequality. Technological trends are expected to increase the inequality of market incomes during the process of new technology diffusion. Crucial drivers to mitigate inequality will be to ensure that AI diffusion focuses more on innovation of products and services than pure labour automation, and that skill shifts happen as fast as possible.¹²⁵

We have emphasised that public social expenditure should be allowed to rise to support the transition, not only to comply with Europe's welfare philosophy, but also because the investment has strong social returns—in particular returns on skills.¹²⁶ Higher public social spending may not necessarily mean a long-term increase in the share of GDP of such spending, however, because, in theory, productivity gains may be higher than the cost of extra social expenditure.¹²⁷

At the cross-country level, our simulations suggest rising divergence, particularly of the Mediterranean cluster. Further support for investment and training, and dealing with debt levels, may be needed to complement more reform at the cluster level. Nordic countries undertook major economic and social reforms in the 1990s, providing the backbone for their current inclusive growth model, and they may provide lessons for other member countries.

European institutions need to engage in a dialogue, as those with social challenges have a tendency to try to close borders. While trust in the EU is low in the Mediterranean cluster, the share of citizens who trust the EU is still up to twice the share of those who trust their domestic institutions.¹²⁸

¹²⁵ *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, September 2018.

¹²⁶ Returns to skills can be relatively high. Returns on high ICT skills have been found to be 8.7 percent in OECD countries, and up to 13 percent in sectors with high digitisation. See R. Grundke et al., *Which skills for the digital era? Returns to skills analysis*, OECD Science, Technology and Industry Working Papers, number 2018/09, 2018.

¹²⁷ In the deliver scenario (assuming Wagner's Law holds for the EU), annual income growth may be 1.9 percent in real terms and would lead to 0.7 percent growth in public spending. This would still leave 1.2 percent of productivity gains to finance each year. Growth of public social spending of 0.85 percent per year with 45 percent of total public debt would lead to 0.4 percent total income growth. It is therefore possible to stabilise public debt as a percentage of GDP. For countries with large public spending elasticities and low returns in the deliver scenario, there may be an automatic increase in spending, which needs to be watched out for. If these costs are not publicly funded, they will fall on individuals. Note that the United States spends less than European countries on the social front, but US private spending is large. See Anthony B. Atkinson, *Inequality: What can be done?*, Cambridge, MA: Harvard University Press, May 2015.















¹²⁸ Eurobarometer, social indicators, 2016.

3. AMEND THE PARAMETERS OF THE SOCIAL CONTRACTS

The six megatrends not only affect outcomes such as inequality but also change the nature of many components of the social contract—between firms and workers, among citizens of different generations, between citizens and government, between firms and government, and at the intergovernmental level. An extensive discussion is beyond the scope of this paper, but we note some areas that could bear further thought (Exhibit 17).

Exhibit 17

Social contract parameters may need to evolve.

	 Firms vs workers 	 Firms vs government 	 Citizens vs government 	 EU/ intergovernmental 
 Ageing demographics	Increase female participation	Retirement age	Retirement age and pensions; female participation	Intra-EU migration
 Digital technology, automation, and AI	Reskilling and lifelong learning	Data protection regulation, open data, AI ethics	Inclusion (eg, smart capital taxation, universal allowance)	Innovation funding and regulation
 Increased global competition	Attract foreign talent; partnerships	FDI and intellectual property rules		Trade agreements and joint industrial policy
 Migration	Talent attraction and deployment	Dual education/ labour-market integration	Migrant integration approaches	Common rules
 Climate change and pollution		Funding of carbon transition, public-private partnerships	Incentives for low-carbon lifestyle	Carbon abatement rules and tools
 Shifting geopolitics		Cybersecurity and data rules	Liberty vs security	Defence and security union

SOURCE: McKinsey Global Institute analysis

- **Firms and workers.** As firms increase their adoption of disruptive technologies, how can they best contribute to the reskilling and lifelong learning of their workers, and how do workers need to invest in their own development? How can incentives be created for companies to prioritise technologies that complement workers over those that displace them? What are the right structures of worker representation and protection, particularly as the gig economy gains ground? What would be “fair” as well as “living” wages, and what would be the right mechanisms to ensure them?
- **Firms and government.** What is the right public-private collaboration for financing sustainable infrastructure and energy efficiency, and moving to a full circular economy (options include public-private partnerships, carbon taxes, investment incentives, and regulation)? What role should the public sector (as opposed to the private sector) take in pushing innovation and the adoption of technology (options include public innovation, scaling up funding of R&D policies, and exchange of best practice between the public and private sectors)? How can firms raise the game on cybersecurity, and what rules and support may be needed? What is the right code of conduct for handling data and publishing information that balances efficiency and freedom of opinion with security, privacy, and the fact base?
- **Citizens and government.** The EU as an institution and national governments will have to regain the trust of their citizens and win their support for the reforms needed to sustain the inclusive growth model, such as improving the way they deliver government services (from trash collection to tax collection), boosting the transparency of decision making, and increasing the engagement of citizens on policy, regulation, and budgeting.¹²⁹ But if inclusive growth does become more challenging, how should the EU evolve social security and transfers mechanisms in order to provide the fiscal flexibility to execute on the deliver scenario? How should the intergenerational contract evolve as societies age? Will continued raising of retirement ages still be the best approach should technology displacement rates increase? Can Europe allocate a sufficient share of gains from technology adoption to pensions to avoid rising inequality on that front? How should the EU prioritise investment in carbon abatement and climate-change mitigation in a way that benefits the next generation the most? And how should European countries further develop their education systems so that they produce more technological and social and emotional skills, and enable lifelong learning?



Significant challenges lie ahead. Trust in government is low, and there may be mounting pressure on inclusiveness over the next decade. An agenda that helps to bolster Europe’s inclusive growth model includes (but is not limited to) generating growth and distributing the benefits of that growth, while attempting to rebuild trust. Some of the decisions that need to be made are likely to require strong political mandates, which may be difficult at a time of broken trust. But lack of action could leave the European inclusive growth model even more vulnerable. Standstill, therefore, is not an option. Citizens are more likely to rally around their political leaders—and back action that can sustain inclusive growth and Europe’s welfare model of social contract—if a compelling narrative about “Europe” can be updated for the 21st century.¹³⁰ This will need to be more than a shallow public relations campaign. To grow, strengthen, become more resilient, and remain a key actor on the global stage, Europe will need to address legitimate concerns and reenchant its people.

¹²⁹ The OECD highlights citizen involvement in its work on rebuilding trust. See *Trust and public policy: How better governance can help rebuild public trust*, OECD Public Governance Reviews, March 27, 2017.

¹³⁰ A recurring theme in MGI’s 2016 essay contest on “how to fix Europe” was the need for a clearer and more compelling narrative updated for the 21st century. See *MGI essay prize*, mckinsey.com/mgi/overview/mckinsey-global-institute-essay-prize.

TECHNICAL APPENDIX

This appendix provides details of our methodology, data sources used, and further results of our modelling together with sensitivity analyses of the average scenarios simulated. It is arranged in the following sections:

1. Scope
2. High-level methodology
3. Data sources
4. Estimation method
5. Results
6. Sensitivities

1. SCOPE

The scope of this paper is EU-28 (including the United Kingdom) with subgroups that match the social cluster taxonomy of Esping-Andersen¹³¹:

- Mediterranean cluster (Southern Europe): Cyprus, Greece, Italy, Malta, Portugal, and Spain
- Corporatist cluster (Continental Europe): Austria, Belgium, France, Germany, Luxembourg, and the Netherlands
- Eastern cluster (Central and Eastern Europe): Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, and Slovenia
- Liberal cluster (Anglo-Saxon countries): The United Kingdom and Ireland
- Social democratic cluster (Nordic): Denmark, Finland, and Sweden

The focus of this analysis is whether Europe can sustain its current model of social contract, and how. Our timeframe is the period to 2030—far enough into the future to enable us to draw a contrast to today and to take an informed initial view of the sustainability of Europe's social model.

¹³¹ See Gøsta Esping-Andersen, *Three worlds of welfare capitalism*, Princeton, NJ: Princeton University Press, 1990; Gøsta Esping-Andersen, "The comparative macro-sociology of welfare states", in *Social exchange and welfare development*, Luis Moreno, ed., Madrid, Spain: Consejo Superior de Investigaciones Científicas, 1992; and Gøsta Esping-Andersen, *Social foundations of postindustrial economies*, Oxford, UK: Oxford University Press, 1999.

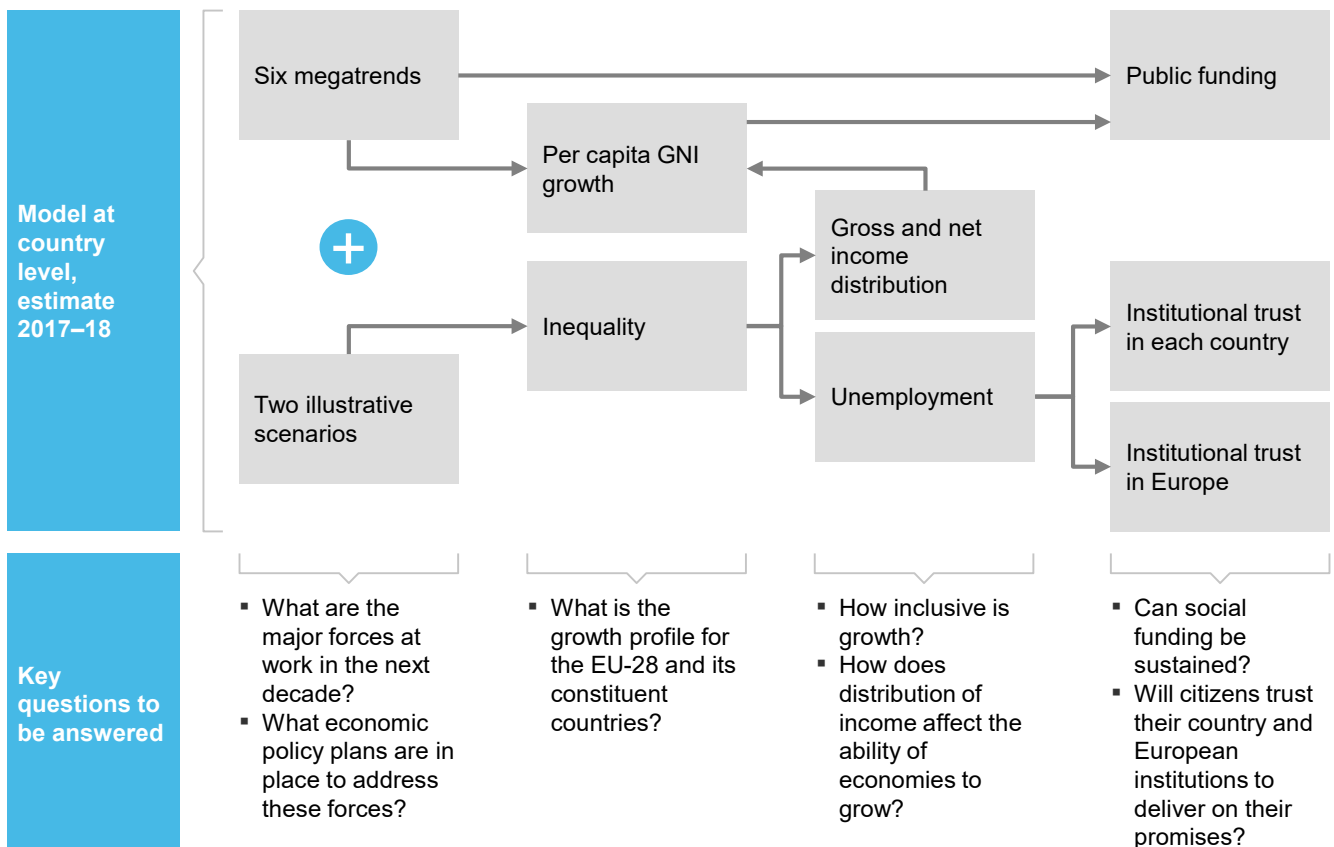
2. HIGH-LEVEL METHODOLOGY

We focus only on the economic aspects that are relevant to Europe’s social contract; we exclude other—potentially crucial—elements such as the ecological footprint of the region and the state of citizens’ life satisfaction, happiness, or health. Our discussion is therefore about establishing the level of inclusive growth, what resources are likely to be needed for a given welfare model, and how more or less trust among citizens will partly determine their support for policy aiming for a particular growth path. We assume that the most resilient outcome results when three conditions are met: when income growth is high, and therefore the extra social costs to sustain this growth can be financed by disposable income growth; when an increase in poverty—especially through increased unemployment—is contained; and when a majority of citizens trust their institutions in the design and delivery of policies.

We use a four-step methodology (Exhibit A1). First, we defined a list of megatrends that may materially affect socioeconomic paths. Second, using those trends, we forecast per capita income growth and estimate the distribution of income generation according to two discrete illustrative scenarios—a denial scenario and a deliver scenario—that are affected by the megatrends. Third, we add a feedback loop—how inequality changes may affect the ability to generate economic growth and to adjust net growth and income paths accordingly. Finally, we assess how these illustrative scenarios affect the level of necessary public funding (assuming the same welfare model), and citizens’ trust in institutions.

Exhibit A1

MGI's model was developed in four steps.



SOURCE: McKinsey Global Institute analysis

Six megatrends

We consider six global megatrends: (1) ageing demographics; (2) digital technology, automation, and AI; (3) increased global competition; (4) migration; (5) climate change and pollution; and (6) shifting geopolitics. MGI and academic research suggests that these are the trends most likely to have a material structural impact on economies.¹³²

We acknowledge that business cycles may exert a major influence on our structural estimates. In some cases, they may create long-standing deviations from the trends. For instance, restoring the level of per capita GDP in Europe to the level prevailing before the crisis of 2007–08 has taken between five and ten years, depending on the country; Germany achieved the milestone earlier than all others. If business-cycle-related risks do emerge, they are likely to make sustaining the European social contract more challenging and to reinforce the view that European countries and EU institutions need to be proactive in mitigating the impact, or delivering the opportunity, of the trends.

We do not model any impact coming through financial channels such as shifts in interest or exchange rates (for countries outside the Eurozone), or Brexit. We do, however, account for major EU initiatives including the Digital Single Market and Horizon 2020 (and subsequent and related programmes) in our deliver scenario.

Scenarios

We focus on two major illustrative scenarios against which the megatrends play:

- **Scenario 1 (denial).** This scenario assumes that Europe and its constituent countries do not act either to mitigate the negative impact of trends or to proactively seek to capture positive opportunities. This scenario assumes that Europe does not adopt policies on ageing and that, for instance, workforce participation continues to decline and that pension funding may be at risk. It also assumes that the Paris Agreement on climate change is not agreed and applied, and that Europe does not take any measures to support the development of the circular economy. The scenario also assumes that Europe and its constituent countries do not invest in new digital technologies, automation, and AI.
- **Scenario 2 (deliver).** In this scenario, Europe continues to pursue various initiatives that respond to the megatrends, and it delivers according to current assets and competencies of Europe and its countries. In this scenario, Europe (1) partially delivers the Digital Single Market on the basis of current innovative capacity; (2) builds a circular economy and complies with the Paris Agreement; (3) adjusts its defence spending to the 2 percent of GDP agreed with NATO; (4) readjusts pension ages according to recent changes of laws that mostly push the pension age out by two to three years; and (5) invests in AI according to its current skills and specialisation in industries such as high tech and semiconductors. Deliver is therefore not a full-potential scenario, but it entails delivering on current promises.

We model the impact of each megatrend in interaction with each scenario. In the deliver scenario, for instance, the deployment of technology is important, creating opportunities for additional growth, but also leading to a skills premium and increased inequality in accordance with academic literature and empirical evidence on the effects of innovation

¹³² *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, September 2018; Richard Dobbs, James Manyika, and Jonathan Woetzel, *No Ordinary Disruption: The Four Forces Breaking All the Trends*, New York, NY: PublicAffairs, 2015; Robert J. Gordon, "Secular stagnation: A supply-side view", *American Economic Review, Papers and Proceedings*, 2015, Volume 105, Number 5.

within firms.¹³³ In the denial scenario, more global competition from countries investing in technology has a negative impact on growth, and inequality rises because of jobs being competed away, for instance.

Feedback loops

A large body of literature examines the impact of inequality on countries' ability to grow. We consider this loop in this analysis, but with two twists.

First, the empirical link from inequality to growth is not a constant. We leverage recent work by the IMF, which finds that the effect of income inequality on economic growth can be either positive or negative, but that, at a particular level of inequality—a net Gini coefficient of about 0.27—the direction of the relationship changes, and instead of inequality being positive for economies, it begins to harm economic development. In our simulation case, we take the average European estimate from the IMF that inequality has a depressive effect on economic growth.

Second, we integrate a more complete model of the feedback loop in our simulation. In particular, we consider the effect of growth in terms of social progress, especially new work opportunities, and how this, in turn, creates more trust among citizens in national governments and EU institutions, and therefore more propensity to consume, boosting growth. However, this loop is very small, accounting for only 10 to 15 percent of the total impact of the feedback loop.

Social impact

We model the impact of growth and its interaction with the megatrends on two major indicators of acceptance among citizens of a resulting growth path.

The first indicator is the social funding necessary to sustain a particular growth path. For instance, building on our global model of the potential economic impact of the diffusion of AI, we estimate how, in a deliver scenario, that diffusion leads to transition costs in the form of training, skills development, and the payment of unemployment support.¹³⁴ In practice, we model tasks that are likely to be changed by AI and need to be upgraded through additional skills, and estimate how many jobs become obsolete that will then have to be retooled with a temporary risk of unemployment. We then split these transition costs between private costs (for example, skills upgrades within firms) and public costs (for instance, unemployment benefits). Another example of our assessment of additional funding needs is the case of ageing. We use forecasts for the ageing of populations and assess the impact of this demographic trend on public funding of pensions, maintaining the current model in each country. The total impact on funding from ageing varies by scenario. In the deliver scenario, people work for two to 33 years longer, depending on the approach of each country.

The second indicator is the degree to which citizens trust their governments to deliver. In practice, many elements contribute to trust among citizens. In our analysis, we focus only on economic aspects, specifically how changes in the level of unemployment affect trust in

¹³³ Roland Benabou was one of the first to model how technology evolution affects the performance of economies and their ability to redistribute. His main insight has been that firms tend to choose to generate a large degree of flexibility, leading to greater inequality in some cases of technological diffusion. See Roland Benabou, "Unequal societies: Income distribution and the social contract", *American Economic Review*, 2000, Volume 90, Number 1. Philippe Aghion and his co-authors used matched employee-employer data from the United Kingdom to analyse the relationship between innovativeness and average wage income across firms. They concluded that innovative firms pay more than others, but also that the wage premium is higher for low-skill workers in innovative firms than in others. See Philippe Aghion et al., *Innovation, firms and wage inequality*, March 2017.

¹³⁴ *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, September 2018.

national institutions. We choose this metric because academic literature deems it the most robust and most influenceable source of impact on trust in institutions.¹³⁵

3. DATA SOURCES

We used a wide range of data for this paper—a battery of secondary estimates drawn from academic literature, essentially to calibrate the impact of trends on inclusive growth, and a variety of official sources and surveys for country-level data in the following categories:

Official data sources

- **Macroeconomic.** Country-level sources of macroeconomic data are the most comprehensive. We use the European Commission and European Investment Bank for GDP, investment and income, and so on; UNDP data for age demographics and population growth; Eurostat for unemployment and government spending; and the World Bank and the World Trade Organization for trade.
- **Inequality.** We use the Gini coefficient and the inequality ratio both gross and net (after redistribution). For both, the sources are the World Bank and Eurostat, each of which maintains and publishes time series of inequality indices. To arrive at a detailed view of how the gross impact translates into net impact, we use the current net/gross ratio by decile from the World Income Inequality Database. We also use data from various national statistical institutes and national banks of EU member states for estimates of marginal tax and transfer rates by income population decile to simulate the amount of transfers needed to stabilise the inequality ratio.
- **Trend sizing.** We used many sources for our analysis of the megatrends. For the evolution of ageing, we use UNDP, Eurostat, and the European Commission to estimate pension costs per country in light of ageing demographics. To size the benefits and associated costs of implementing the circular economy, we use joint research by McKinsey and the Ellen MacArthur Foundation.¹³⁶ We estimate the cost of pollution, waste, and heating by country by referring to studies on European countries by the European Commission.¹³⁷ For automation and AI, we use MGI research on automation potential and corporate diffusion.¹³⁸ We use OECD data on tasks and jobs for each country, and the US Department of Labor O*NET database for the assignment of tasks within jobs. Estimates on corporate diffusion of AI draw on multiple surveys conducted by McKinsey in the years to 2017, using answers from executives of European companies.¹³⁹ Data used to estimate the impact of global competition come from the IMF, the World Bank's World Development Indicators, and the World Trade Organization. For our simulation of the impact of geopolitics, we use gaps in defence budgets from

¹³⁵ Because the countries within the scope of this paper are in the EU, we looked also at how changes in trust in EU institutions relate to changes in trust in national governments and at indicators of general life satisfaction linked to membership of the EU. We find a strong connection between trust in national governments and EU institutions, and that (similar to trust in national institutions) the largest influence is changes in life satisfaction and unemployment. See Christine Arnold, Eliyahu V. Sapir, and Galina Zapryanova, "Trust in the institutions of the European Union: A cross country comparison", in *Beyond Euro-skepticism: Understanding attitudes towards the EU*, Laurie Beaudonnet and Danilo Di Mauro, eds., European Integration online Papers (EIoP), special mini-issue 2, European Community Studies Association Austria, 2012, Volume 16.

¹³⁶ *Growth within: A circular economy vision for a competitive Europe*, Ellen MacArthur Foundation and McKinsey Center for Business and the Environment, June 2015.

¹³⁷ *How will we be affected? High temperatures*, European Commission, ec.europa.eu/clima/policies/adaptation/how_en.

¹³⁸ See *A future that works: Automation, employment, and productivity*, McKinsey Global Institute, January 2017; *Jobs lost, jobs gained: Workforce transitions in a time of automation*, McKinsey Global Institute, December 2017; and *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, September 2018.

¹³⁹ *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, September 2018.

NATO. To gauge migration stocks and flows, we use Eurostat data on applications for citizenship.

- **Transition costs.** We have estimated additional funding costs attached to the effects (and counterpolicy actions) for each scenario. Those estimates leverage the following sources. For cybersecurity, we use European Commission research, plus academic estimates. For climate change, we use estimates in research from the European Commission, as well as from the joint report on the circular economy by the Ellen MacArthur Foundation and McKinsey.¹⁴⁰ Our MGI work on the future of work and skill shifts provides an estimate of people and jobs to reskill.¹⁴¹ The associated cost of reskilling is based on recent Google research with McKinsey.¹⁴²
- **Social indicators.** We leverage the annual survey on trust in each of the EU countries and EU institutions as collected by the European Commission. For the Social Progress Index, we leverage recent reports by the Social Progress Imperative.
- **Scenario range.** Regarding scenario range, we use IMF and Oxford Economics for projecting per capita GNI as a way to cross-check whether our estimates fall into “normal” ranges. In general, the simple average of IMF and Oxford Economics projections leads to an average annual growth of 1.5 percent per capita to 2030. This is above our denial scenario, as is to be expected (as the scenario does not include current actions already launched in the Eurozone to counter the trends), and lower than our deliver scenario.

Estimated impact data sources

In cases where estimating the impact of trends, scenarios, or both for each country was challenging, we checked consistency with estimates contained in previous MGI analyses on, for instance, migration, global flows, AI, and Europe.¹⁴³ We also conducted a meta-analysis of academic findings for the impact of the megatrends, with major papers cited in the text of this paper. Here we highlight the academic literature on two important feedback loops detailed in our research:

- **Impact of inequality on growth.** Extensive academic literature attempts to gauge how income inequality can generate negative pressure on growth. For this paper, we reviewed the literature and used the most relevant, robust, and up-to-date analysis. In particular, recent IMF analysis has emphasised a two-way link between growth and inequality, finding that the effect is likely to be nonlinear with multiple threshold effects.¹⁴⁴ This IMF research used new flexible estimation methods to avoid those issues and found that a rise in inequality may depress growth, but only when inequality is already high. Below that threshold, an increase in inequality may be more likely to act as a stimulus to the economy, for example, boosting entrepreneurial spirit.

¹⁴⁰ *Growth within: A circular economy vision for a competitive Europe*, Ellen MacArthur Foundation and McKinsey Center for Business and the Environment, June 2015.

¹⁴¹ See *A future that works: Automation, employment, and productivity*, McKinsey Global Institute, January 2017; and *Skill shift: Automation and the future of the workforce*, McKinsey Global Institute, May 2018.

¹⁴² See Marie Preisler, “The Nordics could take a digital lead—with the right measures”, *The Nordic Labour Journal*, June 6, 2018; and *Skill shift: Automation and the future of the workforce*, McKinsey Global Institute, May 2018.

¹⁴³ For migration, see *People on the move: Global migration’s impact and opportunity*, McKinsey Global Institute, December 2016; and *Europe’s refugees: Refocusing on integration*, McKinsey Global Institute, May 2018. For flows, see *Digital globalization: The new era of global flows*, McKinsey Global Institute, March 2016. For the future of work, see *A future that works: Automation, employment, and productivity*, McKinsey Global Institute, January 2017; and *Skill shift: Automation and the future of the workforce*, McKinsey Global Institute, May 2018. For AI, see *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, September 2018. For Europe, see *European business: Overcoming uncertainty, strengthening recovery*, McKinsey Global Institute, May 2017.

¹⁴⁴ Francesco Grigoli and Adrian Robles, *Inequality overhang*, IMF working paper number 17/76, March 28, 2017.

- Economic growth and trust.** We use the most extensive and recent data on Europe from Foster and Frieden, who examined 23 waves of the European Commission’s Eurobarometer from 2004 to 2015 to explain how trust in institutions varies across countries and over time.¹⁴⁵ The authors found that cultural, ideological, and political factors are important determinants for a baseline of trust, but that changes in trust are mostly driven by economic factors, in particular unemployment dynamics. Their findings have been firmly corroborated by other scholars, notably Algan et al.¹⁴⁶ We use these marginal estimates of how unemployment drives dynamics of trust to arrive at point estimates in our reduced form model.

4. ESTIMATION METHOD

Scenario development: Income growth

For our scenarios, we consider an “as-is” baseline case or “anchor scenario” in which everything remains constant from an economic standpoint. We then build trends as a deviation from this anchor scenario, with the interaction of denial and deliver action scenarios for each EU country.

In practice, our anchor scenario is one in which GDP growth continues with the same ratio of investment to capital output, a constant employment to labour-force ratio, and secular technical progress. This produces a weighted average of total factor productivity growth for all the EU-28 of 0.8 percent a year—as per the European average over the past two decades.¹⁴⁷ Further, we consider that income from other countries is constant to GDP, and that therefore per capita income growth is also per capita GDP growth. In general, this baseline case produces a benchmark in the period to 2030 of real growth in gross per capita national income of 1.6 percent for the EU-28. The spread is between 1.0 for the EU-15 and 2.0 percent in Eastern Europe (as a result of catch-up).

It is important to see our baseline case as an anchor, as we know that adverse shocks have recently (at the time of writing in autumn 2018) put significant pressure on this long-term potential. For instance, Europe’s total factor productivity growth has barely been positive over the past ten years as the result of the crisis. Most of the megatrends studied for this paper have already played some role. For instance, the dynamics of labour-force participation have already been slowly influenced by ageing demographics, and the labour-output ratio has been declining since the 1970s in Europe, largely as a result of the diffusion of technology.¹⁴⁸

Future effects are taken as a deviation from this anchor case, but in relation to the denial and deliver scenarios. For example, AI shifts the labour-output ratio and investment rate in the deliver scenario. Our analysis finds that a combination of the six trends, and their interaction, leads to average growth in per capita GNI of about 0.3 percent for the EU-28, not accounting for the pressure of growing inequality. In the denial scenario, growth in per capita GNI roughly matches the 0.4 percent a year observed from 2008 to 2016. In

¹⁴⁵ Chase Foster and Jeffrey Frieden, “Crisis of trust: Socio-economic determinants of Europeans’ confidence in government”, *European Union Politics*, 2017, Volume 18, Number 4.

¹⁴⁶ Yann Algan et al., “The European trust crisis and the rise of populism”, *Brookings Papers on Economic Activity*, BPEA Conference Drafts, September 7–8, 2017.

¹⁴⁷ Assuming a Cobb-Douglas function for economic growth, then output growth is the sum of employment growth and of total factor productivity growth scaled by the inverse of the labour share. Total factor productivity growth in Europe between 1996 and 2016 was 0.6 percent for the EU-15 and 1.3 percent for Eastern Europe. See Natalia Levenko, Karpas Oja, and Karsten Staehr, “Total factor productivity growth in Central and Eastern Europe before, during and after the global financial crisis”, *Post-Communist Economies*, 2018.

¹⁴⁸ The labour income share in the EU started to decline around the second half of the 1970s, largely linked to technology. See Alfonso Arpaia, Esther Pérez, and Karl Pichelmann, *Understanding labour income share dynamics in Europe*, European Commission, European economy economic papers number 379, May 2009.

the deliver scenario, growth in per capita GNI is above 2 percent, excluding the feedback loop of inequality on growth. This potential is above the anchor case trend line of the past two decades. Given that the anchor case is at 1.6 percent, this implies that most of the megatrends exert large pressure on growth in Europe. Overall, the difference between the two scenarios is per capita gross national income growth in the EU of 1.7 percent.

Scenario development: Inequality

For simplicity, in our anchor case, inequality ratios remain constant (all economic ratios remain constant, even tax and transfer redistribution). In fact, the Gini coefficient of market income inequality increased beginning in the early 1990s, from around 0.45 to above 0.50, but there has been little variation since 2000.¹⁴⁹ Redistribution has accelerated, leading to a decline in the net Gini coefficient and stabilisation over the past ten years.¹⁵⁰ For our scenarios, we estimate the impact of the megatrends on inequality coupled with bottom-up analyses where possible. An example of a bottom-up analysis is using MGI's econometric model of AI diffusion to determine the distribution of productivity growth by clusters of firms, and the impact of AI on wage income by deciles based on the principle used in recent research by David Autor. This principle is that, in a production function where machines substitute tasks, wages should grow by the difference in total productivity growth from automation, net of any productivity increase from the substitution of human tasks.¹⁵¹ For this paper, we re-ran the econometrics on the diffusion and segmentation of firms using up-to-date 2018 survey data, and the results hold.

Total scenario impact

We use the feedback loops first to close the scenario model and provide a final measure of inclusive income growth. We then rebuild the inclusive income growth model in the GDP growth model. We estimate unemployment as the difference between new demand for labour based on the new labour-output ratio of the two scenarios and labour-force deployment.¹⁵² We then use the change in unemployment to predict dynamics in institutional trust.

5. RESULTS

In this appendix, we share some results that go beyond the average results in this paper on both the current European situation and our estimates for 2030.

Current European situation

- **Trust.** In 2017, on average, trust in national institutions among European citizens was low but ranged widely, from only 11 percent in Greece to more than 70 percent in Luxembourg. Trust is driven by many factors, including, as we have noted, the dynamics of unemployment—which also varies significantly within Europe. Unemployment ranges from 21 percent in Greece at the high end to 3 percent in Croatia, the Czech Republic, and Germany. While indicative only of the dynamics between trust and socioeconomic outcomes, we find a statistically significant negative correlation (correlation = -0.4) between the level of trust and unemployment, as a percentage of both the active workforce and the total populations of European countries (Exhibit A2).

¹⁴⁹ Zsolt Darvas and Guntram B. Wolff, *An anatomy of inclusive growth in Europe*, Bruegel Blueprint, October 27, 2016.

¹⁵⁰ Rocco L. Bubbico and Leon Freytag, *Inequality in Europe*, European Investment Bank, January 2018.

¹⁵¹ Daron Acemoglu and Pascual Restrepo, *Modeling automation*, NBER working paper number 24321, February 2018.

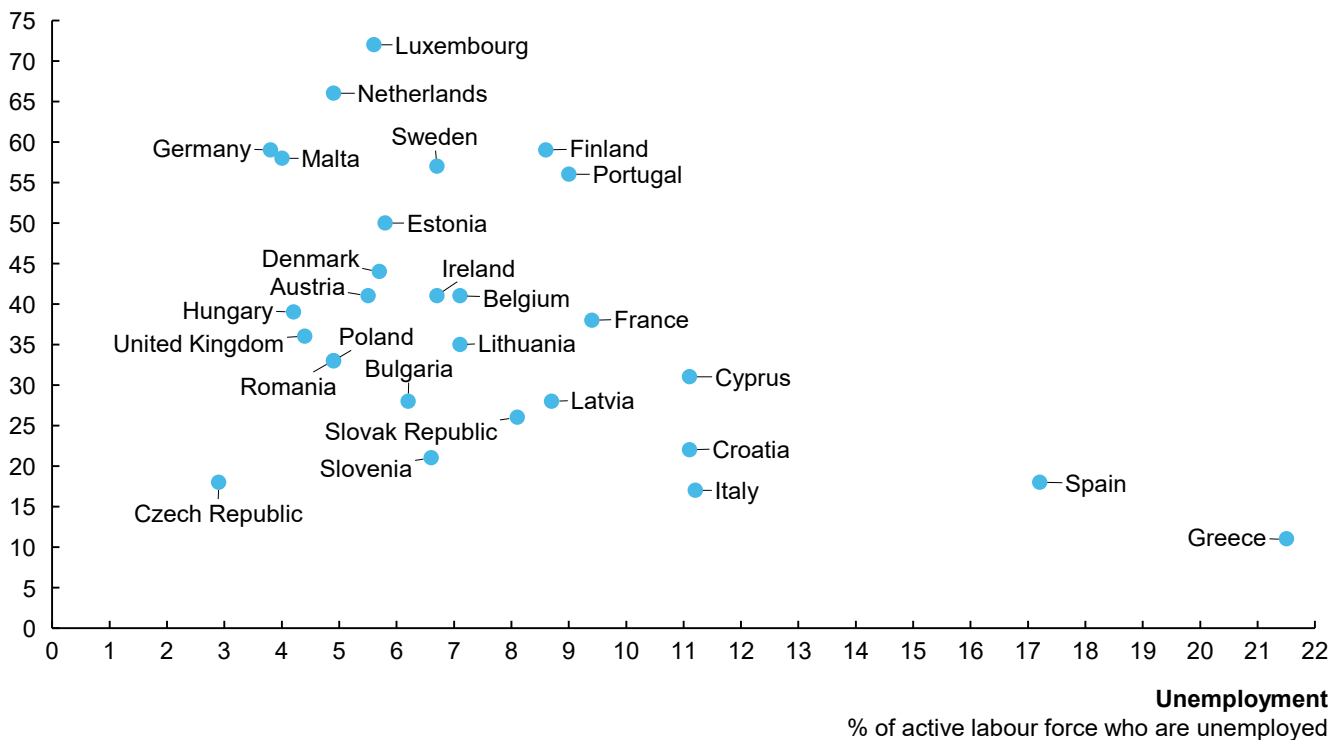
¹⁵² In practice, the labour-output ratio does not change in the denial scenario. In the case of the deliver scenario, AI diffuses in the economy, and job automation starts to build up, substituted by AI capital. The labour-output ratio changes in proportion of full-time-equivalent work being replaced by AI technologies.

Exhibit A2

There is a statistically significant negative correlation between the level of trust and unemployment.

Trust in government

% of surveyed population indicating they trust their government



SOURCE: Eurobarometer; Eurostat; McKinsey Global Institute analysis

- **Inequality.** The ratio of income earned by the top 20 percent versus the bottom 20 percent varies by a more than a factor of two among EU countries, with higher ratios being more visible in Eastern Europe (for instance, Bulgaria) and southern Europe. While only indicative, the cross-country correlation between per capita GNI and inequality is negative, at $r = -0.5$.
- **Inclusive growth.** Given the above, we have built an index that blends economic performance (per capita GNI) equally with social performance (measured by level of trust and equality). Normalising the performance distribution by each of the indicators above, Northern countries such as Benelux and Germany clearly stand out for generating the most inclusive growth in 2017. Greece, Italy, and Spain, which were hit hardest by the crisis and have been less resilient than other economies of the EU-28, have the lowest rankings on social performance (Exhibit A3).

Exhibit A3

The main Southern European countries of the Mediterranean cluster have made the least progress on social economic inclusion.

Rank ¹ #	Synthetic Index 2017	Social Index 2017	Economic Index 2017
1	Luxembourg	Finland	Luxembourg
2	Netherlands	Netherlands	Ireland
3	Sweden	Malta	Austria
4	Ireland	Sweden	Netherlands
5	Germany	Germany	Denmark
6	Finland	Luxembourg	Sweden
7	Denmark	Denmark	Germany
8	Austria	Belgium	Belgium
9	Belgium	Austria	Finland
10	Malta	Ireland	France
11	France	Hungary	United Kingdom
12	United Kingdom	France	Italy
13	Czech Republic	Portugal	Malta
14	Slovenia	Slovak Republic	Spain
15	Portugal	Estonia	Czech Republic
16	Slovak Republic	Slovenia	Slovenia
17	Estonia	Czech Republic	Cyprus
18	Hungary	Poland	Slovak Republic
19	Cyprus	United Kingdom	Portugal
20	Poland	Cyprus	Lithuania
21	Italy	Croatia	Estonia
22	Spain	Lithuania	Poland
23	Lithuania	Latvia	Greece
24	Croatia	Romania	Latvia
25	Latvia	Bulgaria	Hungary
26	Romania	Italy	Romania
27	Greece	Spain	Croatia
28	Bulgaria	Greece	Bulgaria

1 Rank 10 is 1 standard deviation from the top-ranked country, while Rank 20 is 2 standard deviations from the top-ranked country.

SOURCE: Social Progress Index; Eurostat; Eurobarometer; World Development Indicators; Yann Algan, Sergei Guriev, Elias Papaioannou, and Evgenia Passari, *The European trust crisis and the rise of populism*, Brookings Papers on Economic Activity, September 2017; McKinsey Global Institute analysis

Estimated impact by 2030

We find a large difference in annual growth in per capita GNI between the two scenarios of up to 1.7 points in favour of the deliver scenario. By 2030, the cumulative per capita gap between the two scenarios is about €9,000, or €700 per year (the deliver scenario is €45,700 versus €36,700 in the denial scenario).

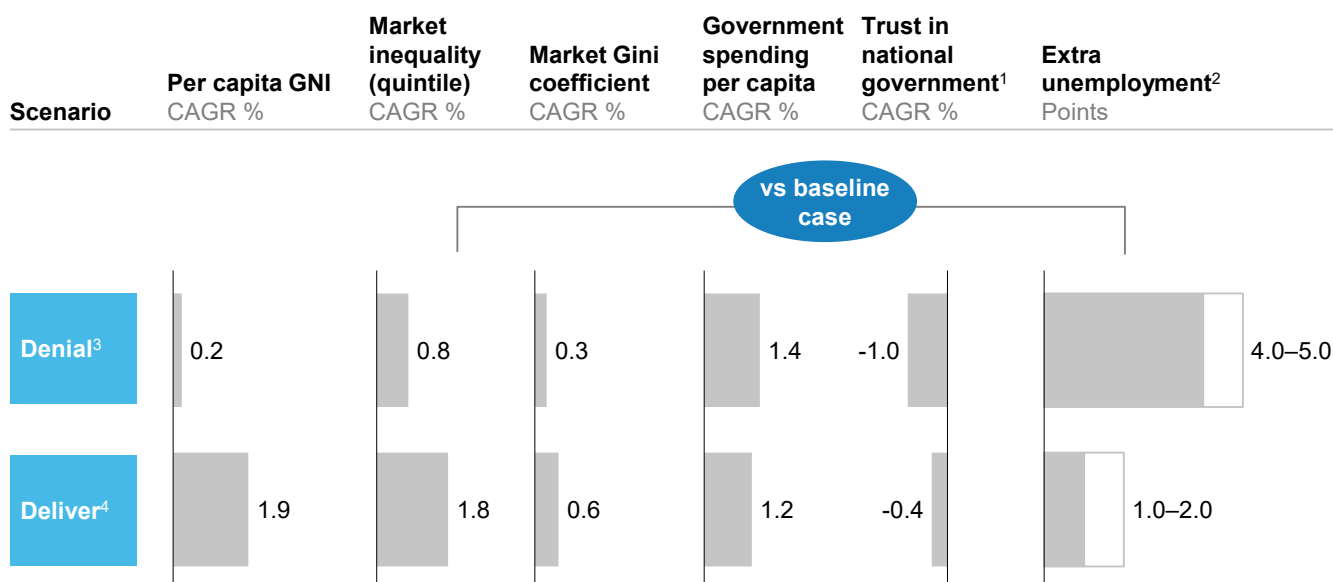
The deliver scenario implies slightly less public spending growth than in the denial scenario—€1,000 versus €1,340 by 2030—largely reflecting the fact that, in the deliver scenario, there will be smaller total pensions to fund and lower numbers of unemployed to support because the momentum of growth is much higher. However, the deliver scenario also implies more cost of developing the skills of the workforce as AI diffuses. The deliver scenario also, on average, brings a slight decline in institutional trust (in both national and EU institutions), whereas in the denial scenario, there is more pressure on trust. By 2030, everything else being equal, trust may decline by an extra 10 percent of the population, meaning that roughly 70 percent would not trust their own institutions. To put that weak support in context, this is lower than trust in the United States, with its laissez-faire social contract, and a level similar to those European countries that, as of 2018, were witnessing the emergence of more polarised political parties.

The main challenge of the deliver model is that inequality may increase at twice the rate as in the denial scenario, largely reflecting technology diffusion dynamics, which may reduce with time (Exhibit A4).

Exhibit A4

MGI compared estimated impact by scenario in 2030 for the EU-28.

Average point estimates



¹ Trust in national government effects only includes the marginal impact of inclusive growth, and no other effects.

² Extra unemployment only includes effects of scenarios; other effects such as reduction in working time, gender mix, or effects in unemployment benefits are not included.

³ The denial scenario: Europe does not take action to mitigate the impact of megatrends.

⁴ The deliver scenario: Europe continues to pursue, and scale up, current policies and develops new approaches that leverage existing assets and competencies to respond to newer trends such as the diffusion of AI.

SOURCE: World Development Indicators; Eurostat, Eurobarometer; McKinsey Global Institute analysis

The impact of the megatrends on inclusive growth is asymmetric. In comparison with the base case, trends in aggregate depress GNI, increase inequality, and boost the amount of spending necessary to sustain growth and rebuild trust. Ageing, competition through new technologies, and continued globalisation (outside of technology) each contribute about one-third of the impact. At the margin, global competition has a relatively larger impact on boosting inequality than on other metrics. Ageing demographics put more pressure on spending (pressure on pension model), for example. In the deliver scenario, the diffusion of technology has a disproportionate positive impact on growth in GNI but also pushes inequality significantly higher. Ageing continues to be a burden to GNI growth insofar as it does not boost participation in full-time employment, and competition continues to exert pressure. The development of the circular economy creates growth.

One important estimate is how inequality builds up through AI diffusion in the economy. We have followed a six-step process that examines the distribution of firm performance, labour automation, and the impact on productivity, real wages, and employment. Our analysis has used extensive previous MGI research (Exhibit A5).¹⁵³

Exhibit A5

Wage inequality among firms develops as automation and AI diffuse.

Steps	Key elements
1 Computation of employment distribution at risk by job task and occupation	<ul style="list-style-type: none"> ■ Average automation potential is 45% of FTE tasks currently performed in European firms
2 Based on matching tasks with skills; ranking of firms by quintile on automation potential	<ul style="list-style-type: none"> ■ Top quintile of firm have 15% of tasks to be automated vs 70% for the bottom decile, with many bottom-quintile firms in sectors such as hotels, transportation, trade, and construction
3 Assessment of firms' deployment of AI based on econometric model of diffusion; incorporating major factors such as competition, business value of AI adoption, state of firm digitisation	<ul style="list-style-type: none"> ■ Industries with faster adoption are ICT, media, and financial services; adoption is lower in trade and hotel services. ■ Diffusion may take time with three groups of firms emerging <ul style="list-style-type: none"> – Those that adopt AI for the full period to 2030 (30%) – Those that partially adopt (30%) – The remainder (40%)
4 Split of employment evolution type by firm segment based on automation potential, revenue gain, and distribution among firm quintiles	<ul style="list-style-type: none"> ■ Employment grows for top-quintile firms by 0.8% a year and becomes negative for the last three quintiles given labour automation. ■ Total employment demand shrinks by 0.5% a year, in line with other MGI research
5 Determination of real wage growth based on growth in labour productivity linked to automation	<ul style="list-style-type: none"> ■ Real wages growth spread increases by about 0.5% between top and bottom quintiles, and labour productivity by 1%. This pattern has been visible in Europe since 2000, with a productivity growth spread of 1% between the top ten and the rest
6 Considering real wage growth differential and employment pressure growing on quintile distribution; computation of wage income pressure	<ul style="list-style-type: none"> ■ Total income gap reaches 1.8% per year, or roughly doubles gap with productivity given unemployment pressure in the bottom quintile of performing firms
7 Computation of gap increase for share of population at work and considering unemployment allowance for FTE without jobs	<ul style="list-style-type: none"> ■ Gross inequality increases by 1% a year in total population

SOURCE: McKinsey Global Institute, *Harnessing automation for a future that works*, 2017; McKinsey Global Institute, *Skill shift: Automation and the future of the workforce*, 2018; McKinsey Global Institute, *Artificial intelligence: The next digital frontier?*, 2017; McKinsey Global Institute, *Jobs lost, jobs gained: Workforce transitions in a time of automation*, 2017; Jacques Bughin, "Why AI isn't the death of jobs", *MIT Sloan Management Review*, Fall 2018; OECD; McKinsey Global Institute analysis

¹⁵³ *Jobs lost, jobs gained: Workforce transitions in a time of automation*, McKinsey Global Institute, December 2017; *Skill shift: Automation and the future of the workforce*, McKinsey Global Institute, May 2018; and *Notes from the AI frontier: Modeling the impact of AI on the world economy*, McKinsey Global Institute, September 2018.

6. SENSITIVITIES

The results in this paper refer to average estimates. We also used sensitivity analysis to test our results (including, for instance, projections of per capita GNI) and found them to be robust. We also used Monte Carlo simulation based on a variety of distribution assumptions. As the results were qualitatively the same, we have reported them based on normal distribution.

In the denial scenario, per capita income maintains positive compound annual growth of 0.2 percent (made up of 0.4 percent growth and a negative spillover of inequality of 0.2 percent). There is a risk that growth could be even lower than this. Our Monte Carlo simulations suggest negative net growth in 10 percent of cases. Only in seven cases out of the 100 run of simulations did we find potential to reach 1 percent net growth a year in a denial scenario. This 1 percent growth arises if (1) the baseline case is already stronger than average because of higher total productivity growth or higher demographic growth; (2) Europe is more insulated from the risk of global competition than expected; and (3) new competition through technology takes more time to materialise than expected. In all cases, however, per capita income growth in the denial case is below the baseline case.

In a deliver case, the average scenario delivers 1.9 percent annual growth in per capita income. In general, the simulation suggests that there may be only a few percent probability for per capita income growth to be less than 1 percent a year.

On average, increased inequality depresses growth. The negative impact in the denial scenario remains relatively bounded at up to 0.3 to 0.4 percent a year of negative impact, but rises to 0.7 to 0.8 percent in the deliver scenario.

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