AN ANATOMY OF INCLUSIVE GROWTH IN EUROPE

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Acknowledgements

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Foreword

With only seven percent of the world's people but about half of its welfare payments, the European Union's levels of inequality and absolute poverty are low in a global context. Nevertheless EU countries face social challenges. Unemployment remains high in a number of member states, while the intergenerational divide between the young and the old has widened. Social mobility is weak, in particular in the more unequal economies of southern Europe, limiting opportunities for the children of poor and disadvantaged families.

Striving for fairness in economic development is crucial in order for societies to be stable and citizens not to feel disenchanted. This was why my colleague Zsolt Darvas and I attempted an analysis of inclusive growth in Europe with a global perspective. With around 50 charts and many tables, we provide an anatomy of inclusive growth in the EU.

Poverty, defined as very low absolute income, is extremely rare in the European Union. Income inequality also tends to be low, compared to other parts of the world. We present new estimates of inequality in the EU as a whole and show that, perhaps contrary to perceptions, it has declined since 1994. However, measured on a country-by-country basis, income inequality has in some cases increased. Our analysis confirms its negative associations with lower social mobility, weaker educational achievements of children born into poorer families, worse health outcomes and higher unemployment. Moreover, Zsolt Darvas' estimates confirm that high inequality and poverty boosted the 'leave' vote in the United Kingdom's June 2016 Brexit referendum, suggesting that perceived unfairness can lead to protest votes in referendums and elections.

Our data casts doubt on the popular hypothesis that inequality is an unavoidable counterpart of technological change that favours those with skills. While we find evidence that the demand for university graduates has increased significantly in recent years and that certain tasks, most notably manual and cognitive tasks requiring routine skills, have been automatised, we also find that in many European countries university graduates receive a smaller premium over the wages of lower-educated workers compared to the US, and the premium has fallen. Our results suggest that we should not fear the 'new machine age', but must instead equip the next generation of workers with skills that benefit from technology. Such skills are likely to emphasise social and creative intelligence.

European policymakers have a long to-do list to foster inclusive growth in Europe. Pressing tasks include improving access to quality education for all to ensure greater equality of opportunity. Welfare systems should be reformed for greater effectiveness in a number of countries, because the same amount of social spending often yields very different results in terms of inequality. A lower tax burden on low incomes would contribute to inclusive growth, as would a review of protectionism in certain segments of markets and unjustified rents. Designing fiscal policies so that fiscal adjustments do not disadvantage the young and families, or undermine education and investment, is equally important. Last but not least, unemployment needs to be addressed.

These policies mostly concern national policymakers. EU institutions can highlight best practices and apply peer pressure to member states, but we warn that promising results without proper instruments could backfire and lead to a backlash against the EU if citizens perceive that promises are not being kept.

Guntram B. Wolff, Director of Bruegel
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Executive summary

Years of crisis and stagnation have left Europeans worried about both growth and fairness. They have seen the impact of recessions on their communities, but they are well aware that hardship has not fallen equally on all shoulders. Policymakers need to strive to bring European economies back to robust growth, in order to meet promises of opportunity and prosperity. But that growth must also be fair if citizens are not to grow disenchanted. This is why the concept of 'inclusive growth' is so important and deserving of detailed investigation.

Growth is considered inclusive if it creates opportunities for all segments of the population and shares them fairly. To understand inclusive growth, we must first understand inequality. This can be inequality of opportunity in access to education, jobs, finance or the judicial system, for example. Or it can be inequality of outcomes, such as income, wealth, health and educational attainment. Both categories of inequality are central to discussions of inclusive growth.

Recognition is growing that inclusive growth matters: in specific countries, and in the European Union as a whole. At EU level, an inclusive economy is among the prominent targets of the Europe 2020 strategy.

In this report we analyse inequality and inclusiveness in Europe, taking a global perspective. Our aim is to present a snapshot of the current situation and assess longer term trends in terms of growth and fairness in European economies and societies. Building on a thorough literature review, careful data collection/analysis and some econometric estimates, we reach the following key conclusions:

What are the EU's main social challenges?

- The EU's social problems are generally different from social problems in other parts of the world. Poverty, defined as a very low absolute income, is extremely rare in the EU. Income inequality also tends to be low, compared with the emerging economies of Asia, Africa and Latin America, and also with the United States.

- Nevertheless, EU economies are diverging in terms of social dynamics. Social indicators show that polarisation between the south and the north has widened since 2008. Several EU countries, in particular in the south, have suffered increases in material deprivation and unemployment (including youth unemployment and a greater share of children living in jobless households), and a growing intergenerational divide between the young and the old. Income inequality is relatively high in some EU countries, in particular in the southern EU.

- Unemployment has a negative impact on the living conditions of a large segment of society. It also has major negative consequences for medium- and long-term economic growth. Long spells of unemployment erode skills and discourage labour market participation, thereby undermining countries' long-term growth potentials.

- Youth unemployment is especially alarming. A long period of unemployment after graduation, when a young worker should acquire his or her first workplace skills, can undermine whole careers. This risks creating a lost generation, with trickle-down effects also for fertility rates. Moreover, when children grow up in families in which parents do not work for long periods or work irregularly, their opportunities are curtailed compared to children whose parents work.

Why is inclusive growth important?

- When assessing inclusive growth, poverty and income inequality are the two most relevant indicators, although there are many others, including non-monetary indicators. Income inequality and poverty have an impact on inequality of opportunity and prospects for social mobility, with major consequences for individuals and societies.

- Research shows that in most countries children growing up in poorer and disadvantaged families tend to underperform in school compared to their classmates from richer families. Educational underachievement then leads to low employability. Moreover, people with a low level of education tend to have worse health and live shorter lives. An economy cannot be regarded as inclusive if opportunities to progress depend on family background.

- Inequality and poverty also influence the prospects of social convergence across regions, generations and families belonging to different socio-economic groups.

- Higher income inequality is associated with less intergenerational (or social) mobility: the children of poor families tend to become poor, while the children of rich families tend to become rich. The same result holds for educational achievements too. Nordic countries, such as Finland and Denmark, exhibit low income inequality and relatively high social mobility. Southern European countries such as Italy, but also the United Kingdom, are marked by high income inequality and relatively low social mobility.

- The literature about the impact of income inequality on long-term growth is mixed, but there is growing evidence that inequality was also a determinant of the unsustainable pre-2008 booms in the United States and in several European countries. Countries with

greater inequality tended to have higher household borrowing prior to the crisis, which led to weaker consumption growth during the crisis. The higher private debt rendered economies more vulnerable and contributed to the higher unemployment and higher levels of poverty.

- High levels of income inequality and poverty can also boost protest votes in referenda and elections. Our econometric estimates reveal that in the United Kingdom's June 2016 Brexit referendum, income inequality and poverty were factors that boosted the vote for 'leave' – in addition to geographical differences and larger shares of less-educated and older people in certain UK regions. Our estimates confirm that the young (who will dominate the population in the coming decades) and the well-educated (who may be better able to understand the benefits of EU integration) were more in favour of EU membership.

Does technological change drive income inequality?

- There is no indicator of income inequality for the EU as whole from official statistical sources. Therefore we estimated the EU-wide Gini coefficient and other relevant indicators. Our calculations show marked differences in the development of inequality between the European Union and most other parts of the world, including the United States and emerging countries. In many parts of the world, income inequality increased in the past two decades, but Europe was different. Since 1994, there was a steady decline in net (after taxes and transfers) inequality in the EU until 2008, after which inequality remained broadly the same.

- In the EU and the United States, there has been a decline in the number of jobs for workers with low levels of educational

attainment over the past 25 years. Meanwhile, there has been a tremendous increase in jobs for workers with tertiary education, and this is the only job category that expanded after 2008, even in several countries that were hit hard by the recent global and European financial and economic crises. While underemployment (when a worker takes a job for which they are over-qualified) is a prevailing phenomenon, it tends to be temporary.

- If a greater share of jobs is only open to tertiary-educated workers, it could contribute to greater inequality. This is the case if the skill premium (the potential for higher income that comes with higher educational achievement) is large and increasing. Several authors build on this and explain rising wage inequality through 'skill-biased technical change'. This is the idea that technological progress is biased in favour of skilled workers and against unskilled workers. However, our data raises doubts about the relevance of this explanation for Europe. There was a significant increase in the skill premium in the US and China, and a limited increase in Germany, but the skill premium has in fact declined in many other countries during the past two decades, including the United Kingdom, Italy, Spain, France, Sweden and Japan.

- Our analysis of the number of new graduates and the unemployment rate of tertiary-educated people does not support the claim, frequently made in the literature, that a reduced supply of university graduates relative to demand has been a main reason for the increased skill premium in the US. Moreover, in OECD countries where the share of tertiary-educated workers is high, the skills premium of tertiary education tends to be relatively low. In fact, the United States is an exception to this trend and its relatively high share of tertiary-educated workers is associated with a relatively high tertiary education premium.

- The income share of the top 1 percent of earners is a major contributor to overall income inequality. However, in the US, a rather small fraction of the top 1 percent of earners comes from high-tech industries such as ICT and manufacturing. The bulk of top earners are lawyers, doctors, dentists and financial sector professionals. Some of these industries enjoy a relatively high level of protection, while the impact of technological change may still be comparatively modest. Europe tells a different story. In many European countries a much higher share of the top 1 percent of earners than in the United States is in the manufacturing sector.

- Therefore, our comparison of countries suggests that even though technological change tends to favour those with greater skills, it is hard to see how it has contributed to rising inequality. Other factors such as redistribution and education policies or the regulation of certain professions may be more relevant.

- The literature about the risk posed by the automation or 'robotisation' of jobs reaches mixed conclusions. Some authors conclude that the risk is high for many current jobs, but others conclude only a few jobs are at high risk. It is difficult to compare such estimates because of their differing assumptions and methodologies.

- By looking at European data, we conclude that the so-called 'job polarisation' hypothesis might be at work in Europe. This hypothesis posits that technology can replace human labour in routine tasks, be they manual or cognitive, but (as yet) it cannot replace human labour in non-routine tasks. According to this hypothesis, demand for labour increases for well-paid skilled jobs (such as professionals and managers), which typically require non-routine cognitive skills. Labour demand also increases for the least skilled low-paid jobs, which typically require non-routine manual skills and revolve around unpredictable interactions with people and the environ-

ment, such as various services and sales jobs. Demand for labour in 'middling' jobs, which require routine manual and cognitive skills – clerks, operators and assemblers, for example – will fall. By analysing the largest countries in Europe, we find data that supports this hypothesis.

- Looking ahead, if technology is able to start to cope with non-routine cognitive tasks, the next generation of workers must be equipped with skills that benefit from technology rather than being threatened by it. Such skills are likely to emphasise social and creative intelligence. Appropriate shifts in education policy are recommended.

National and European policies to foster inclusive growth

Tax, social, education and labour policies are almost exclusively national competences and are under the direct control of national policymakers, who face a number of challenges. The first is to foster social mobility. Early childhood education is key for social mobility and higher education increasingly important for employment. Second, there are major differences in the efficiency of welfare systems. In particular, welfare systems are often not efficient in reducing income inequality. Reforming welfare systems is particularly important in some southern European countries. A third issue is the progressivity of the tax system, which has generally come down. The tax system often puts too much burden on low income households. Fourth, while the skill premium in most European countries has not increased, increases in the US happen in sectors with less technological change. A review of the extent to which different sectors are protected in different countries could be a useful contribution in terms of addressing some unwarranted rents that accrue to top-income households. Fifth, the composition of fiscal consolidation was often biased against young families and education and also against investment. This had negative

implications for growth, while exacerbating inequality and the growing intergenerational divide. A sixth issue is to address (youth) unemployment which is an issue for national labour market policies alongside European and national macroeconomic policies.

The EU has set itself social targets. The EU can set targets but has few direct instruments to achieve them. Such normative power can be useful in increasing peer pressure but it can also lead to frustration as perceived promises are not kept. But the EU can play a greater role in tax policies and by using its regulatory power in setting certain social standards.

To conclude, inclusive growth should be at the top of the political agenda. European countries are actually performing rather well in terms of reducing income inequality, though developments vary in different EU states. But policymakers need to address unemployment more forcefully, especially youth unemployment. Moreover, social mobility is rather weak in many countries (particularly in southern Europe and the United Kingdom). Countries should carefully review the evidence about the main obstacles to social mobility. In terms of EU-level policy, there is a good case for regulation where the EU has real competence. But it is undesirable to make promises and set goals in areas in which the EU cannot deliver because of its lack of competence or instruments.

1. Introduction

There is a growing recognition that economic growth in itself does not provide equal opportunities to different segments of society. In most countries disadvantaged people find it difficult to progress, as shown by, for example, Sen (2000), Atkinson (2005) and Silver (2007). Children growing up in disadvantaged families tend to underperform compared to their classmates from richer families (Van der Berg *et al*, 2011; Leventhal and Brooks-Gunn, 2000), while educational under-achievement leads to low employability (Rutter, 1993; Bynner, 2000). People with low educational levels tend to be less healthy and live shorter lives (Wilkinson, 2003; Braveman and Gottlieb, 2014).

Economic growth that leads to increased inequality in different aspects of life could also be unsustainable. A high level of inequality might lead households to rely on debt financing to maintain living standards, a factor that might have been a significant driver of the housing boom in the pre-crisis period in the US, and the consequent bust (Rajan, 2012; Van Treeck, 2014). Greater inequality could reduce the level and duration of periods of growth (Ostry, Berg and Tsangarid, 2014), and could also be linked to greater financial instability (Skott, 2013; Vandemoortele, 2009). For the euro area, Darvas and Wolff (2014) showed that in countries with greater inequality, households tended to borrow more prior to the crisis, resulting in more subdued consumption growth during the crisis. The resulting high private debt, high unemployment, poverty and more limited access to education undermine long-term growth and social and political stability.

The notion of inclusive growth refers to a broader concept of development, including various non-monetary aspects of life, such

as health, educational opportunities, employment prospects and possibly also environmental issues. An extensive academic literature has explored the reasons behind income inequality and its consequences. Multinational institutions, such as the OECD, World Bank, International Monetary Fund and the World Economic Forum have played a pivotal role in defining conceptual issues, indicators and policies for fostering inclusive growth.

Inclusive growth is a top priority in the European Union's overall strategy. The European Commission, for example, argues in its Europe 2020 strategy, that "*in a changing world, we want the EU to become a smart, sustainable and inclusive economy*"[1]. Other major economies have similar goals[2].

The EU's social problems are generally different from social problems in other parts of the world. With one of the largest welfare states in the world, the concept of inclusive growth must be explored and defined differently in the EU than in many emerging economies. To illustrate the differences, Table 1 presents three simple indicators. Poverty, as measured by the share of people living on less than $2.50 a day, is practically non-existent in the EU, while the developing world still suffers massively from this problem. Income inequality, as measured by the Gini coefficient, is somewhat diverse in the EU, yet even the most unequal EU countries are somewhat more equal than the United States and much more equal than emerging and developing countries in Africa, Asia and Latin America. Only in terms of the third indicator reported in Table 1, unemployment, do some EU countries rank worse than most of the rest of the world.

1 http://ec.europa.eu/europe2020/index_en.htm.

2 In China, the 12th Five-Year Plan (2011-15) marked a shift from 'pursuing economic growth' to 'sharing benefits of development among all people,' and the goal of a harmonious society is highlighted by the government. See for example http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/12/12/000356161_20131212171010/Rendered/PDF/revised08251900Box0382083B00PUBLIC0.pdf.

Table 1: Poverty and income inequality around the world (latest available data)

		No. countries	Poverty (%)	Income inequality	Unemployment rate (%)
EU	EU15 (ex. south & UK)	10	0.5	27	7.8
	Southern EU	4	2.3	34	19.4
	United Kingdom	1	0.5	35	6.2
	Baltics	3	1.5	34	9.6
	Other newer EU members	10	1.7	30	10.3
Non-EU	United States	1	1.3	37	6.1
	Non-EU advanced (ex. US)	7	0.3	29	4.8
	China	1	19.3	53	4.1
	Asia (ex. China & CIS)	19	23.6	40	4.5
	Latin America	19	12.1	44	6.9
	Africa	36	72.5	44	12.0
	CIS (former USSR)	10	19.3	35	6.9

Source: Bruegel based on World Bank World Development indicators (poverty), the Standardised World Income Inequality Dataset (income inequality), International Monetary Fund World Economic Outlook (unemployment rate). Note: Poverty refers to the percent of population living below $2.50 a day. Income inequality refers to the Gini coefficient after taxes and transfers. For each country and indicator, the latest available data is used, which is typically available for 2012 or 2013 for poverty and income inequality and 2015 for the unemployment rate. Unweighted averages of country data are shown for country groups. EU15 refers to the EU member states before 2004. Southern EU refers to Greece, Italy, Portugal and Spain. Baltics refers to Estonia, Latvia and Lithuania. Other newer EU members are countries that joined the EU between 2004-13, excluding the three Baltic countries.

The low level of absolute poverty and diverse and relatively lower levels of income inequality underline the different nature of social challenges in the EU. Darvas *et al* (2014) demonstrated that Europe's social problems widened with the increase in unemployment and material deprivation in some parts of Europe. Polarisation between

the south and the north of the EU has increased, as well as between the young and the old. Hüttl, Wilson and Wolff (2015) show that there was increasing intergenerational polarisation during the economic crisis years. Piketty (2014), in turn, focuses on increases in wealth inequality. Such polarisations, along with differences in access to good jobs, good education and high-quality healthcare, call for a new policy focus in the EU.

Our aim is to study the importance and influence of inclusive growth in building Europe's future and to draw some conclusions about how policymakers should respond. Chapter 2 briefly summarises the inclusive growth literature with a focus on developed economies. Chapter 3 analyses the drivers of income inequality by assessing labour market developments and the possible role of skill-biased technical change in driving the skill-premium up. Chapter 4 focuses on the potential for social mobility in the European Union. We pay special attention to the effect on inclusive growth of the recent global and European financial and economic crises by studying who benefitted and who suffered from the crisis. Finally, chapter 5 sets out our recommendations for national and European Union policies to foster inclusive growth.

2. Inclusive growth: why it matters

2.1 Defining and measuring inclusive growth

OECD (2014) defines inclusive growth as "*economic growth that creates opportunity for all segments of the population and distributes the dividends of increased prosperity, both in monetary and non-monetary terms, fairly across society*". Inclusive growth goes beyond one-dimensional GDP growth. Jobs, skills, education, health, the environment and active participation in the economy and society also matter. The OECD emphasises that what is considered relevant for inclusive growth varies in different countries and circumstances. For instance, in developing countries, social connections and quality of institutions matter more, whereas social protection (such as access to services and unemployment insurance) tend to be more relevant in advanced countries.

Ianchovichina and Lundström (2009) emphasise that the main instrument of sustainable and inclusive growth is 'productive employment', reached through employment growth (new jobs, wages and self-employment) and productivity growth, which has the potential to lift the wages of the employed and the incomes of the self-employed. For Ianchovichina and Lundström (2009), inclusive growth should focus on the poor, especially on the part of the labour force that is trapped in low-productivity activities and/or completely excluded from the growth process. Ranieri and Almeida Ramos (2013) also underline the concept of 'productive employment', as well as the difficulties in understanding the complex interactions between growth, poverty and inequality.

Measurement of inclusive growth ranges across a broad spectrum of indicators. OECD research suggests using wide-ranging indicators, including income and wealth, health status, work-life balance, environmental quality, housing conditions and personal security. White (2012) presents a broad list of requirements for inclusive growth, such as lower income inequality, a reduction in absolute poverty, internalising the externalities of growth, reducing the North–South income gap, reducing inequality of opportunity (such as in access to education, jobs, finance and the judicial system) and greater space for emerging market economies in the governance of international financial institutions. A few studies attempt to calculate a single indicator for inclusive growth, such as the 'opportunity index' of Ali and Son (2007) or the index based on the 'social mobility curve' of Anand, Mishra and Peiris (2013).

While there is a growing consensus that poverty and inequality themselves are not sufficient to characterise the inclusiveness of the growth process, these two indicators are generally considered to be the most relevant factors: see for example Habito (2009), Rauniyar and Kanbur (2010), Dagdeviren, van der Hoeven and Weeks (2000) and Ramos, Ranieri and Lammens (2013).

2.2 Inequality and growth

Inequality of outcomes (such as income, wealth, health and education) and opportunities (access to education, jobs, finance and the judicial system) are central to understanding how inclusive growth is.

IMF (2015) highlights key factors driving inequality, such as:

- Technological change: inequality has also increased as growth has been accompanied by technological change that favours those with the right skills (skill premium).

- Trade globalisation: although trade has been an engine for growth in many countries by promoting competitiveness, high trade flows

are commonly cited as driving income inequality by lowering wages for unskilled labour in advanced countries (though the empirical evidence is mixed).

- Financial globalisation: while it can facilitate efficient international allocation of capital and promote international risk-sharing, financial globalisation can increase income inequality in advanced and emerging market economies because of the concentration of cross-border financial claims in relatively higher-skill and technology-intensive sectors, which pushes up demand for, and therefore wages of, higher skilled workers. Financial deregulation and globalisation has increased wages in financial industries, thereby contributing to increases in inequality.

- Financial deepening: financial development could benefit the rich in early stages (Roine, Vlachos, and Waldenstrom, 2009), though it will likely also promote better access of households and firms to finance and thereby reduce income inequality.

- Changes to labour market institutions: more flexible labour market institutions can foster economic dynamism by reallocating resources to more productive firms and therefore provide better opportunities for skilled workers. On the other hand, greater flexibility can pose challenges to low-skilled employees, while the decline in trade union membership and increase in more temporary forms of employment can increase their vulnerability.

- Redistributive policies: tax systems in some advanced economies have become less progressive over the last few decades. Rising pre-tax income concentration has coincided with declining top marginal tax rates.

Greater inequality could affect economic growth in various ways (as various papers have already summarised, for example OECD, 2008, 2011, 2014). Greater inequality and financial market imperfections might reduce the capacity of low-income households to invest in education, lowering economic growth (Galor and Zeira, 1993, 1998). Under-investment in human capital by poorer segments of society might reduce social mobility and adequate allocation of talent across occupations (Banerjee and Newman, 1993; Fershtman *et al*, 1996; Owen and Weil, 1998). Greater inequality might also reduce growth if it leads to political instability and social unrest (Alesina and Perotti, 1996; Knack and Keefer, 2000). If inequality becomes unacceptable for voters, they might insist on higher taxation and regulation and mis-trust businesses, reducing incentives to invest (Bertola, 1993; Alesina and Rodrick, 1994).

On the other hand, greater inequality could increase growth if it provides incentives to work harder and take risks in order to capitalise on high rates of return (Mirrlees, 1971; Lazear and Rosen, 1981). High differences in rates of return for education might encourage more people to seek education. Higher inequality could foster aggregate savings and capital accumulation, because the rich consume relatively less (Kaldor, 1956; Bourguignon, 1981).

The empirical evidence for the impact of inequality on growth is inconclusive. Several papers have found that inequality reduces growth, while many others have concluded that it increases growth. A number of papers have concluded that the impact is insignificant or that earlier findings that seemed conclusive are not robust.

For example, a generally negative relationship is established by Alesina and Rodrick (1994), Persson and Tabellini (1994), Clarke (1995), Perotti (1996), Knowles (2005), Ostry, Berg and Tsangarides (2014) and OECD (2014). On the contrary, a positive relationship is found by, for example, Li and Zou (1998), Deininger and Olinto (2000), Forbes (2000) and Halter, Oechslin and Zweimuller (2014).

Among the studies that found inconclusive results or concluded that earlier findings in the literature were not robust, Barro (2000), for example, found that the relationship is insignificant for the whole sample (which includes 84 countries), but positive in rich and negative in poor countries. Castelló and Domenech (2002) found a negative relationship for the whole sample, but a positive relationship when income and human capital inequality are considered simultaneously. Banerjee and Duflo (2003) found negative effects on growth resulting from changes in inequality in any direction. Voitchovsky (2005) found an insignificant relationship considering the whole sample, but a positive relationship at the top of the inequality distribution and negative at the bottom of the inequality distribution. The findings of Castelló (2010) were similar to the findings of Barro (2000): that there is a negative relationship for poor countries and a positive relationship for rich countries, though for the whole sample he found a negative relationship.

Anderson and Maibom (2016) rationalise the mixed results of the literature. They argue that theoretically, there exists a trade-off between efficiency and equity only at the frontier of the possible set of combinations of economic performance and income equality available to policymakers. However, there may be many historical, institutional and political reasons why countries are not at the frontier, and these countries can improve efficiency and equity at the same time. Their empirical stochastic frontier analysis using data from OECD countries supports these theoretical predictions: the estimated frontier indicates a trade-off between efficiency and equity, but there are many countries well below the frontier and therefore a simple cross-country correlation would suggest a seeming positive relationship between efficiency and equity. By using a different frontier analysis and data from US states, Aghion *et al* (2015) report similar findings. They find significant correlation between top income inequality and growth in those US states which are close to the most productive US state ('frontier growth'), but negative correlation between top income inequality and non-frontier growth.

2.3 Social mobility

Higher inequality is found to be associated with less inter-generational mobility: the children of poor families tend to stay poor, while the children of rich families tend to stay rich. This association is described by the so-called 'Great Gatsby Curve' (Figure 1), which relates inter-generational earnings elasticity (how much a child's adult earnings vary from his/her parents' earnings) to income inequality (Corak, 2013; Andrews and Leigh, 2009)[3]. The higher this elasticity (that is, earnings of a worker correlate more with the earnings of his/her parents), the lower social mobility is. The results clearly indicate that greater inequality tends to be associated with a greater likelihood that economic advantage/disadvantage will be passed from parents to their children. For example, in some Nordic countries (Finland, Denmark, Norway), where income inequality is relatively low (Gini coefficient around 21-23), intergenerational earnings elasticity is also relatively low, below 0.2, implying relatively high social mobility. In contrast, in countries where income inequality is relatively high (Italy, United Kingdom, United States), intergenerational earnings elasticity is much higher and close to 0.5, implying relatively low social mobility. While there are differences in intergenerational mobility in different regions in each country, Bratberg *et al* (2015) found that the most socially mobile region in the US is substantially less mobile than the least mobile regions of Norway and Sweden.

Educational achievement is a driver of social mobility. For the United States, Belley and Lochner (2007) concluded that even con-trolling for cognitive skills, the strength of the relationship between family income and college attendance is persistent and even increases over time. Bailey and Dynarski (2011) found that the rate of college graduation increased by only 4 percentage points for low-income cohorts born in the early 1980s relative to cohorts born in the early

3 According to Corak (2012) 'The Great Gatsby Curve' label was first used in a 2012 speech by Alan Krueger, in his capacity as the Chairman of the US Council of Economic Advisors, evoking the 1925 novel by F. Scott Fitzgerald.

1960s, while those born into high-income households increased by 20 percentage points during the same period. Reardon (2011) showed that maths and reading score differences between the 90th and 10th percentiles did not change from 1950-70, but increased to 30-40 percent between 1970-2001.

Figure 1: The Great Gatsby Curve: more inequality is associated with less mobility across the generations
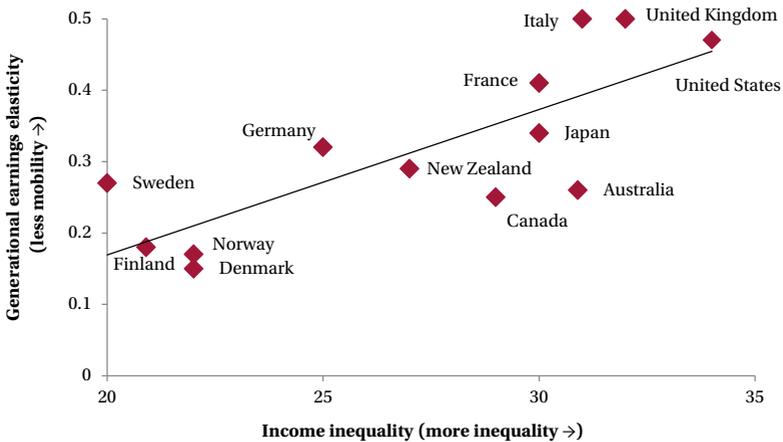
Source: Reproduced with permission from Corak (2013), Figure 1.

An important reason for such a relationship is that richer parents can provide better educations for their children. Knudsen *et al* (2006) emphasised the importance of socio-economic status, including the quality of neighbourhoods and schools, which influences children's' cognitive abilities. Socio-economic status has an impact on success in primary school, which in turn influences success in high school and college, and subsequently the access to good jobs in the labour market. McLanahan (2004) found that children born to more-educated mothers are likely to be raised by older, more mature mothers who are working and have better paying jobs and who are thus able to support their children more, while children of less-educated mothers are likely

to make less significant gains and even incur losses in the parental resources available to them. Aghion *et al* (2016a) conclude that innovation, particularly new entrants, is positively associated with social mobility, while Aghion *et al* (2016b) find that the probability of becoming and inventors is strongly correlated with parental income, which correlation is mostly driven by the ability of richer parents to provide better education to their children.

Another aspect is the skill premium. Aaronson and Mazumder (2008) and Mazumder (2012) found that the higher the returns from going to college, the lower the degree of intergenerational mobility. They showed that the correlation between returns from going to college and intergenerational mobility of earnings was quite strong in the United States from 1940-2000.

Some authors highlight that prospects for social mobility differ for different segments of society. For example, Bratsberg (2007) concluded that in Denmark, Finland and Norway (three countries in which social mobility is relatively high) being raised by a low-income father does not disadvantage children, but being raised by high-income father confers an advantage (ie intergenerational elasticity of income does not change for the lower part of the distribution, but changes for the top part). For the United States, Bratberg *et al* (2015) found particularly low upward mobility at the very bottom of the income distribution.

Social networks can also reinforce inertia in income rankings within a society. For example, Datcher and Loury (2006) argued that in the United States, half of jobs are found through family, friends or acquaintances. Corak and Piraino (2010, 2011) and Bingley, Corak and Westergard-Nielson (2012) concluded that intergenerational transmission of earnings is associated with intergenerational transmission of employers (even in more socially mobile countries like Canada and Denmark). Children of top earning fathers are more likely to be top earners even if they get a job with different employers to their fathers. Sweden, Canada and Denmark, even though generally equitable, show an existence of a 'dynasty' when it comes to the top 1 percent.

Moreover, Solon (2004) also argued that public policy can either accentuate or dampen the influence of labour market inequality and intergenerational mobility. Public programmes that benefit the less well-off relatively more may increase social mobility[4]. A possible political reason for reduced intergenerational mobility might be that wealthy individuals capture the political system and thereby reduce more redistributive policies, which in turn lowers social mobility (Burtless and Jencks, 2003)[5].

2.4 Impact on politics: Brexit vote boosts case for inclusive growth

High inequality and poverty can boost protest votes in referenda and elections.

In the United Kingdom's Brexit referendum on 23 June 2016, 51.9 percent of voters rejected the United Kingdom's membership of the European Union. Did income inequality, poverty and unemployment contribute to 'leave' votes? To answer this question, we estimated some regressions to uncover the determinants of 'leave' votes and voter turnout. Full details of our regression analysis are presented in Annex 1, while here we summarise the key findings and conclusions.

Using hard data from statistical offices (as opposed to using the results of opinion surveys) for 173 UK regions, our regression results confirm that younger and better-educated people voted for 'remain' in greater proportions and older and less-educated people tended to vote for 'leave'. There was a clear geographical pattern in which Scotland, Northern Ireland and London were for 'remain'. The actual presence of immigrants did not have a significant effect on the results, supporting

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4 For example, public spending on education directed at high-quality early childhood education and to primary and secondary schooling accessible for all is likely to benefit more families that are lower in the socioeconomic scale than public spending directed at high-quality private tertiary education accessible to only a few.

5 A counter-argument is expressed by Alessina and Glaeser (2004), who argue that in more unequal societies the median voter will tend to have a stronger preference for redistribution, implying higher social mobility.

the conjecture of Mourlon-Druol (2016) that it was the perception that immigration could be a problem, rather than the actual presence of immigrants, that influenced the vote. Average household income did not play a role either; we adjusted for several socio-economic characteristics of the regions. Turnout was lower among disadvantaged people and in the 'remain' strongholds: the young and residents of Scotland, Northern Ireland and London voted in lower proportions.

Despite the clear overall vote for 'leave', EU leaders could take a positive message from the referendum result. The young (who will come to dominate the population) and the well-educated (who might be able to understand better the benefits of EU integration) were more in favour of EU membership.

A key contribution of our calculations is to show using regression analysis that in areas of the UK where inequality and poverty are higher, there were more 'leave' votes, even after controlling for socio-economic and geographic factors. This finding calls for more inclusive growth. In the UK, income inequality – a key indicator of inclusive growth – is almost the highest in the European Union. Theresa May, who became prime minister of the UK in the wake of the Brexit vote, rightly emphasised very strongly the importance of social reform to reduce inequality of opportunity (Asthana *et al*, 2016).

Overall, high levels of inequality and poverty undermine personal well-being and social cohesion, and can also boost protest votes in referenda and elections. This is another key lesson that politicians in other countries should learn from the Brexit vote.

3. Labour markets, inequality and technology

The key underlying theme from our literature survey and our analysis in the previous section is that inequality of opportunity, fuelled by poverty, inadequate access to good education, jobs and healthcare are likely to be detrimental not just to personal well-being and social cohesion, but also in terms of macroeconomic prospects and political stability. Income inequality can be a major factor influencing the inequality of opportunity and the prospects for social mobility and convergence of social indicators among families with different socio-economic standings, age profiles and that live in different regions. In this chapter, we document the development of income inequality in the European Union as a whole, based on our novel estimates, and assess the potential drivers of income inequality.

3.1 Income inequality: Europe is different

European countries are different from most countries in terms of how income inequality has developed. Unfortunately, income inequality indicators are not available from official statistical sources for the EU as a whole[6]. Therefore, in Darvas (2016b), we estimated for the EU the Gini coefficient of income inequality from 1989 to 2014.

6 While Eurostat, the European Union's statistical office, publishes Gini coefficients for 28 EU members and for various groups of countries within the EU, these Gini coefficients are population-weighted averages of country-specific Gini coefficients, which are not the Gini coefficients that correspond to the combined income distribution of the countries. See Darvas (2016b) for more details.

Figure 2 shows a marked difference between the United States and the European Union in inequality over time. In the US, income inequality declined in the 1960s and remained broadly unchanged in the 1970s. Since then, however, there has been a steady increase in income inequality, both before redistribution (so-called 'market' inequality) and after taxes and transfers ('net' inequality).

There was a sharp increase in EU-wide inequality from 1989-93, reflecting a large increase in inequality among the first 15 EU member states and among the 13 countries that joined the EU from 2004 onward. The central and eastern European countries in the latter group suffered from massive output declines because of their transitions from socialist to market-based economies during this time, which widened the income gap between their citizens and those of western European countries, pushing up aggregate EU-wide income inequality.

Nevertheless, the most notable feature of Figure 2 is the steady and remarkable decline in net income inequality in the 28 current EU countries from 1995 to 2008. This development differentiates the EU not just from the US, but also from most other countries.

The decline in EU-wide net income inequality stopped in 2008 and income inequality has remained broadly stable since then. Therefore, the recent global and European financial and economic crises might have played a role in halting the 15-year long trend of declining net income inequality in the EU.

Another notable development to be noted from Figure 2 relates to the differences between market and net measures of income inequality. In the EU, market inequality jumped to a Gini coefficient level of about 51 in the early 1990s and has remained broadly stable since then. The EU's social redistribution systems played a key role in achieving the declining trend of net income inequality between 1995 and 2008. In the US, both market and net income inequality rose in the past four decades. Social redistribution in the US therefore has not played such an important role in containing the rise in net inequality. Interestingly, market inequality in the US increased to practically the

same level as the EU in 2010-14, yet net inequality is much lower in the EU, underlining the importance of redistribution. We will analyse redistributive issues in more detail in chapter 5.

Figure 2: Gini coefficient of market (before taxes and transfers) and net (after taxes and transfers) income inequality: comparing the EU as a whole with the US, 1960-2014
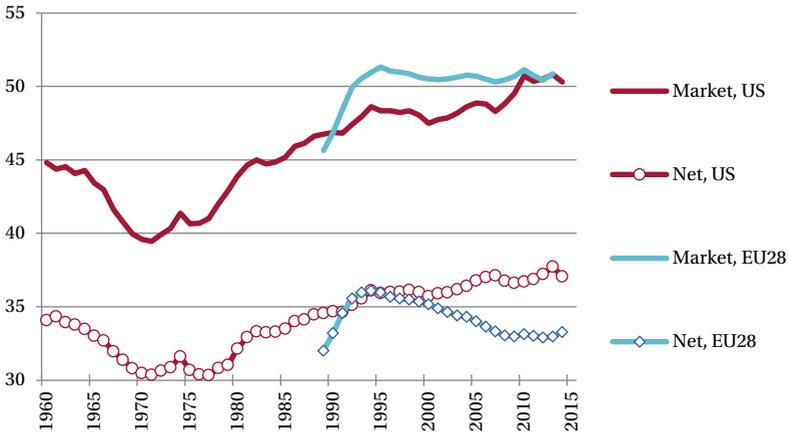
Source: Bruegel based on US data: the Standardised World Income Inequality Database (SWIID) from Solt (2016); EU28 data: Darvas (2016b), which is based on the individual country data from Solt (2016); thereby the US and EU28 data reported in this figure are comparable. Note: A Gini index of zero represents perfect equality (ie incomes are perfectly evenly distributed) and a Gini index of indicates 100 perfect inequality (all incomes are owned by one person).

Unfortunately, missing data does not allow calculation of the EU28-wide Gini index before 1989. In order to show inequality over an even longer term for some EU countries, Figure 3 reports Gini coefficients for the five largest EU countries compared to Brazil, China, Japan and the US. While there were some fluctuations, the Gini coefficient tended to be lower in France and Germany than in other countries. Italy, Spain and the UK are less equal than France and Germany, yet they are much more equal than the Brazil, China and the US.
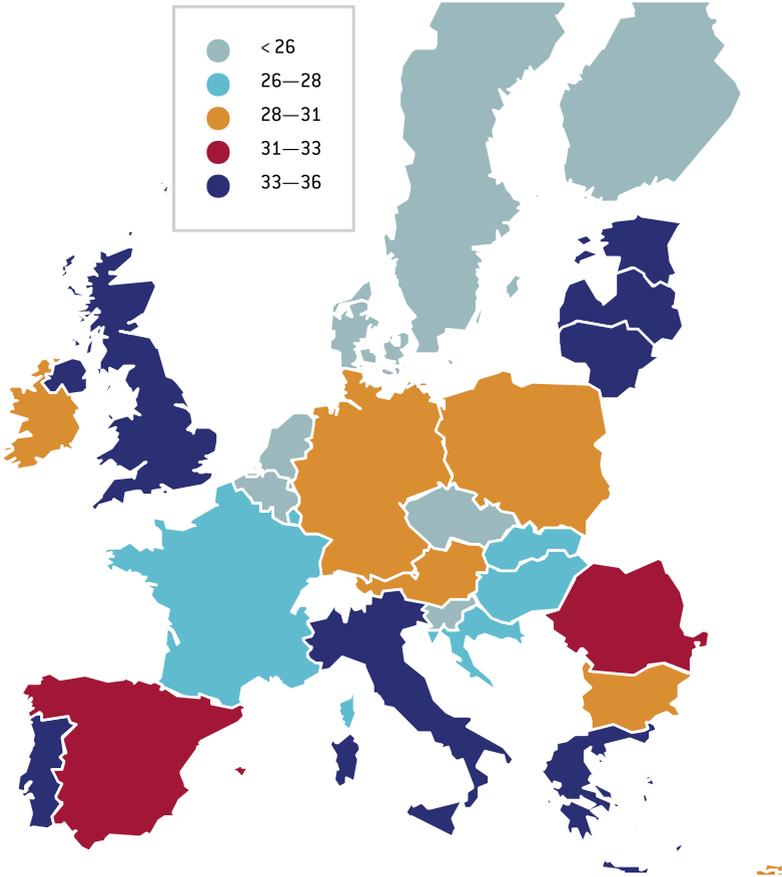
Figure 3: Gini coefficient of net income inequality (after taxes and transfers), selected countries, 1960-2014
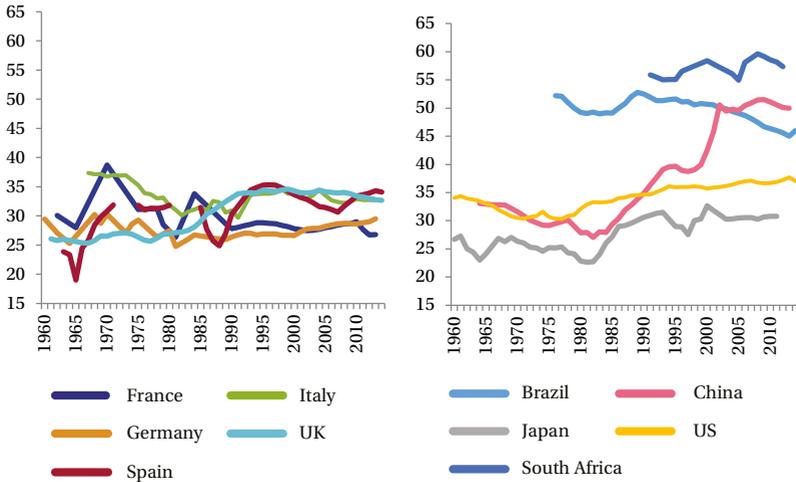
Source: Bruegel based on the Standardized World Income Inequality Database (SWIID). Note: A Gini index of zero represents perfect equality (ie incomes are perfectly evenly distributed) and a Gini index of indicates 100 perfect inequality (all incomes are owned by one person).

While the EU as a whole, and individual EU countries, tend to be characterised by lower income inequality than the US and most emerging/developing countries, there is are significant differences between EU countries, as Figure 3 shows for the five largest EU countries. Figure 4 maps the inequality levels of EU countries between 2010-14. Mediterranean countries, Baltic countries and the United Kingdom exhibit relatively high Gini coefficients, while Nordic countries and 'core' continental EU countries are characterised by lower income inequality levels.

Figure 4: Gini coefficient of net disposable income in the EU, average of 2000-14

Source: Bruegel based on the Standardized World Income Inequality Database (SWIID). Note: Gini coefficient is after taxes and social transfers.

3.2 Long-term structural changes to labour markets: the EU and US are similar

Despite differing developments in net income inequality, there is a striking similarity between the EU and the US in terms of a major long-term change in the labour market: the decline in jobs with low education requirements and the increase in jobs with high education requirements. This development has major implications for social mobility.

While the categorisation of jobs according to education requirements differs somewhat between the EU and the US, Figure 5 and Figure 6 show notable similarity.

The number of jobs for people with higher education has increased significantly and steadily in both the EU and the US, starting at least after 1992 (since when there is available EU data). The number of such jobs has practically doubled in two decades. It is really noteworthy that during the global and European financial and economic crises of the past few years, employment of highly-educated workers continued to increase in the EU, even in countries suffering from large increases in unemployment, such as Cyprus, Italy, Ireland, Lithuania, Portugal and Spain. In three other hard-hit countries, Estonia, Latvia and Greece, the employment of the highly-educated remained broadly stable. In the US, there was just a slight decline in the number of jobs requiring high-level educational attainment in 2009, since the increasing trend has resumed[7].

7 An important aspect of the steady increase in jobs with tertiary-educated workers is underemployment: that is working in jobs that typically do not require a university degree. By analysing underemployment in the United States following the Great Recession, Abel and Deitz (2016) conclude that recent underemployed college graduates were not forced into low-skilled service jobs, but into jobs that appeared to be more oriented toward knowledge and skills when compared to the distribution of jobs held by young workers without a college degree. Moreover, they also find that underemployment is a temporary phase for many young graduates when they enter the labour market, because it often takes time for new graduates to find jobs suited to their education level.

Jobs requiring medium-level qualifications also increased significantly after 1992 in both the EU and the US, but the growth of such jobs stopped in the EU in 2008 and after some decline, only a slow job growth has resumed in the US.

On the other hand, the number of jobs in the EU for people with lower qualification levels declined between 1992 and 2007[8] and dropped massively during the crisis. In the US, the number of such jobs was more or less stable from 1993 to 2007, after which there was a major decline.

Figure 5: Employment by educational attainment in the EU, 1992-2015 (millions of jobs)
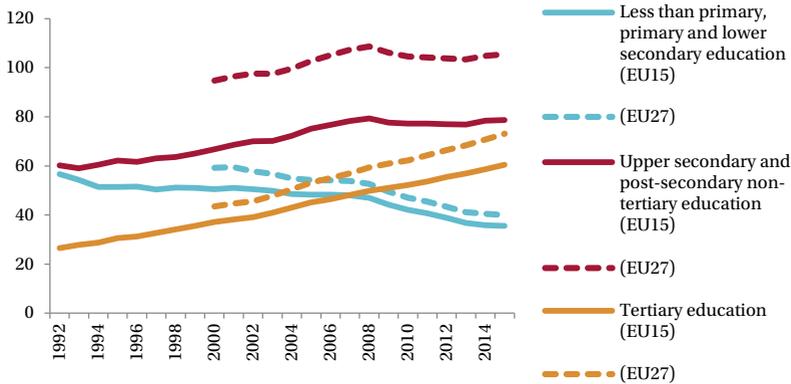
Source: Eurostat 'Employment by sex, occupation and educational attainment level (1 000) [lfsa_egised]' dataset. Note: the solid line shows the aggregate of EU15 countries (EU members before 2004), which is available from 1992. The same-colour dashed line indicates the aggregate for 27 EU member states, which is available from 2000.

Therefore, the recent global and European crises have amplified the difference between the availability of jobs requiring high and low

8 There were a few exceptions to this trend, like in Spain and Ireland, where the pre-crisis housing bubbles were associated with the creation of low-skilled jobs in the construction sector. However, the excess creation of such jobs proved to be unsustainable.

levels of education, even though the divergence started at least 25 years ago.

Using data from the United States, Bitler and Hoynes (2015) report that lower income earners experience much greater income variability than higher earners. Furthermore, this disproportionate effect of recessions on low earners was greater in the great recession of 2008-09 compared to the previous 1980s recession. The vulnerability of low-skilled workers likely applies in the EU too.

The long-term decline in the number of jobs for low-educated workers, and the consequent vulnerability of those workers, underline the importance of upward social mobility. More and more children and young people need to attain higher levels of education, including those who were born to parents with low educational achievements.

**Figure 6: Employment by educational attainment in the US, 1992-2015 (millions of jobs)**
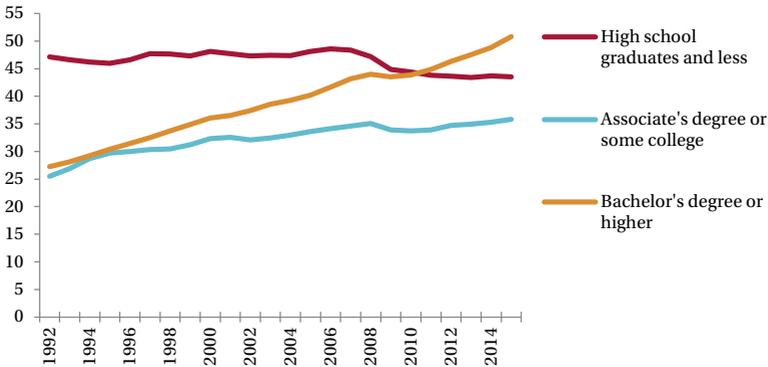
Source: US Census Bureau. http://data.bls.gov/pdq/SurveyOutputServlet. Note: Annual averages for employed persons 25 years and over.

Developments in China have been different, reflecting its different level of economic and social development (Figure 7). In 1997, almost 100 million jobs were filled by illiterate people, declining to close to zero by 2014. The number of jobs for workers with only primary

education also declined considerably from 246 million to 143 million between 1997 and 2014, possibly related to urbanisation and the decline in agricultural jobs. On the other hand, only 20 million jobs, less than 3 percent of total jobs, were occupied by people with college and higher degrees in 1997. The number of such jobs increased tremendously to 112 million by 2014, reaching a share of 15 percent of all jobs. Among workers with college and higher education, the number of university graduates increased from 10 million in 2001 to 46 million in 2014. The number of jobs requiring junior and senior school qualifications also went up. It has to be noted, moreover, that the number of illiterate and semi-literate workers declined sharply from 90 million in 1997 to 14 million in 2014.

Figure 7: Employment by educational attainment in China, 1997-2014 (millions of jobs)
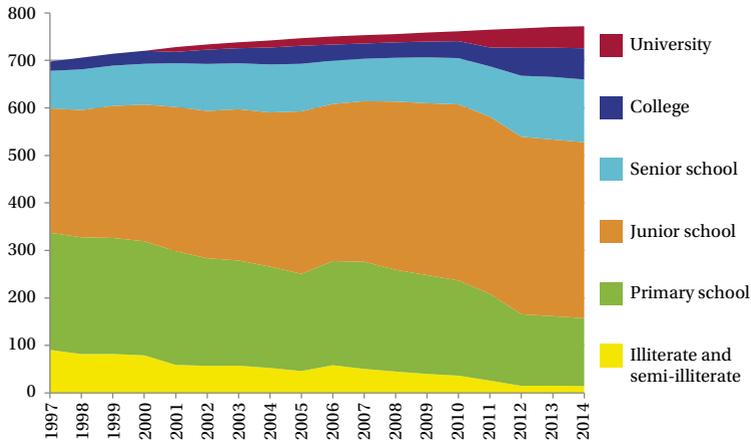
Sources: National Bureau of Statistics of China. Note: Data for employment of university graduates and above only available from 2001 onwards. China has 9 years of publicly funded compulsory education, which consists of 6 years of primary school and 3 years of junior school. After 9 years of primary and junior school, there is 3 years of senior school. After senior school graduation (equivalent to US high school education and EU upper-secondary education) people enter either college (equivalent to US and EU specialised and vocational education) or university (equivalent to US bachelor's degree or higher and EU tertiary education).

On the other hand, it is notable that the total number of jobs in China increased only by 11 percent from 1997 to 2014, which corresponds to 0.6 percent per year job creation, while average GDP growth during the same period was 9.5 percent.

### 3.3 Technological change and the skill premium

Recent economic research studying the impact of technology on the labour market emphasised the role played by skill-biased technical change, the idea that technical changes shifts production to technology that favours skilled over unskilled workers (see Katz and Autor, 1999, and Violante, 2008, for surveys of the literature). By increasing the productivity of skilled workers, and thereby the demand for such workers, skill-biased technical change may explain rising wage inequality.

The skill premium and/or returns from schooling refer to the gain that a worker gets by investing in higher education. It is calculated as the ratio of wages of the high-skilled workers to the wages of low-skilled workers. Autor (2014) notes the dramatic rise in the skill premium in the US and argues that this contributes substantially to the rise in income inequality. Figure 8 shows that the median weekly earnings of high-skilled workers continually increased during the 1980s and 1990s, whereas the weekly earnings of those with primary and high school education experienced a decline. Since about 2000, however, the increase in the skill premium has stopped.

Autor (2014) attributes the sharp increase in the skill premium in the US to:

- The decline in non-college employment in production, administrative and clerical work;
- The sharp rise in low-skilled labour supply and competition from the developing world;
- The decline in the bargaining power of labour unions and reductions in top marginal tax rates.

Figure 8: Median weekly earnings by education (left hand scale) and the skill premium (right hand scale) in the US, 1979-2013
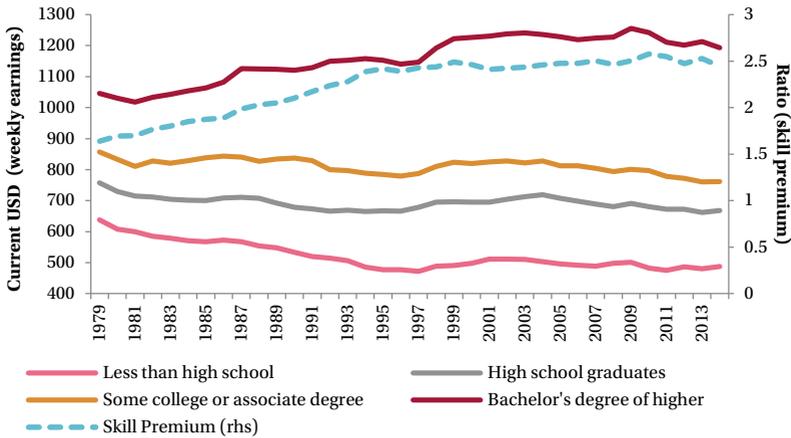

Source: US Bureau of Labor Statistics. Note: the sample is not longitudinal (ie not following the same people through time) and thereby compositional changes (eg the arrival of new workers with a lower wage) influence the median value. In Figure 10 we show the average real wage growth according to skill level, which is not a longitudinal sample either. Figure 10 suggests that there was some real wage increase even for low-skilled workers (though such an average statistic is also influenced by compositional changes). Still, Figure 10 confirms that the skill premium has increased in the United States.

However, the question remains of whether, in such analyses, education can be used interchangeably with skills, ie if we can credibly state that education translates into skill and thus has an impact on wages. The OECD Program for International Assessment of Adult Competences (PIAAC) provides an internationally compatible database of adult cognitive skills and skills needed in the workplace, namely literacy, numeracy and problem-solving. The results of the survey indicate that cognitive skills differ greatly depending on educational attainment. Figure 9 compares the mean numeracy score of adults with lower than high school education to the scores of those who have obtained tertiary education. Workers with tertiary education have higher numeracy scores in all countries, particularly in the US

where the mean score difference is greatest at 82 points between those with less than high school education and those with college education. France ranks second with a 78 point gap.

Figure 9: Mean score on the numeracy test by educational attainment, 2013
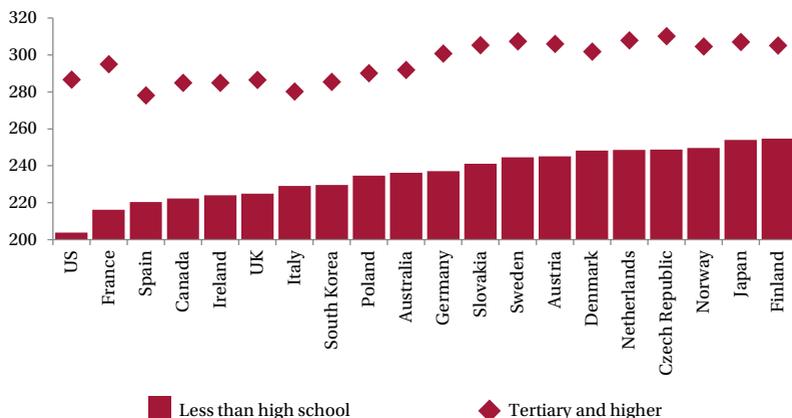
Source: OECD PIAAC survey, 2013.

However, over time, the skill premium has not increased everywhere. As Figure 10 shows, in the United States, the wages of high-skilled workers increased much more than the wages of low-skilled workers from 1995 to 2009. While such a development can also be observed in China and to a much lesser extent in Germany, exactly the opposite has happened in France, Italy, Spain, the United Kingdom, Sweden and Japan, where the wages of high-skilled workers declined relative to the wages of the low-skilled, while in Korea wages increased broadly at the same rate in all three skill categories. Consequently, there are major differences in the level of skill premium. While it is around 2.5 in the US and China, the EU average skill premium is around 1.6, albeit with significant differences between EU countries (Figure 11). Turkey and Brazil have the highest skill premiums among the countries considered.

Figure 10: Percent change in wage per hour worked from 1995-2009 (deflated by the consumer price index)
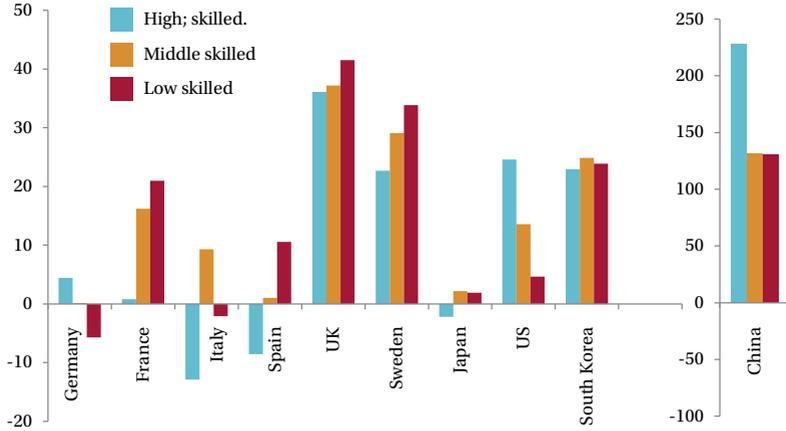

Source: World input output database, July 2014 release; Note: definition of skills follows 1997 ISCED level, where LOW encompasses primary education or first stage of basic education and lower secondary or second stage of basic education; MEDIUM is (Upper) secondary education and post-secondary non-tertiary education; HIGH is first stage of tertiary education and second stage of tertiary education.

One possible reason for the differences in the way skill premiums have developed is the supply of higher-educated workers. The supply of such people in a given year is composed of those who obtained their degrees earlier, those who obtained their degrees in the current year, the net immigration of people with university degrees, minus those who left the labour force because of retirement or any other reason. It is not easy to obtain data for each of these components, but we report two relevant indicators: the annual number of new graduates (representing the annual 'home production' of workers with university degrees) and the unemployment rate among people with tertiary education (which indicates the tensions in the labour market).

The number of new graduates has increased steadily in the EU and in the US (Figure 12). Interestingly, the total percent increase from

1998 to 2014 was very similar: 85 percent in the US and 90 percent in the EU. In our view, this slight difference in the number of new graduates cannot explain the major differences in the EU and US skill premium trends. On the other hand, there was a huge increase of new graduates in China, where the skill premium increased dramatically.

Figure 11: Relative earnings of workers by educational attainment (earnings of medium-educated workers = 100), 2013
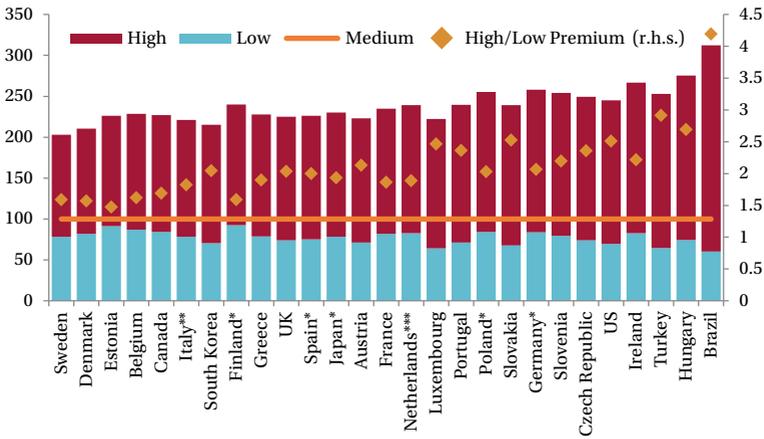

Source: OECD Education at a glance, 2015. Note: Adults with income from employment, medium education refers to upper secondary education and equals 100. (*) Data for 2012. (**) Data for 2011. (***) Data for 2010.

Moreover, the unemployment rate among people with tertiary education should be a useful indicator, reflecting the tightness of the labour market. Figure 13 shows that there is a statistically significant association between the unemployment rate among people with tertiary education and the change in the skill premium: a lower unemployment rate is associated with a higher increase in the skill premium, as expected. But the increase in the skill premium in the United States was much faster than the regression relationship would have implied. Figure 13 therefore suggests that the supply-demand conditions were

not the key determinants of the major skill premium increase in the United States, and that there were other reasons.

Therefore, relative to the EU and China, the data does not support the claim that a reduced supply of university graduates relative to demand has been one of the main reasons for the increased skill premium in the United States.

**Figure 12: Number of new tertiary education graduates per year, millions, 1998-2014**
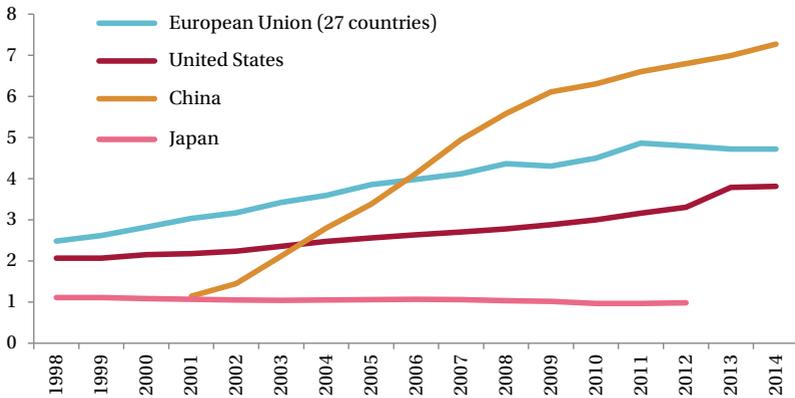
Source: Eurostat, OECD and Chinese Ministry of Education. Note: Tertiary education is classified as ISCED 5 and above/bachelor's degree and above.

In terms of the wage skill premium, Hanushek *et al* (2014) find that on average one standard deviation increase in numeracy score is associated with an 18 percent increase in wages. In Sweden, the Czech Republic and Norway the returns range from 13-15 percent, while in the US, Ireland and Germany the wage returns to skill average 24-28 percent, thus showing significant differences between countries.

Felgueroso *et al* (2010) document the reasons for the falling wage skill premium in Spain in two periods: from the mid-1980s and from the mid-1990s to 2010. The authors conclude that despite the significant increases in the number of graduates with tertiary education,

Spain recorded a falling wage skill premium starting from the beginning of 1990s. Over-education and a continuous mismatch between education and occupation explain the falling returns on education among high skilled workers. Structural changes to the Spanish labour market with a marked increase in temporary employment also contributed to the falling premium. Temporary contracts have affected workers of all ages and educational levels, in particular the middle skilled, which affects their employment and wages in later stages of their careers.

Figure 13: The correlation between the average rate of unemployment of those with tertiary education and the change in the skill premium, 1998-2009
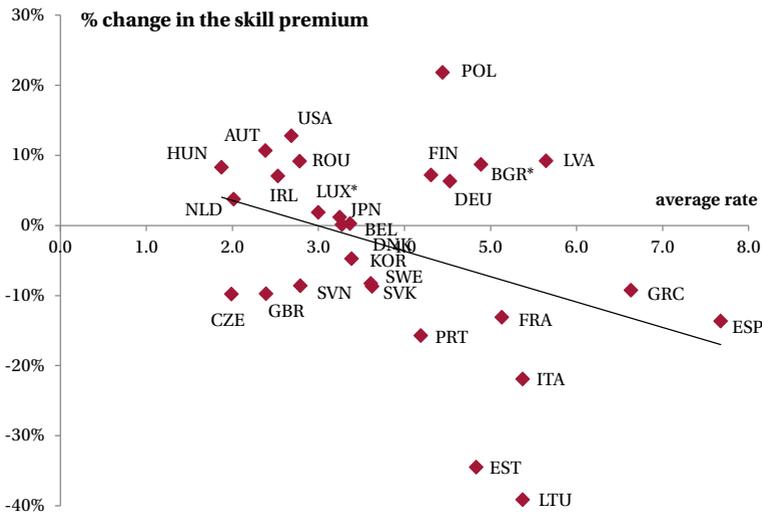

Source: Eurostat, OECD. Skill premium is calculated from World Input-Output database.

We note that the United States is also an outlier in terms of the relationship between the share of tertiary-educated workers and the tertiary education premium: in OECD countries where the share of tertiary-educated workers is high, the tertiary education premium

tends to be relatively low (Figure 14). But the United States and Ireland are exceptions to this trend and the relatively high share of tertiary-educated workers is associated with a relatively high tertiary education premium. On the other hand, Italy, where income inequality is relatively high, is an outlier on the other side: the very low share of tertiary-educated workers is associated with a rather low tertiary education premium.

Figure 14: Share of tertiary-educated workers and their relative earnings, 2013
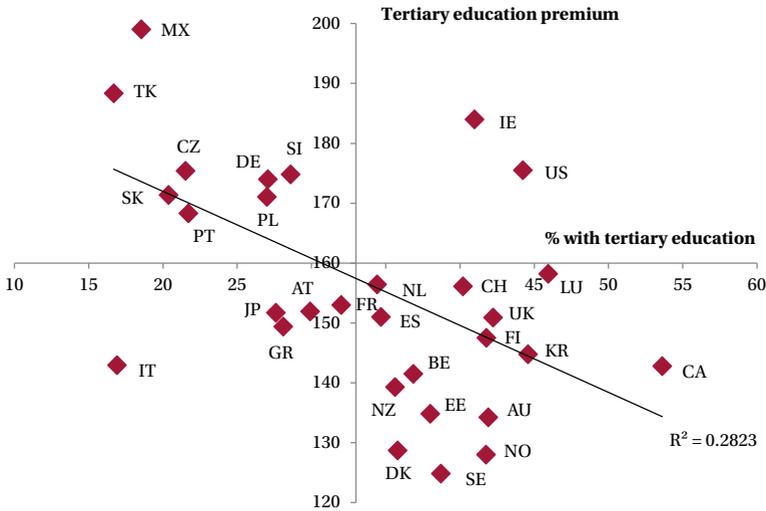
Source: OECD, Education at a glance 2015. Note: Workers with medium education= 100. Data for Netherlands: 2010; France and Italy: 2011; Australia, Canada, Finland, Japan, Poland, Spain: 2012.

Finally, we report data on the composition of the top 1 percent of income earners. If technological development was the key driver of the skill premium, then we would expect many high-tech sector workers to be in the top 1 percent. This is not really the case for the US: many of the top earners are lawyers, doctors and financial service employees, and very rarely ICT sector workers (Figure 15). Rothwell (2016) argues

that these high-earning sectors enjoy high levels of protection in the US and thereby enjoy unjustified rents relative to their skills.

Figure 15: Industries with the most top 1% earners in the United States
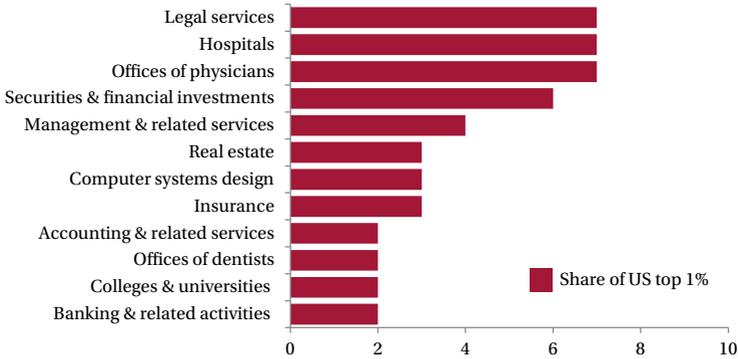
Source: Rothwell (2016).

Europe is different from the US in terms of the composition of the top 1 percent. As calculated by Denk (2015), after finance and insurance, manufacturing is the second industry with about 18 percent of the top 1 percent of earners, and ICT also ranks prominently. In Germany, manufacturing sector employees account for 34 percent of the top 1 percent of earners. Therefore, in Europe a larger share of technology-intensive sector workers are privileged to be in the top 1 percent, compared to the US.

To sum up, our comparison of countries suggests that even though technological change tends to favour those with greater skills, it is hard to see in the data how it has contributed to rising skill premia and consequent income inequalities. Most likely, other factors were more important, such as redistribution and education policies or regulation of certain professions. This result is in line with the findings of Anderson and Maibom (2016), who argue that political changes can explain the movements of the United States toward higher efficiency and lower equity during recent decades.

Figure 16: Industries with the most top 1% earners in the European Union
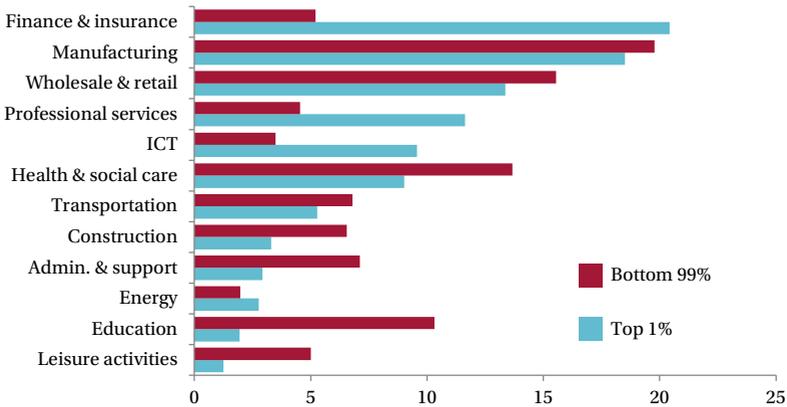
Source: Denk (2015). Note. Employees in the public administration are not available for all countries and are therefore removed from the sample for cross-country comparison. Germany is excluded from the average since its industry classification is different.

3.4 Technological change and the risk of 'robotisation'

Autor, Levy and Murnane (2013) argue that technology can replace human labour in routine tasks, whether manual or cognitive, but (as yet) cannot replace human labour in non-routine tasks. Combining these two strands, Goos and Manning (2013) argue for the UK that the impact of technology leads to rising relative demand in well-paid skilled jobs, which typically require non-routine cognitive skills, and rising relative demand in low-paid least-skilled jobs, that typically require non-routine manual skills. At the same time, demand for 'middling' jobs, that have typically required routine manual and cognitive skills, will fall. The authors call this process 'job polarisation'.

Acemoglu and Autor (2011) found similar results for the US and concluded that technological change increased the demand for skilled labour. Technology was incorporated into the subset of core job tasks previously performed by middle-skill workers, causing substantial change. When differentiating employment growth by occupation, one

can see similar developments also in Europe (Figure 17). The number of high-education jobs such as managers, engineers and

**Figure 17: Employment growth, 1995-2015, by occupation**
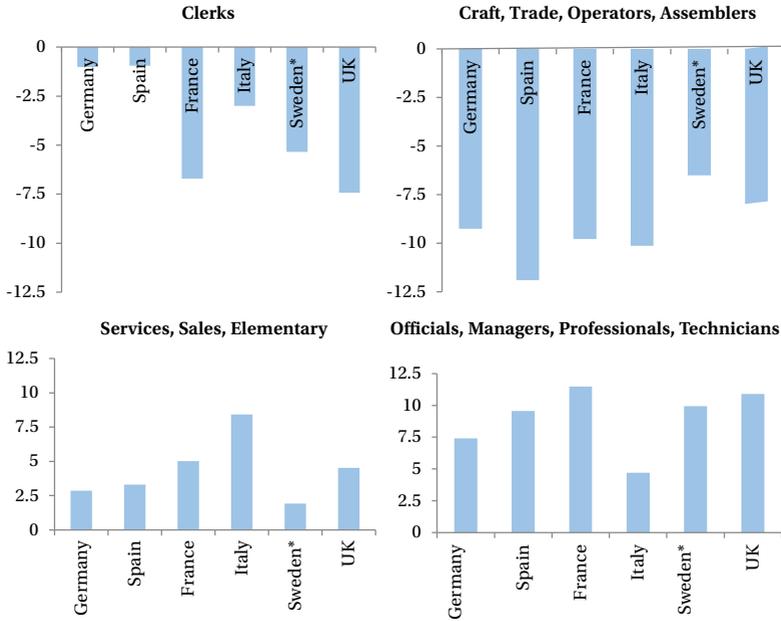
Source: Eurostat. *data for Sweden starts only in 1997. Note: Top left panel: Clerks include office clerks (eg secretaries and keyboard-operating clerks, library, mail and related clerks, etc) and customer services clerks (eg cashiers, tellers, client information clerks). Top right panel: Craft and related trades workers include extraction, building trades, metal, machinery, precision, handicraft, craft printing, food processing, wood treaters textile and related trades workers, while operators and assemblers include stationary-plant operators, machine operators and assemblers, drivers and mobile plant operators. Bottom left panel: professions included are service workers and shop and market sales workers, agriculture, fishery and related labourers, and labourers in mining, construction, manufacturing and transport. Bottom-right panel: professions include legislators, senior officials, managers and various professionals and technicians (including physical, mathematical, engineering science, life science, health, teaching, business, finance, legal, social science and other professionals, police inspectors and detectives). See the complete classification here: http://ec.europa.eu/eurostat/documents/1012329/6070763/ISCO88.pdf/192120ae-49cb-4f24-bfbc-06f054471e3b.

health professionals, is growing, while the number of middle-education jobs (clerks, machine operators, assemblers) is declining. By contrast, the number of low-education service occupations, such as shop workers, which are non-standard and difficult to replace by automatisation, is growing. Looking ahead, a second wave of robotisation is on its way, in which intelligent robots will more and more be capable to carrying out high skill level jobs. In recent years, a series of studies has revived the debate about robotisation taking over jobs. Frey and Osborn (2013) in particular sparked a debate by claiming that 47 percent of US jobs are at risk of being automated. Bowles (2014) redid these calculations for the European labour market, and found that on average, 54 percent of EU jobs are at risk of computerisation.

By contrast, Arntz *et al* (2016) argue that one of the major limitations of Frey and Osborn is that they view occupations rather than tasks as being threatened by automation. They therefore focus on the task-content of jobs, and find that in the US only 9 percent of jobs (as opposed to 47 percent) are potentially automatable. Figure 18 shows their results by country. Breaking down the risk according to educational attainment (Figure 19), one can see that low-educated workers will likely bear the brunt of technological change related adjustment costs.

What these estimates imply for policy is clear: if we believe that technology will start to be able to cope with non-routine cognitive tasks then we must equip the next generation of workers with skills that benefit from technology rather than being threatened by it. Such skills are likely to emphasise social and creative intelligence, which suggests that appropriate shifts in education policy are surely required in order to meet the challenge of automation.

Figure 18: Potential for automation of jobs, OECD countries
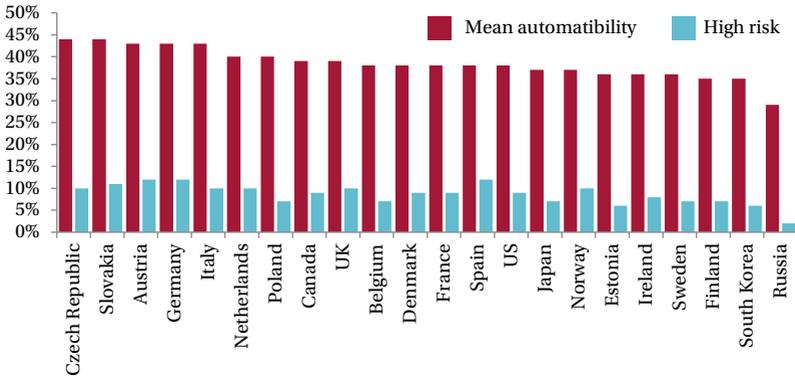
Source: Arntz *et al* (2016) based on the Survey of Adult Skills.

Figure 19: Share of people with at risk of automation of their jobs by educational level and country
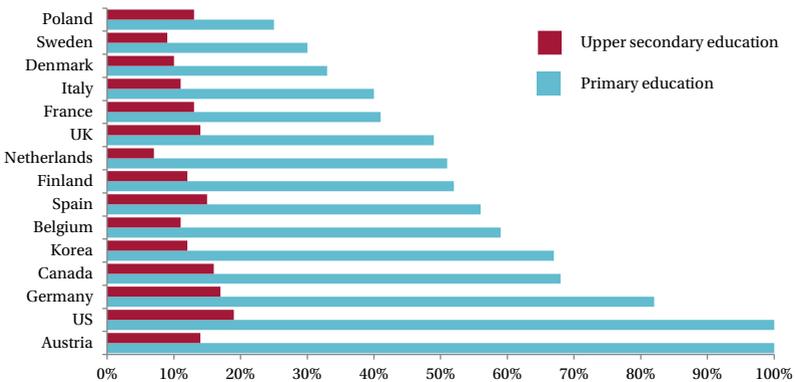
Source: Arntz *et al* (2016) based on the Survey of Adult Skills.

3.5 Wage share and globalisation

Wages as a share of GDP have been falling in advanced countries, including in the EU (Figure 20). There is a vivid debate in the academic literature on the underlying reasons. A falling labour share can be regarded as a concern for inclusive growth because the distribution of capital income is very unequal in society. As a result, a falling labour share will lead to a decline in income for a large part of the population, accentuating inequality. Some blame globalisation and the integration of low-wage developing countries into world trade. Karabarbounis and Neiman (2014) show that the share of national income going to labour has been falling for several decades. They explain the falling labour share as a consequence of technological development that increase the productivity of capital relative to labour. However, their results assume an elasticity of substitution between capital and labour that is greater than 1, a hypothesis also advanced by Piketty. This elasticity of substitution is at odds with large parts of the empirical literature (for a discussion see Lawrence, 2016). Most of the empirical literature finds that this elasticity is smaller than 1, which would imply that capital and labour are not substitutes but complements. To the best of our knowledge, this issue has not been further investigated for the EU. In particular its implications for economic developments in the euro area remain unexplored. We leave this for further research.

Figure 20: Wages as a share of GDP
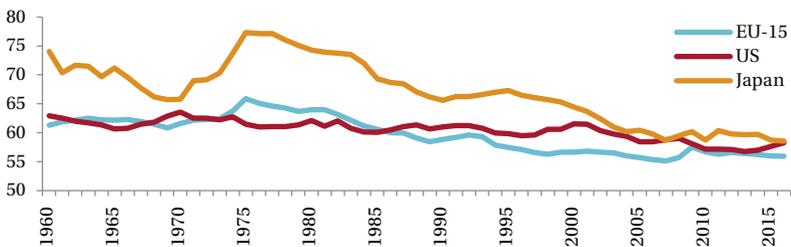
Source: Ameco database. Note: Wage share in GDP denotes the compensation per employee as percentage of GDP at market prices per person employed.

4. Prospects for social mobility in Europe

The Great Gatsby Curve (Figure 1) shows that higher income inequality is associated with less social (or intergenerational) mobility. The indicator of social mobility, the elasticity between parental earnings and their children's adult earnings, is relatively high in Italy and the United Kingdom, and much lower in Denmark and Finland. France, Germany and Sweden are in between.

Unfortunately, other European Union countries are not included in Corak (2013), on which this Great Gatsby Curve is based. Moreover, given that the calculation of intergenerational earnings elasticity requires decade-long data, the Great Gatsby Curve in itself does not allow the assessment of changes over time in intergenerational earnings elasticity.

Given that social mobility is a major aspect of inclusive growth, in this section we look at further indicators that might describe social mobility.

4.1 Poverty

Poverty in the EU is different to poverty in developing and emerging countries. The level of poverty as measured by an income of less than $2.50 a day is close to zero in the EU (see Table 1 in the introduction). Therefore, poverty has to be measured differently in the EU.

A widely-used indicator is the so-called 'at risk of poverty' indicator, which is one of the three indicators for which the EPSCO (Employment, Social Policy, Health and Consumer Affairs Council) set targets in the context of the Europe 2020 Strategy. This indicator

measures the share of people with a net income after social transfers of below 60 percent of the national median equivalised disposable income. However, as first noted by Darvas and Tschekassin (2015), even though the word 'poverty' is part of the name of this indicator, it is not measure of poorness, but a measure of income inequality: the correlation coefficient between this indicator and the Gini coefficient of income inequality is very high at 0.9, as Figure 21 indicates[9]. There could be good reasons to aim for a reduction in income inequality, yet it is unfortunate that the main EU target indicator for this goal is inaccurately named.

In the EU, the most suitable indicator of poverty is the so-called severe material deprivation rate, which represents the proportion of people who cannot afford at least four of nine basic items, including utility bills, warm food, adequate heating or a car (see definition in the note to Figure 22)[10].

The first panel of Figure 22 shows that poverty rates differ greatly in different EU countries. The rate is higher in the countries that joined the EU in 2004 and after. It increased significantly during the crisis in Greece, Ireland, Portugal, Italy and Spain. On the other hand, in 'core' EU15 countries, the poverty rate has been relatively stable at about 5

9 Eurostat's glossary also notes that "*this indicator does not measure wealth or poverty, but low income in comparison to other residents in that country, which does not necessarily imply a low standard of living*". Furthermore, the differences between the national thresholds (which are used to calculate the at-risk-of-poverty-rate) are so huge that they further underline the inappropriateness of this indicator for assessing poverty trends in Europe. For example, after taking prices into account, someone at the national threshold in Austria (who is regarded 'poor' in Austria according to this indicator) can consume twice as much in goods and services as someone at the national threshold in the Czech Republic (who is regarded 'poor' in the Czech Republic according to this indicator).

10 The nine items are: 1) (arrears on) mortgage or rent payments, utility bills, hire purchase instalments or other loan payments; 2) one week's annual holiday away from home; 3) a meal with meat, chicken, fish (or vegetarian equivalent) every second day; 4) unexpected financial expenses; 5) a telephone (including mobile phone); 6) a colour TV; 7) a washing machine; 8) a car and 9) heating to keep the home adequately warm.

percent on average and there was hardly any change during the crisis.

The second panel of Figure 22 shows poverty rates according to education level. Clearly, poverty is much more widespread among low-educated people and they suffered during the crisis, while highly-educated people have low levels of poverty, has and this did not change much during the crisis years.

Figure 21: Correlation between the Gini coefficient of income inequality and the at-risk-of-poverty indicator
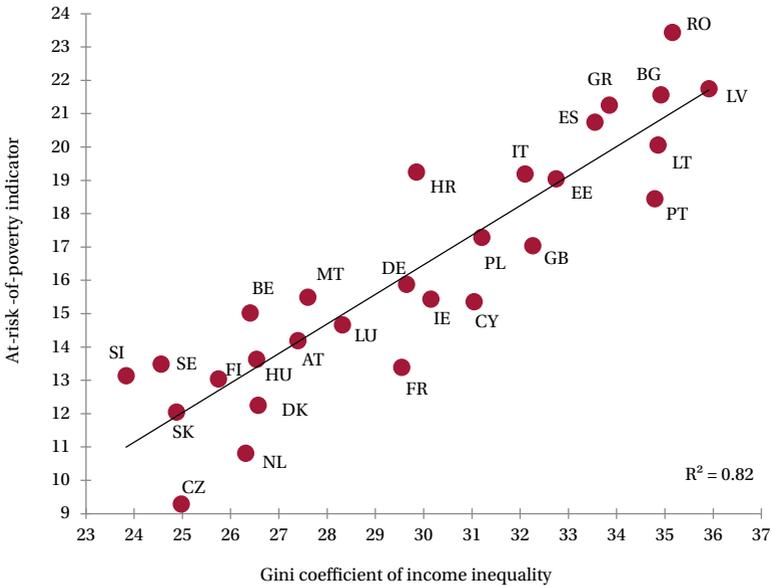
Source: Bruegel using data from Eurostat. Note: both indicators are averaged over 2007-2015. The correlation coefficients between the two indicators in each year between 2007 and 2015 are: 0.92, 0.90, 0.88, 0.89, 0.85, 0.85, 0.87, 0.83 and 0.92. The correlation coefficient between the 2007-2013 time averages of the two indicators is 0.90. The at-risk-of-poverty indicators is 'At risk of poverty rate (cut-off point: 60 percent of median equivalised income after social transfers)', while the Gini coefficient is the 'Gini coefficient of equivalised disposable income'.

The third panel of Figure 22 shows poverty rates according to age group. The striking feature is that poverty is much more common

among children than among the elderly, while for people of working age, the rate in between. The gap between young and old widened during the crisis: while it was a benign development that elderly people faced only a small increase in poverty during the crisis, and the poverty rates of the elderly are now well below pre-crisis rates, it is especially worrying that children suffered a large increase in poverty during the crisis years and the current levels of poverty among children remain relatively high.

Figure 22: Severe material deprivation rate in the EU, 2005-15
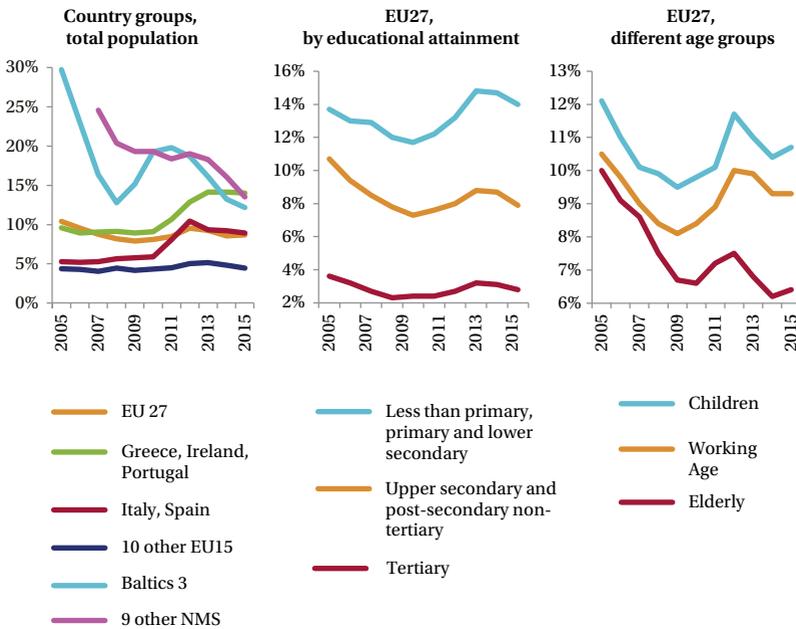
Source: Eurostat. Note: The severe material deprivation rate represents the proportion of people who cannot afford at least four of the nine following items: 1) (arrears on) mortgage or rent payments, utility bills, hire purchase instalments or other loan payments; 2) one week's annual holiday away from home; 3) a meal with meat, chicken, fish (or vegetarian equivalent) every second day; 4) unexpected financial expenses; 5) a telephone (including mobile phone); 6) a colour TV; 7) a washing machine; 8) a car and 9) heating to keep the home adequately warm.

Figure 23: Change in severe material deprivation rate by educational attainment, change from 2008-2013

Change in the severe material deprivation with highest level of education
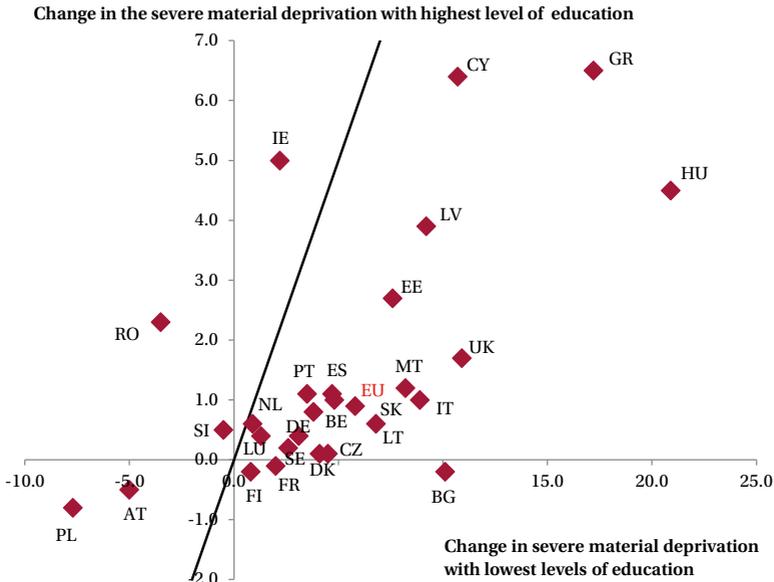
Source: Eurostat. Note: Highest level of education refers to first and second state of tertiary education and lowest level of education refers to pre-primary, primary and lower secondary education. The X axis shows the change in the severe material deprivation rate of those having the lowest level of education and Y axis shows the change of the same rate but of those having the highest level of education (from 2008 to 2013). The solid line indicates the same values on the two axes, that is, in countries to the right of this line people with low education levels suffered more than people with high education levels.

Figure 23 compares the increases in the severe material deprivation rate of low-educated and highly-educated people between 2008 and 2013. Clearly, the lowest educated groups experienced a greater increase in their rate of severe material deprivation compared to the highest educated groups in most countries, the exceptions being Ireland, Romania, Slovenia, Austria and Poland. Poland and Austria saw reductions in the rate of material deprivation for both educational categories, while in Romania and Slovenia the rate of severe material

deprivation declined for the lowest educated groups, but rose for the highest educated groups.

4.2 Education

A crucial factor for upward social mobility is the ability of a child to attain a higher level of education than his/her parents. In disadvantaged families, the highest rate of return in early childhood development comes from investing as early as poosible, because skills beget skills in a complementary and dynamic way, as highlighted by Heckman (2012). Figure 24 shows for European countries the education levels of children whose parents have a low level of education. There are considerable disparities with Malta having the biggest share of low-educated children whose parents similarly have low education, followed by Portugal, Luxembourg and Italy. In contrast, in the UK and Finland the share of children obtaining a high level of education despite having low-educated parents is high.

Figure 24: Highest level of education of children whose parents have low education, age group 25-59, 2011
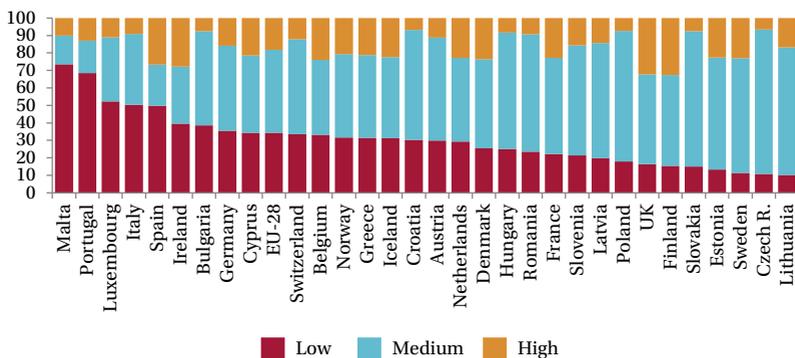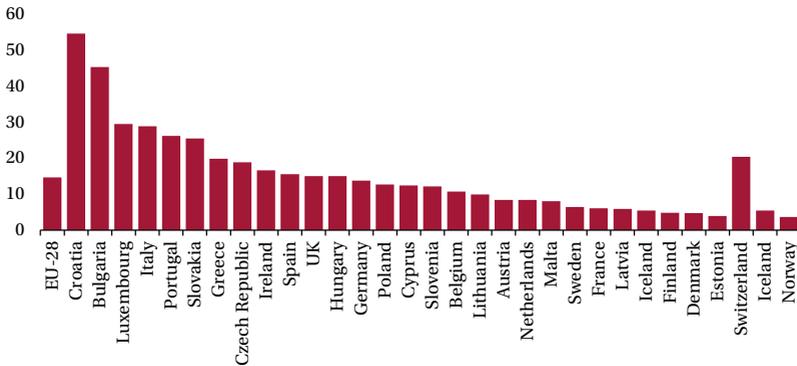

Source: Eurostat.

Figure 25 shows the association index, which measures the persistence of low education in parents and their children (see the note

to the figure for explanations). This persistence is high in Croatia and Bulgaria, whereas in Estonia, Denmark and Finland there is a low level of persistence of low education.

Figure 25: The association index, low-education parents having low-education children, age group 25-59, 2011

Source: Eurostat, Intergenerational transmission of disadvantage statistics. Note: The association index is calculated as an odds ratio and measures how strongly the low level of education of adults is related to the low level of education of parents compared to the high level of education of parents. Odds are expressed as the probability of an event occurring divided by the probability of the event not occurring. The odds ratio is a tool to show how strongly having or not having a certain property in the population is related to having or not having another property in that population.

OECD (2011) highlighted the association between the socio-economic status of parents and the educational achievement of children. A one unit increase in the *PISA index of social, cultural and economic status* is associated with a 38 score point difference in reading performance (Figure 26). On average, according to the OECD, 14 percent of the variation in students' reading scores can be explained by their families' socio-economic status. The highest value is observed in Hungary, where 26 percent of the variation in students' reading scores can be explained by the parental socio-economic status, whereas in Iceland and Estonia, only 5-8 percent of the variation can be explained by students' socio-economic status. Students in Shanghai-China,

Korea, Finland, Canada and Japan have above OECD average reading performance and at the same time below-average impact of parental socio-economic background on children's school performance. By comparison, in Belgium and New Zealand students score high in reading performance and their socio-economic background has an above average impact on their reading performance. Interestingly, three of the highest performers, Shanghai-China, Korea and Finland all exhibit a below-average impact of socio-economic background on children's reading performance.

Figure 26: Relationship between students' reading performance and socio-economic background

Source: Education at a Glance, OECD Pisa database 2009. Note: Impact of socio-economic background (plotted on the vertical axis) is measured by standardized PISA index of social, cultural and economic status based on the socio-economic information provided by students regarding their parents. The index shows the percentage of variation in students' performance explained by their parental socio-economic background (parental education, occupation, number of books in the house etc) The horizontal axis shows reading scores.

Finally, we highlight that the negative association between income inequality and the inter-generational transmission of disadvantage applies to learning outcomes, as demonstrated by Sandefur (2015) for a sample of 52 countries. He measured the inter-generational transmission of learning outcomes by looking at the correlation between the wealth of parents and the reading and maths scores of children as measured by PISA scores, which corresponds to the Great Gatsby Curve for learning outcomes. Figure 27 clearly demonstrates that there is a strong correlation: in more unequal societies, the wealth of parents is more relevant for educational outcomes. This relationship is stronger in the global sample, but also visible within the European Union.
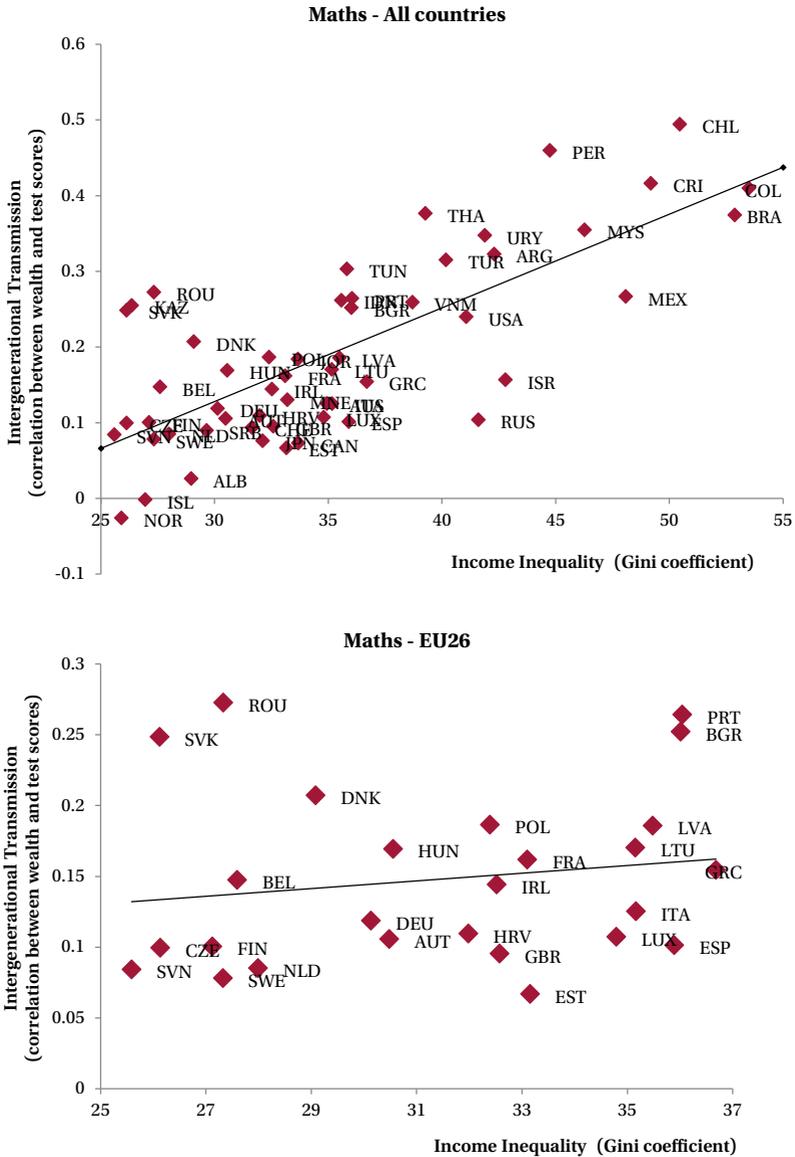
4.3 Health

Regional data for 20 EU countries shows that the relationship between household disposable income per capita and life expectancy at birth is generally positive (Figure 28). However, panel A of Figure 28 suggest that the relationship is non-linear. To better represent non-linearity, panels B and C separate regions where disposable income per capita is below $15,000 from those where it is above $15,000.

Per-capita income has a strong positive relationship with life expectancy for lower income groups for which disposable per-capita income is $5,000 to $15,000. Among the 20 EU countries considered, the lowest life expectancy is recorded in Central Estonia at 72.6 years with corresponding income per capita of $6,898 followed by the regions of Hungary, Slovakia, Poland and the Czech Republic. By contrast, the relationship between income and life expectancy diminishes for regions where per-capita income is above $15,000.

Interestingly, in countries with high income differences within regions, such as the UK, Spain and Italy, the differences in life expectancy are relatively small, suggesting that the regional differences shown by Figure 28 arise primarily from differences between countries.

## Figure 27a: The Great Gatsby Curve for reading test scores

Reading - All countries

Reading - EU26

Source: Sandefur (2015) for intergenerational transmission and SWIID for Gini coefficient.
Note: Malta and Cyprus are missing due to data limitations.

Figure 27b: The Great Gatsby Curve for maths test scores

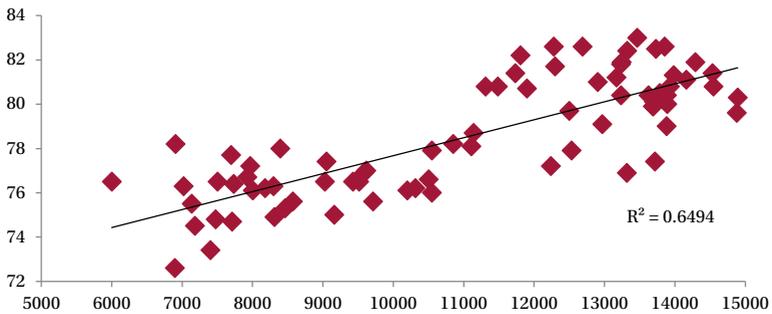Maths - All countries

Maths - EU26

Source: Sandefur (2015) for intergenerational transmission and SWIID for Gini coefficient.

Figure 28: Regional household disposable income per capita (2005 US dollars) and life expectancy, 2013
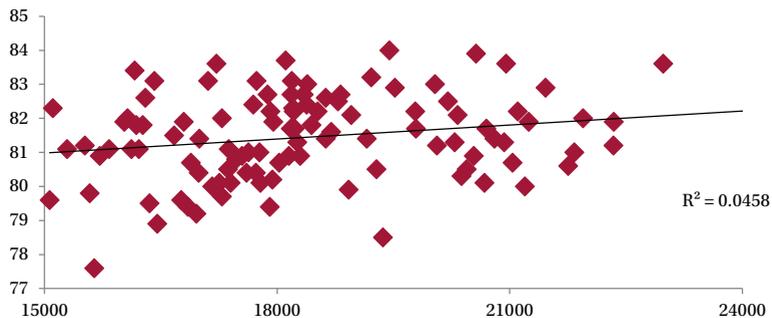
a) All regions
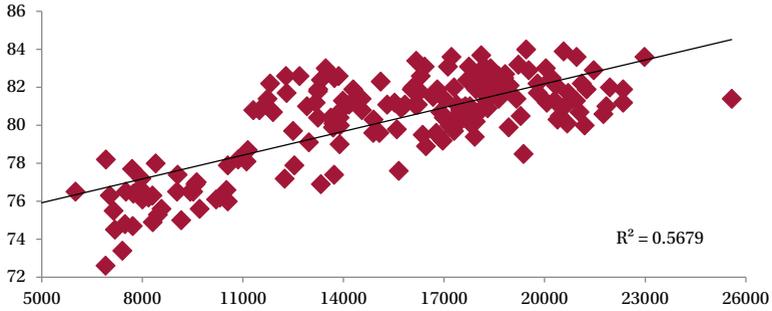

b) Income from 5,000-15,000 USD

c) Income from 15,000-26,000 USD

Source: OECD Regional well-being statistics and Eurostat. Note: Correlations across 184 regions of 20 EU countries.

Educational levels are clearly associated with life expectancy. Figure 29 shows that better-educated people enjoy longer life expectancy at age 25 for all countries for which this data is available. The biggest difference in expectancy depending on education level is observed for Estonia, where remaining life expectancy of the most educated group at age 25 is 57.2, compared to 43.4 for the lowest educated group. Estonia is followed by Bulgaria, where the gap is 9.8 years between the most and the least-educated groups. In contrast, southern European countries such as Italy and Portugal tend to have smaller gaps.

Figure 29: Remaining life expectancy at 25 years by educational attainment, 2013
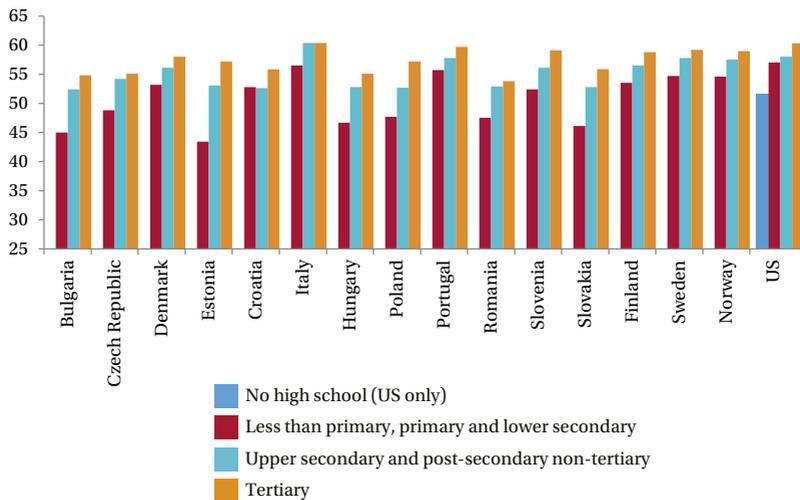
Source: Eurostat and US Census Bureau. Note: Rest of the EU (13 countries) omitted because of missing data. For US, less than primary, primary and lower secondary education is split between high school graduates and no high school due to the non-availability of combined data.

Countries with higher public health expenditure per person tend to have lower proportions of individuals reporting bad and very bad health (Figure 30). This suggests that the rich, who can afford to spend

more on health, are healthier than the poor, who can afford less.

Figure 30: Share of persons 16+ reporting bad/very bad health relative to sickness/health public expenditure per person
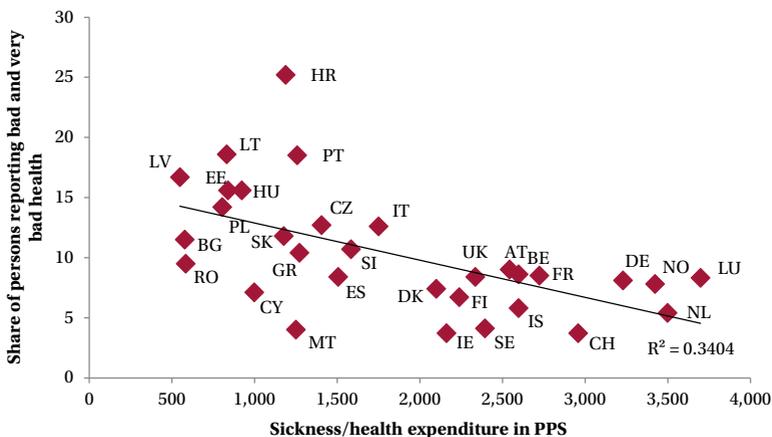
Source: EU-SILC, self-perceived health and Eurostat social protection statistics.

Obesity is another aspect of health. Rates of obesity do not correlate much with income inequality (Figure 31), but are strongly associated with educational achievement levels: well educated people are less obese than low-skilled people (Figure 32).

Infant mortality is another indicator related to income level. Figure 33 shows that infant mortality per 1000 births is higher in regions where income per capita is lower. The figure suggests a strong relationship for regions with income levels of less than about $10,000 per capita, while above this income level there is no further decline in infant mortality with an increase in income.

Figure 31: Correlation between the rate of obesity in men and women and the Gini coefficient, 2012
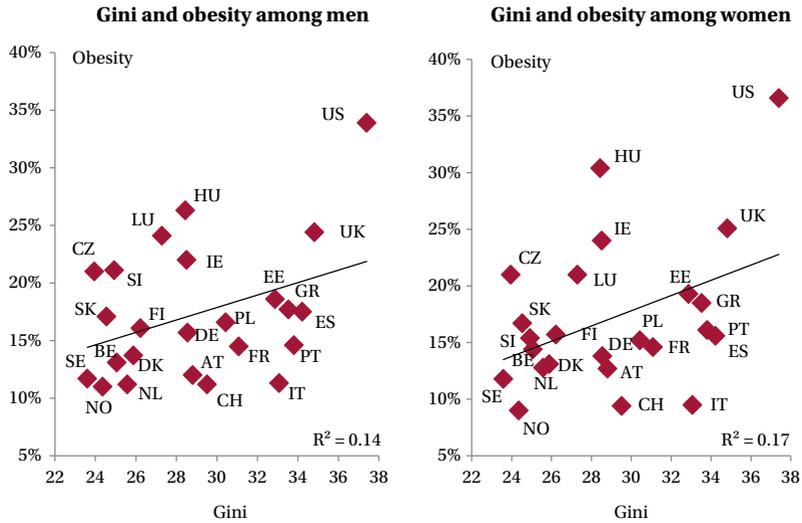
Source: OECD, Obesity update 2014. Note: % of population aged 15 years and over.

Figure 32: Obesity rates in the EU by level of education
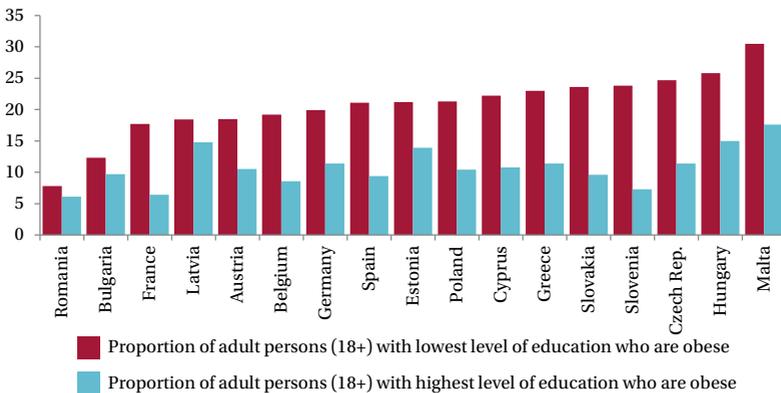
Source: Eurostat. Note: Lowest level of education refers to primary, pre-primary and lower-secondary level of education. Highest level of education refers to first and second state of tertiary education.

Figure 33: Infant mortality rates per 1000 births relative to regional household disposable income per capita in 264 EU regions, average rate for 2003-2013
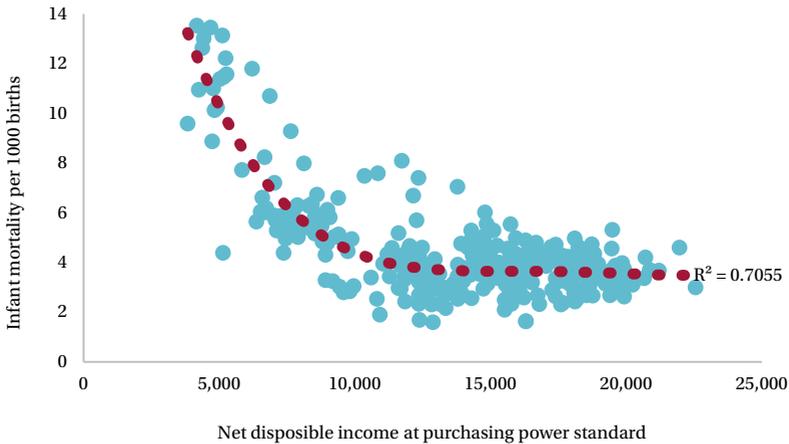

Net disposable income at purchasing power standard

Source: Bruegel based on Eurostat, NUTS 2 regional data, 25 countries, 264 regions excluding 4 French overseas *départements*. Note: disposable income per capita in purchasing power standard.

4.4 The intergenerational divide

Panel C of Figure 22 showed that severe material deprivation among the young has increased relative to poverty among the elderly. There are various other indicators suggesting that the intergenerational divide is on the rise in the EU.

Figure 34 reports the percentage point change from 2008 to 2014 of the indicator 'share of people at risk of poverty or social exclusion rate'. As we have argued, this is not an indicator of poverty, but a measure of income inequality. Consequently, Figure 34 should not be read as showing an indicator of poverty, but rather, as showing whether the young and the old have moved up or down relative to other segments of society. The figure clearly highlights that in most EU countries the old have experienced a substantial reduction while the young have seen a substantial increase in this indicator, suggesting that the relative

income position of the old has improved, while the relative income position of the young has deteriorated. The position of the young has deteriorated especially in Greece, Spain, Hungary, Luxembourg and Malta.

Figure 34: Change in the share of people at risk of poverty or social exclusion by age group, 2008-2014
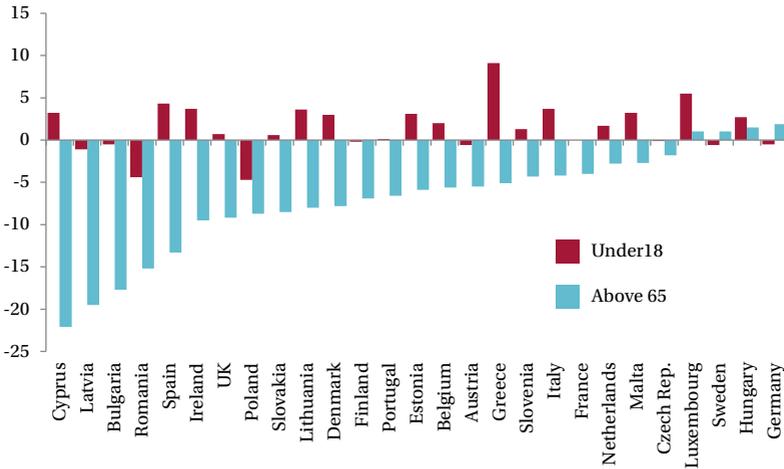
Source: Bruegel based on Eurostat. Note: Croatia is omitted because of missing data.

Young people in Europe have been impacted more by unemployment than old people (Figure 35). While unemployment rates among young people (defined in Figure 35 as aged 20-29) were higher than among older workers even before the crisis, the increase during the crisis was much more significant for the young. Panel B of Figure 35 also highlights that lower-educated people faced higher unemployment rates even before the crisis and they suffered more during the crisis.

Figure 35: Unemployment rate in the EU by age group and level of education

A) Unemployment by age groups, EU27, 2000-15
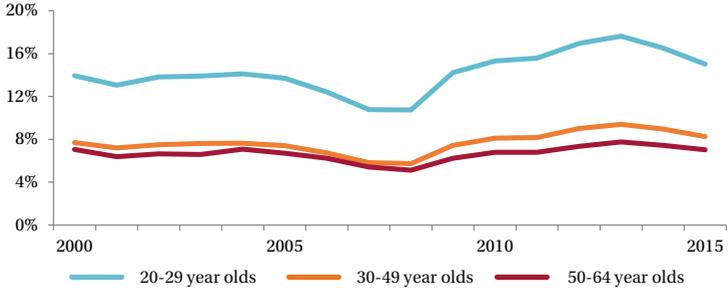
B) Unemployment by level of education, EU27, 2000-15
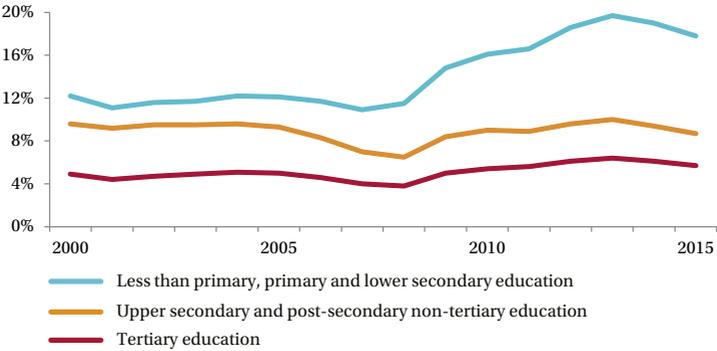
C) Unemployment by level of education, EU countries, 2015
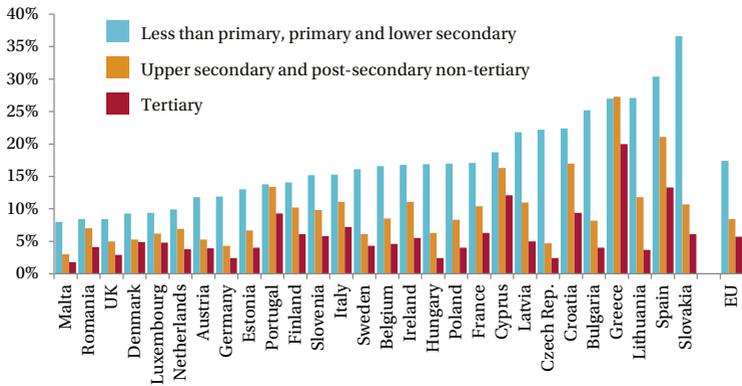
Source: Bruegel based on Eurostat's Labour Force Survey.

Since young people have the option to study or participate in training, Figure 36 shows the so-called NEET indicator (not in employment, education or training). This indicator is significantly different for different EU countries. While the share of NEETs in the Netherlands is only 7.4 percent of the total youth population aged 18-24, in Italy the figure is as high as 29 percent, an alarming proportion. In general, southern European countries and central and eastern European countries have higher shares of inactive youth compared to other EU countries.

Figure 36: Share of young people not in employment, education or training, aged 18-24, in the EU, Norway, Switzerland and Turkey, 2015
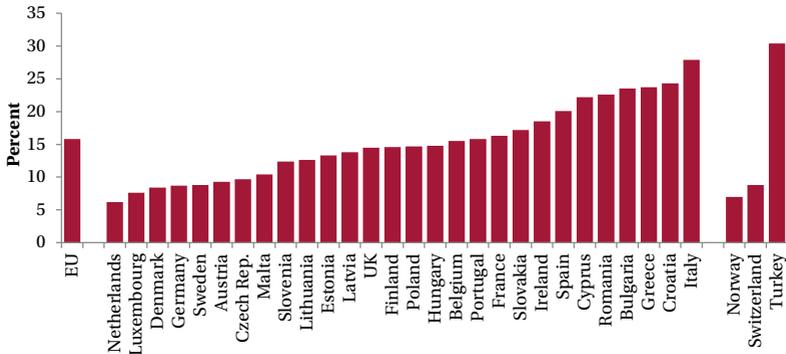

Source: Eurostat. Note: Young people aged 18-24 years not in employment, education or training (NEET) as a percentage of total population in the respective age group.

The share of youth NEETs also varies in different regions within countries. Figure 37 shows the regional minimum, maximum and median NEET values for EU countries. The lowest share of NEET youth is in south Netherlands (6.3 percent), while in Sicily, 42.1 percent of people aged 18-24 fall into the NEET category. Intra-country differences are striking particularly for southern European countries. For example, in Italy, the province of Bolzano-Bozen has the lowest share of NEET youth in the country with 11.7 percent, well below Sicily's 42.1 percent.

**Figure 37: Share of young people not in employment, education or training ,
aged 18-24, by large regions within the EU, 2014**
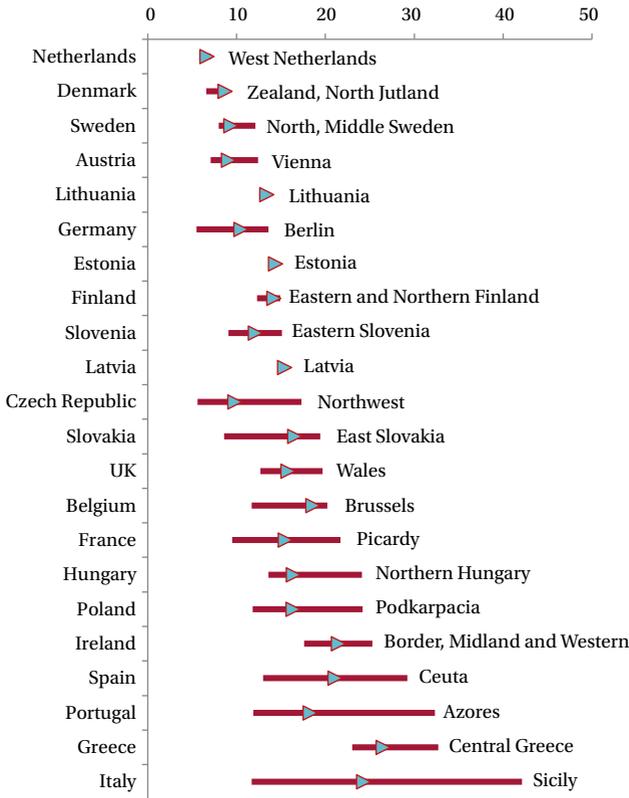
Source: OECD, Regional statistics. Note: The chart shows the maximum, minimum and the median values by large regions within countries. The named regions are those with the highest NEET values within each country.

Finally, we highlight that in regions with greater income inequality, youth unemployment tend to be higher. This relationship is especially strong for Italy and Spain, as Figure 38 shows.

Figure 38: Relationship between the Gini coefficient and youth unemployment rate by regions, 2010
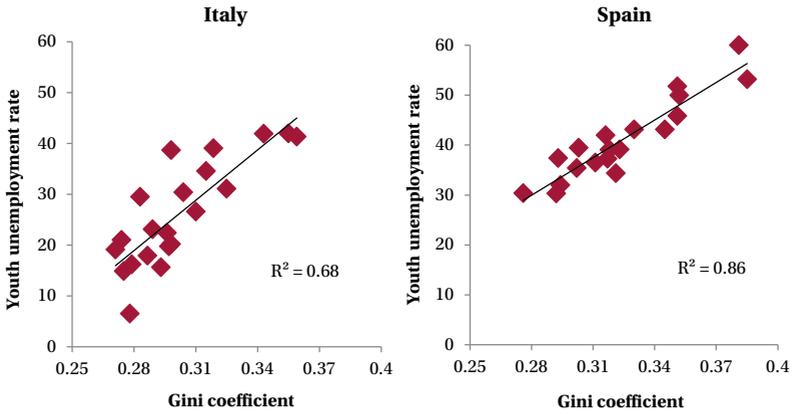
Source: Eurostat.

5. National and European Union policies for fostering inclusive growth

The EU is often perceived to be on the wrong side of the inequality and inclusive-growth debate. It is seen as pushing the integration of markets and allowing the off-shoring of production to other countries, without properly taking care of the losers from 'Europeanisation' and globalisation.

Our assessment of inclusive growth provides a more nuanced picture. In particular, we find that income inequality in the EU is among the lowest in the world. For the EU as a whole, the Gini coefficient has been falling since the mid-1990s. This is evidence of the power of integration and the convergence of EU countries, in particular the convergence of the eastern European countries with the more developed EU countries. But the data also shows that within countries, income inequality has tended to slightly increase in recent years. Moreover, the countries of southern Europe in particular are characterised by relatively high levels of income inequality.

Tax policy and social policy are almost exclusively national competences in the EU. Similarly, labour laws or education policies, which are of central importance if individuals in our societies are to achieve their full potential, are national-level policies. Most of the instruments that directly influence the inclusiveness of growth are thus in the hands of national policymakers. We therefore first explore those national policies before discussing EU policies.

The first question concerns the adequacy of national policies for fostering social mobility. A crucial national policy is education: early childhood education has a decisive role for children and we have shown that children born to disadvantaged families are particularly affected if their education is inadequate. Typically, educational performance depends on the educational levels of the parents, but in some north European countries this is less the case than in southern European countries and the United Kingdom. The expansion of jobs with tertiary-educated workers (the only job category that increased since 2008 both in the EU and the US) highlights the crucial role of education in social mobility. Beyond the general point that reduced income inequality is likely to improve social mobility, these results point to the importance of education system reform to make upward mobility more feasible. Moreover, the education system must equip the next generation of workers with skills that benefit from technology rather than being threatened by it, especially if technology will start to be able to cope with non-routine cognitive tasks. Such skills are likely to emphasise social and creative intelligence, which suggests that appropriate shifts in education policy are required in order to meet the challenge of automation.

A second question concerns the efficiency for addressing inequality of national redistribution systems. Figure 39 shows that a given level of social expenditure can lead to very different reductions of inequality in a cross-section of EU countries. Similarly, taxes on labour income reduce income inequality to different degrees. This suggests that the efficiency of national redistribution schemes varies widely. For example, Greece and Sweden dedicate similar amounts of resources to social expenditure, yet Sweden achieves a reduction in market income inequality of almost 50 percent while Greece only achieves 30 percent. Surely, reform of national redistribution schemes must be a top priority if income inequality in southern Europe is to be addressed.

Figure 39: Correlation between the reduction of market income inequality thanks to the social redistribution system and two fiscal indicators, average for 2000-14
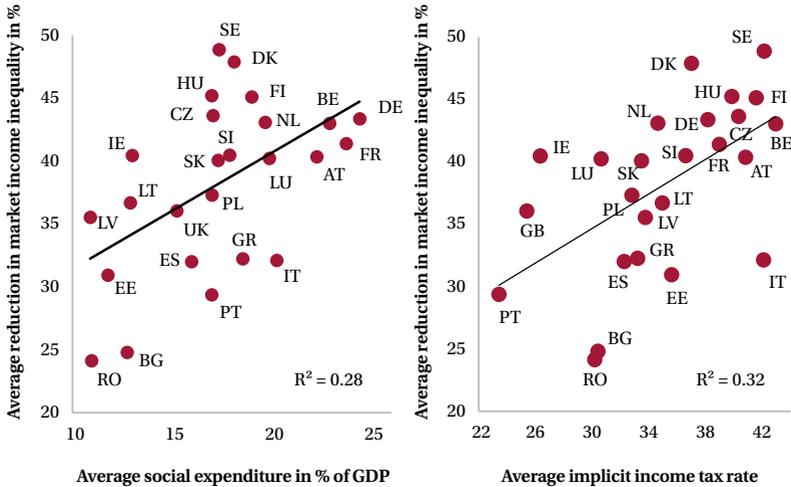
Source: Updated from Darvas and Wolff (2014) using data from The Standardized World Income Inequality Database (SWIID) and Eurostat.

A third issue is the extent of redistribution and how progressive tax systems are. In the past three decades, the top statutory personal income tax rate has been cut in most OECD countries. The average for 23 OECD countries was 66 percent in 1980, falling to 46 percent in 2010. In the same period, the number of personal income tax brackets has been reduced from an average of 14 in 1981 to around five by 2000. Most likely, these tax system changes contributed to lower progressivity of income taxes, which may have been one of the reasons behind increases in (after tax) inequality in a number of countries. Still, Figure 40 suggests that there are major differences between countries in terms of their top income tax rates. It is notable that the countries with the highest top income tax rates (Sweden, Belgium and Denmark) tend to be characterised by relatively low income inequality, suggesting that tax policies, and in particular how progressive the income tax code is, have implications for (post-tax) inequality.

Figure 40: Top personal income tax rates (%),selected OECD countries, 1981-2010
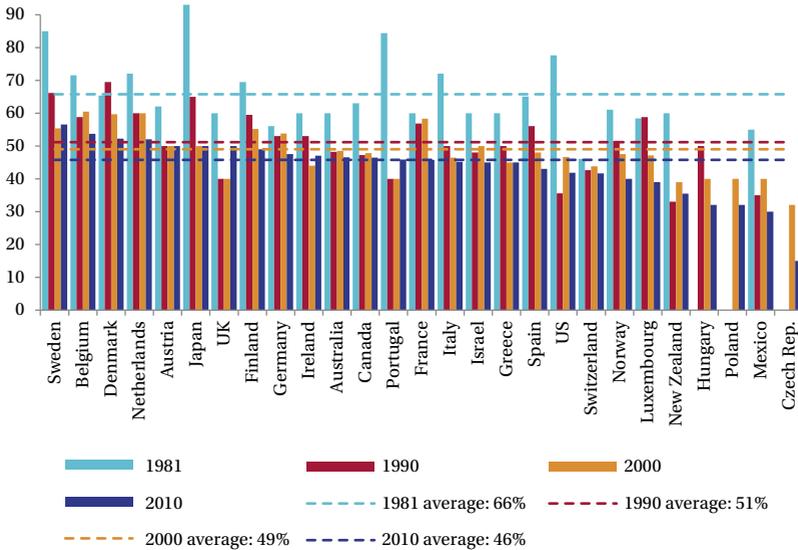
Source: OECD. Note: Average figures are based on the 24 countries for which data was available for the full period. Hungary, Poland and the Czech Republic, for which data is not available for earlier years, are not included in the average.

Fourth, we have documented that unlike in the US and China, the skill premium in most European countries has not increased in the past two decades. This casts some doubt on the hypothesis that skill-biased technical change is the main reason for the increase in skill premia in the US. Rather, protection of certain sectors might be one of the reasons behind the increase. Most of the top 1 percent of income earners in the US are not in sectors that have seen high degrees of technological change, but are often in professions, such as lawyers or doctors. A careful review of how protected different sectors are in different European countries could be a useful contribution to addressing some of the inequality issues that arise out of rents accruing to the top income earners.

A fifth important question concerns more recent economic policy decisions in the EU and in particular, fiscal adjustment strategies during the recent crisis. Beyond its speed, the composition of fiscal consolidation is crucial for influencing social conditions. In response to the crisis, EU countries have cut public investment spending significantly. The fiscal multiplier is estimated to be comparatively high for this expenditure category (see for example Heppke-Falk, Tenhofen and Wolff, 2010, for estimates for Germany). The cuts therefore had a strong effect on GDP and, consequently, on employment. Social spending was broadly maintained. However, Table 2 shows that the distribution of social spending changed significantly. In particular, expenditure for pensions was sustained or even increased, while expenditure for families and education was cut. This has been particularly true in the countries that faced the greatest fiscal pressures.

A sixth and major issue concerns youth unemployment and unemployment more generally. EU countries are not doing well in that area – also not in international comparison. Of course, there is a national institutional aspect to youth unemployment. In some countries, the ratio of youth unemployment to total unemployment is higher than in others. This suggests that in these countries, the labour market institutions are particularly unfavourable towards the young. However, there is also a broader macroeconomic dimension. Youth unemployment and unemployment in general increased massively in the course of the crisis. The slow resolution of the crisis, and the depth and the length of the recession have taken a major toll on the prospects of the young. Part of the answer to this problem has to be a more growth-friendly macroeconomic policy mix. This is one of the important policy areas in which national and European policy responses need to be closely linked.

Table 2: General government expenditure by function, % change 2009-12 (in current prices and constant exchange rates)

	Share	Percent change in current prices, 2009-2012					
	EU24	EU24	Greece, Ireland, Portugal	Italy, Spain	9 other EU15	Baltics 3	7 other NMS
Total general government expenditures	**100**	**4**	**-12**	**1**	**6**	**-3**	**7**
Interest payments	5	23	14	32	19	164	22
Broad services	17	-2	-12	-11	2	-15	-1
Economic affairs	9	-5	-45	5	-6	-20	-4
Environment protection	2	-5	-26	-8	-4	-6	21
Health, recreation	17	4	-20	-7	8	-6	12
Education	11	2	-14	-10	5	-7	8
Old age	20	10	0	8	10	15	13
Family and children	4	0	-19	-10	3	-14	1
Housing	1	12	-30	6	13	23	20
Unemployment	4	0	11	14	-5	13	-11
Sickness and disability	6	7	-7	-1	9	-5	12
Other social protection	5	7	-11	5	9	26	8
Memorandum: inflation		**8**	**6**	**8**	**7**	**12**	**10**

Source: Bruegel using Eurostat's 'General government expenditure by function' (COFOG) database. Note: Belgium, Croatia, Slovakia and Romania are not included because of lack of data; we report data for the aggregate of the remaining 24 countries of the EU (EU24). Country groups as described in Figure 1. For the Baltic States, the 2008-12 period is shown, because fiscal consolidation started earlier in these countries. The aggregates for countries with different currencies were calculated using constant exchange rates (the average of 2009-13) and therefore exchange rate fluctuations do not affect the values shown. Broad services include: general public services except interest payments, defence, public order and safety and community amenities.

European policies also matter for inclusive growth. Macroeconomic policies are important in this respect. The crisis has taken a heavy toll on European labour markets. Macroeconomic policies in the euro area are the result of a common monetary policy delivered by the European Central Bank, and of 19 national fiscal policies. We have shown elsewhere that the resulting policy mix is not always favourable to growth. In particular when monetary policy is constrained by the zero lower bound, better coordination of national fiscal policies could help improve growth and job prospects in the euro area.

But beyond macroeconomics, the EU has set itself ambitious targets on inclusive growth. The Europe 2020 Strategy launched in 2010 aims to create the conditions for smart, sustainable and inclusive growth. Smart growth is defined as developing an economy based on knowledge and innovation. Sustainable growth is defined as promoting a resource efficient, greener and more competitive economy. Inclusive growth is defined as fostering a high-employment economy that delivers social and territorial cohesion[11].

The EU's quantifiable headline targets for inclusive growth include:

1. Placing 75 percent of the population aged 20-64 in employment, especially women, the young, older and low-skilled people and legal migrants;
2. Better educational attainment: reducing school drop-out rates to below 10 percent, and for at least 40 percent of 30-34 year-olds to complete tertiary education (or equivalent);
3. Reducing the number of people at risk of poverty and social exclu-

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11 Inclusive growth is defined as *"empowering people through high levels of employment, investing in skills, fighting poverty and modernising labour markets, training and social protection systems so as to help people anticipate and manage change, and build a cohesive society. It is also essential that the benefits of economic growth spread to all parts of the Union, including its outermost regions, thus strengthening territorial cohesion. It is about ensuring access and opportunities for all throughout the lifecycle".*

sion by 20 million[12].

Table 3: Progress towards the EU2020 targets

Area	Indicator	2008	2011	2012	2013	2014	2015	Target
Employment	Employment rate of population aged 20-64, %	70.3%	68.6%	68.4%	68.4%	69.2%	70.1%	75%
Education	Reducing school drop-out rates to below 10%	14.7%	13.4%	12.7%	11.9%	11.2%	11.0%	<10%
Education	At least 40 percent of 30-34 year-olds completing tertiary education, %	31.1%	34.8%	36.0%	37.1%	37.9%	38.7%	≥40%
Poverty and social exclusion	Reducing the number of people at risk of poverty and social exclusion by 20 million, million people	116.2	119.6	122.5	121.6	120.9	-	96.2

Source: Eurostat, http://ec.europa.eu/eurostat/statistics-explained/index.php/Europe_2020_indicators_-_executive_summary.

Where do Europe's headline targets for inclusive growth stand as of 2016? Table 3 summarises some of the key indicators.

12 As we demonstrated in chapter 4, the at-risk-of-poverty indicator is in fact an indicator of income inequality and thus the targeted reduction of the number of people at risk of poverty actually aims to reduce within-country income inequalities.

In its stocktaking communication on the Europe 2020 targets, the European Commission (2014) states that progress towards the targets has been "*mixed*", and that the crisis had led progress to stall and had "*exacerbated the differences in member states,*" in particular in employment levels and R&D spending. Among the numerical targets of the inclusive growth agenda, only the targets for education appear likely to be reached by 2020. The EU can define many goals but it has few instruments under its direct control to achieve these social goals. The EU aims to boost inclusive growth through two flagship initiatives and various, but rather small, funds, summarized in Box 1. Different European institutions monitor progress and make policy recommendations. Yet almost all the policy recommendations must be implemented by national policymakers. Darvas and Leandro (2015) have shown that the implementation of European recommendations by national policymakers is on average very low.

Perhaps more important than the various small funds is European Union regulation and its normative power, through which it defines and benchmarks performance to highlight good practices implemented by certain countries that were beneficial for improving upward social mobility. But the EU can also play a legislative role, for example by establishing certain rights when services are provided across borders. One of the more controversial issues is certainly the Posted Workers Directive, which sets the norms for the working and social conditions of workers who are temporarily posted to another EU country by their employer when their employer provides a certain service in that country[13]. Views diverge within the EU on whether the directive provides adequate protection of workers' rights and the conditions for fair competition. The EU also wishes to develop a European Pillar of Social Rights for monetary union[14].

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13 See Sapir (2015) and Darvas and Vaccarino (2016).

14 http://ec.europa.eu/priorities/deeper-and-fairer-economic-and-monetary-union/towards-european-pillar-social-rights_en.

Box 1: Flagship initiatives and EU funds to boost inclusive growth.

Agenda for new skills and jobs

Why focus on employment and skills?	How to boost employment and skills?
• Shrinking workforce as a result of demographic change; • Overall low employment rate (particularly for women 63 percent vs. 76 percent men; older workers 46 percent in the EU vs. 62 percent in the US and Japan); • Shorter working hours compared to the US and Japan; • High youth unemployment brought about by the crisis; • 80 million people with low and basic skills; • By 2020, 16 million jobs will require high qualifications, 12 million fewer jobs requiring low skills; • Need for new skills.	• Help individuals learn new skills to adapt to the labour market; • Collectively modernise the labour market to raise employment, productivity and sustainability of the social model.

European platform against poverty

Why focus on poverty?	How to fight poverty?
• Even before the crisis, 80 million people at risk of poverty, 19 million children; • 8 percent do not earn enough to go out of poverty.	• Economic, social and territorial cohesion; • Respect for human rights of those living in poverty and social exclusion; • Provide support, training and help the poor find jobs and have access to social benefits.

The European Union has some funds that can directly promote social goals. Besides the **European Investment Bank**, the **European Social Fund (ESF)** is the main financing tool to promote employment, education and

social inclusion. Between 2014 and 2020, the ESF will provide €80 billion (in current prices) including €6 billion to address youth unemployment through the Youth Guarantee schemes. There is also a small (the annual budget of the fund is around €150 million) **European Globalisation and Adjustment Fund (EGF)** set up in 2006 to help workers who were made redundant because of structural changes in the world economy and financial and debt crises to find new employment and entrepreneurial opportunities. Other initiatives include the **EU Programme for Employment and Social Innovation (EaSI)** and **Erasmus+**, which will run from 2014 to 2020 and has a total budget of €14.7 billion. The programme complements the education and employment of youth pillar of Europe 2020. The **Fund for European Aid for the most Deprived (FEAD)** 2014-20 aims to complement the Europe 2020 target of reducing the number of people at risk of poverty and social exclusion by 20 million but its budget is only €4.5 billion for the 2014-2020 period.

EU-wide initiatives also entail significant political risks. Defining social goals without controlling the instruments to achieve them can lead to a backlash against EU integration because citizens feel that promises made by the EU are not being delivered.

Finally, the EU is increasingly active in the area of tax policy. On 30 August 2016, following the results of an in-depth state aid investigation started in 2014, the European Commission concluded that Ireland granted undue tax benefits of up to €13 billion to Apple. The decision is based on state aid grounds: the Commission argues that two tax rulings issued by Ireland effectively granted Apple preferential treatment, which amounted to state aid. The Commission ordered Ireland to recover up to €13 billion (plus interest) from Apple, but the decision is controversial and will be challenged in court.

The Apple case coincides with a sense among citizens that for far too long too little has been done to ensure tax fairness. But state aid controls cannot be the instrument of choice to address tax competition

problems. Certain issues can be addressed relatively easily. For example, repealing the Interest and Royalties Directive (2003/49/EC) would allow countries to levy source taxes and prevent an erosion of the tax base. Making progress towards more tax coordination is more complicated. For example, discussion on a common consolidated tax base for corporate profits has been slow at best. Rebalancing government revenues away from labour taxes towards corporate taxes, potentially more progressive consumption taxes and inheritance taxes could be a way of achieving more inclusive growth in the EU and would certainly contribute to a perception of greater fairness.

To conclude, inclusive growth should be at the top of the political agenda. European countries are actually performing rather well in terms of reducing income inequality, though developments vary in different EU states. But policymakers need to address unemployment more forcefully, especially youth unemployment. Moreover, social mobility is rather weak in many countries (particularly in southern Europe and the United Kingdom). Countries should carefully review the evidence about the main obstacles to social mobility. In terms of EU-level policy, there is a good case for regulation where the EU has real competence. But it is undesirable to make promises and set goals in areas in which the EU cannot deliver because of its lack of competence or instruments.

Annex 1: Econometric analysis of the June 2016 Brexit vote

(derived from Darvas, 2016a)

On 23 June 2016, 51.9 percent of voters rejected the United Kingdom's membership in the European Union. We estimate some regressions to uncover the determinants of 'leave' votes and voter turnout, and in particular, to assess if inequality, poverty and unemployment contribute to 'leave' votes.

Opinion polls and post-vote analyses (for example Lord Ashcroft Polls, 2016, and Burn-Murdoch, 2016) suggested that older, less-educated and poorer people tended to vote for leave. Geography also seems to have played a major role: while the share of 'leave' votes was 55.5 percent in England outside London and 52.5 percent in Wales, it was the minority position at 44.2 percent in Northern Ireland, 40.1 percent in London and 38.0 percent in Scotland. And while immigration was one of the hottest topics in the Brexit debate, Mourlon-Druol (2016) noted that there was no automatic link between the presence of immigrants and the share of leave votes.

A simple correlation analysis (which was done in previous analyses of this issue) can provide useful insights, but does not prove causality. A correlation between two variables could be caused by a third variable, while a zero correlation does not exclude causality between two variables. There are interactions between indicators, which makes it difficult to interpret a correlation coefficient. For example, younger people tend to be better educated, while older people tend to be richer. The proper tool to assess the factors that influenced the 'leave' vote is a

regression analysis that jointly considers various determinants. It also allows the importance of the various factors to be assessed.

We therefore use a regression analysis. As well as looking at age, education, income, immigration and geographical factors, we analyse the possible influence of three social indicators: income inequality, poverty and unemployment.

Instead of using data from opinion surveys, which are typically conducted by asking a few thousand people and therefore are subject to sampling errors, we use socio-economic data published by UK statistical agencies (see the data description in the annex). For example, a more recent opinion poll concluded that the turnout among the young was almost double than what was suggested by the first opinion polls conducted after the referendum (Helm, 2016). The data we use is not subject to such uncertainties related to opinion polls.

Regressions

We estimate two types of regression: one aims to uncover the determinants of the share of the 'leave' vote, while the other explores the reasons behind voter turnout. We use various social and economic variables as possible determinants.

We also include dummy variables for Scotland, Northern Ireland, Wales and London in the regressions, because of clear geographical differences in voting behaviour. Furthermore, inner London is very different from the rest of England: disposable income is more than twice as high as in the rest of the UK, the share of people with university degree is almost twice as high and the share of immigrants is almost four times as high.

For our calculations, we aggregate the data for the 173 NUTS3 (Nomenclature of Territorial Units for Statistics, 3rd level) regions of the UK. Thereby, we estimate cross-section regressions for these 173 regional units.

Determinants of 'leave' votes

We wish to include the shares of both the young (aged from 20-34 years) and the old (65 years and older) in the resident population, but these shares strongly correlate with each other and it is thus not wise to include them jointly (because of the so-called multicollinearity problem). Similarly, the shares of people with a degree and people with no qualification strongly correlate. Therefore, we estimate four versions of the regression, corresponding to the 2x2 options of age and educational attainment (Table 4).

Table 4 allows a number of conclusions to be drawn out about the social, economic and geographical factors that influenced the share of 'leave' votes in UK regions:

- The parameter estimate of the share of young people is negative, implying that a higher share of young people is associated with fewer 'leave' votes. The point estimate of the parameter of the young is -0.5 in the first model, implying that a 1 percentage point higher share of the young (eg 21 percent instead of 20 percent) is associated with a 0.5 percentage point lower vote for 'leave'.

- In contrast, the estimated parameter of old people is positive, confirming that old people tended to vote for 'leave'.

- The share of the workforce with a degree was a major factor for 'remain' (since the parameter is negative), while a greater share of people with no qualification supported 'leave'.

- It is noteworthy that the share of young people positively correlates with the share of people with a degree, most likely because the number of university graduates increased over time; older people had fewer opportunities to obtain a degree when they were young. Yet our regression results show that the shares of both the young and the well-educated had a statistically significant impact on the results.

- Disposable income per inhabitant does not have a statistically robust effect. When we estimate a simpler regression model which includes only the four regional dummy variables (Scotland, Northern Ireland, Wales and London), the parameter estimate of disposable income is -0.13, suggesting that people in poorer areas tended to vote for 'leave': a 10 percentage point lower income than the UK average is associated with a 1.3 percentage point higher share of 'leave' votes. However, in the four regression models reported in Table 4, the sign of the parameter estimate of disposable income varies, suggesting that average income is not a robust determinant of 'leave' votes. A possible reason for the lack of a robust effect of disposable income per capita is that it has a high positive correlation with the share of people with a degree and a strong negative correlation with the share of people without qualifications: well educated people tend to earn more. Yet when both education and income are included in the regression, education turns out to be statistically significant, while income does not.

- The estimated parameter of the Gini-coefficient of income inequality is positive and statistically significant. The parameter estimate is about 0.9, implying that 1 percentage point higher income inequality (eg 35 instead of 34) boosted the share of 'leave' votes by about 0.9 percentage points. In our view this is a relatively large magnitude highlighting the importance of income inequality.

- The poverty rate is also robust and statistically significant, with a parameter estimate of about 1, implying that a 1 percentage point higher poverty rate boosted the share of 'leave' votes by 1 percentage point. This result highlights the importance of poverty as a determinant of 'leave' votes.

- The parameter estimate of the unemployment rate is statistically insignificant, suggesting that beyond the influence of inequality and

poverty, unemployment did not play an additional role in the votes.

- The share of non-UK born population is also not significant according to our estimates. This suggests that the actual presence of immigrants did not really play a role. A possible explanation for this finding is that the share of non-UK born population correlates positively and very strongly with three other indicators included in the regression model: the share of young people, the share of people with a degree, and average income, implying that immigrants also go to economically more dynamic areas. Our results therefore show that after controlling for these socio-economic factors, immigration does not have an additional impact.

- The four area dummy variables are all statistically significant with negative parameters. For Scotland, the parameter estimate is about -20. This implies that after controlling for socio-economic characteristics, the share of leave votes in Scotland was 20 percentage points lower than in England outside London. The same parameter for Northern Ireland is about -15, for Wales it is about -6 and for London it is about -10. Clearly, beyond socio-economic factors, geography also played a major role in voters' choices.

Finally, let us highlight that the regression fit is quite accurate. The coefficient of determinant (R^2) is 0.85 for the first and third regressions, which is quite high given that we use a cross-section sample. When we include only the four area dummy variables, the R^2 is 0.51, highlighting that the socio-economic variables in the model explain much share of the variability of votes across the 173 regions. Figure 41 shows that in most of the 173 regions, the fitted value by the regression tracks the actual votes remarkably well.

Table 4: Regression estimate for the determinants of the share of 'leave' votes

	Model A	Model B	Model C	Model D
Share of population aged 20-34	-0.49	-0.95		
	[-4.0]	[-6.6]		
Share of population aged 65 and over			0.45	0.69
			[3.2]	[3.7]
Share of population with a degree	-0.97		-1.05	
	[-11.9]		[-13.5]	
Share of population without qualification		0.6		0.6
		[4.9]		[5.0]
Disposable income per inhabitant	0.04	-0.08	0.05	-0.09
	[1.9]	[-3.2]	[2.0]	[-3.3]
Gini coefficient of income inequality	0.77	0.89	0.93	1.24
	[2.6]	[2.4]	[3.1]	[3.1]
Poverty rate	1.00	0.85	1.06	0.95
	[3.0]	[1.9]	[3.1]	[2.0]
Unemployment rate	-0.14	-0.06	-0.34	-0.48
	[-0.7]	[-0.2]	[-1.7]	[-1.6]
Share of non-UK born population	-0.02	0.01	-0.05	-0.12
	[-0.3]	[0.1]	[-0.6]	[-1.2]
Scotland	-19.64	-19.99	-19.92	-20.73
	[-17.9]	[-14.2]	[-18]	[-13.7]
Northern Ireland	-14.61	-17.15	-14.13	-17.38
	[-6.5]	[-6.0]	[-6.1]	[-5.5]
Wales	-5.30	-6.82	-6.00	-8.39
	[-3.9]	[-3.9]	[-4.3]	[-4.5]
London	-8.84	-11.71	-9.27	-12.78
	[-2.9]	[-3.0]	[-3.0]	[-3.1]
R2	0.85	0.76	0.85	0.72

Source: Bruegel. Note: the sample includes the cross section of the 173 UK regions; t-ratios are reported in brackets below the point estimates; the regression includes a constant too. A parameter estimate is significantly different from zero at 10 percent significance level if the absolute value of the t-ratio is larger than 1.7.

Figure 41: Shares of 'leave' votes in the 173 UK regions and the fitted values by the estimated regression
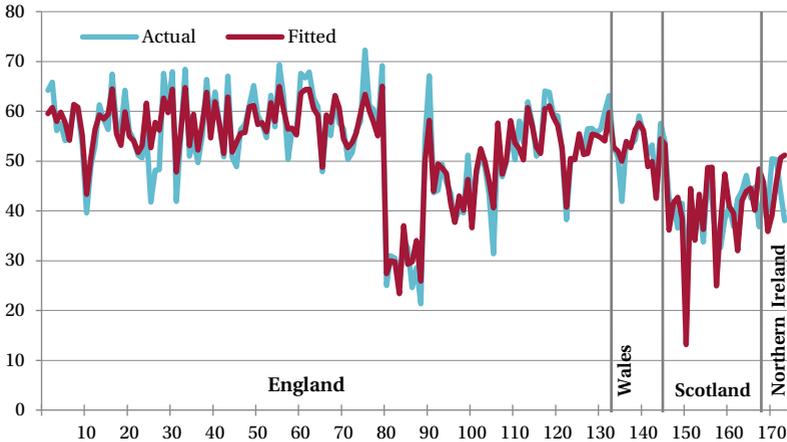
Source: Bruegel. Note: regions from 1-133 are from England, regions from 134-145 are from Wales, regions from 146-168 are from Scotland and regions from 169-173 are from Northern Ireland. Inner London is from 80-88, while outer London is from 89-100. The first regression (Model A) of Table 4 is used.

Who voted?

I also estimated the four versions of the regression for studying the determinants of voter turnout (Table 5).

Table 5 offers interesting insights into voting inclinations:

- Turnout was lower in areas where young people are a higher share of the resident population. Therefore, the young, the main supporters of 'remain', abstained more from voting.

- By contrast, older people (many of whom are 'leave' supporters) cast their votes in a higher proportion.

- People with a degree ('remain' supporters) tended to vote in higher

proportions, while people without qualifications ('leave' support-
ers) abstained more from voting.

- Average disposable income in a region was not a statistically signifi-
  cant determinant of the turnout.

- Among the three social indicators, inequality contributed positive-
  ly to the votes, while greater poverty and higher unemployment
  discouraged people from voting. These results together with the
  finding for uneducated people, suggests that disadvantaged people
  tended to vote in smaller proportions.

- The presence of immigrants had a negative and statistically signifi-
  cant impact on turnout, though quite small.

- Finally, even after controlling for the socio-economic variables,
  turnout was significantly lower in Scotland, Northern Ireland and
  London (in the strongholds of 'remain') than in England excluding
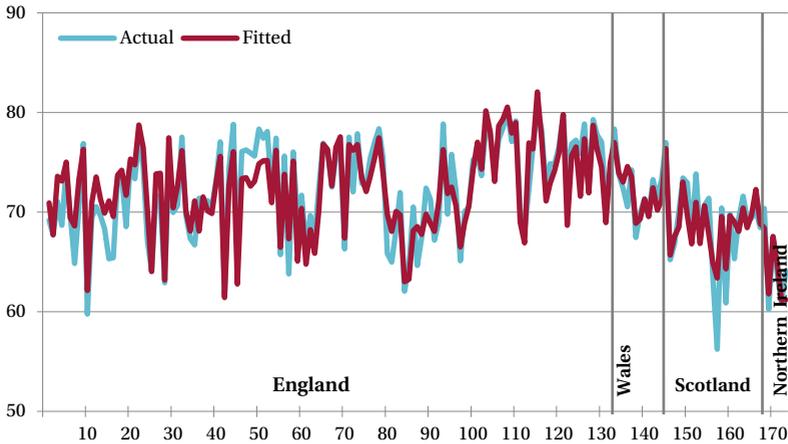 London.

The regression fit is also remarkably strong for the turnout equation.
The coefficient of determination is 0.82 for the first model in Table 5
and Figure 42 shows that the fit by the model tracks actual voter behav-
iour quite well.

Table 5: Regression estimate for the determinants of turnout

	Model E	Model F	Model G	Model H
Share of population aged 20-34	-0.62	-0.48		
	[-10.0]	[-8.0]		
Share of population aged 65 and over			0.47	0.44
			[5.7]	[5.7]
Share of population with a degree	0.36		0.25	
	[8.5]		[5.3]	
Share of population without qualification		-0.4		-0.4
		[-7.9]		[-6.9]
Disposable income per inhabitant	-0.02	0.01	-0.01	0.00
	[-1.6]	[1.2]	[-0.7]	[0.3]
Gini coefficient of income inequality	0.32	0.32	0.51	0.51
	[2.1]	[2.1]	[2.9]	[3.1]
Poverty rate	-0.36	-0.15	-0.30	-0.07
	[-2.1]	[-0.8]	[-1.5]	[-0.4]
Unemployment rate	-0.44	-0.31	-0.72	-0.49
	[-4.0]	[-2.6]	[-6.0]	[-4.0]
Share of non-UK born population	-0.10	-0.12	-0.16	-0.16
	[-2.7]	[-3.2]	[-3.7]	[-3.8]
Scotland	-5.47	-5.09	-5.88	-5.41
	[-9.6]	[-8.7]	[-9.0]	[-8.6]
Northern Ireland	-8.04	-6.66	-7.76	-6.46
	[-6.9]	[-5.6]	[-5.7]	[-5.0]
Wales	-1.02	-0.38	-1.82	-1.23
	[-1.4]	[-0.5]	[-2.2]	[-1.6]
London	-2.78	-2.27	-3.08	-3.00
	[-1.8]	[-1.4]	[-1.7]	[-1.7]
adjusted R2	0.82	0.81	0.75	0.78

Source: Bruegel. Note: the sample includes the cross section of the 173 UK regions; t-ratios are reported in brackets below the point estimates; the regression includes a constant too. A parameter estimate is significantly different from zero at 10 percent significance level if the absolute value of the t-ratio is larger than 1.7.

Figure 42: Turnout in the 173 UK regions and the fitted values by the estimated regression

Source: Bruegel. Note: regions from 1-133 are from England, regions from 134-145 are from Wales, regions from 146-168 are from Scotland and regions from 169-173 are from Northern Ireland. Inner London is from 80-88, while outer London is from 89-100. The first regression (Model E) of Table 5 is used.

Brief summary and implications for inclusive growth

Using a regression analysis based on hard data from statistical offices (as opposed to using the results of opinion surveys) for 173 UK regions, our results confirm that younger and better educated people voted for 'remain' in greater proportions and older and uneducated people tended to vote for 'leave'. There was a clear geographical pattern in which Scotland, Northern Ireland and London were for 'remain'. The actual presence of immigrants did not have a significant effect on the results, supporting conjecture of Mourlon-Druol (2016) that it was the perception that immigration could be a problem, rather than their actual presence, that influenced the vote. Average household income did not play a role either, as we control for several socio-economic characteristics of the regions. Turnout was lower among

disadvantaged people and in areas belonging to the strongholds of 'remain': the young and residents of Scotland, Northern Ireland and London voted in lower proportions.

Despite the clear overall vote for 'leave', EU leaders may read a positive message from the referendum result: the young (who will dominate the population in the coming decades) and the well-educated (who may be able to understand better the benefits of EU integration) were more in favour of EU membership.

A key contribution of our calculations is to show with regression analysis that in areas where inequality and poverty are higher, there were more 'leave' votes, even after controlling for the influences of socio-economic and geographic factors. This finding calls for more inclusive growth. In the UK, income inequality – a key indicator of inclusive growth – is almost the highest in the European Union. Theresa May, the new UK prime minister, has rightly emphasised very strongly the importance of a social reform to reduce the inequality of opportunities (Asthana *et al*, 2016).

Overall, high inequality and poverty undermine personal well-being and social cohesion, and can also boost protest votes in referenda and elections. This is another key lesson that politicians in other countries should learn from the Brexit vote.

Data description

We use a cross section data for the 173 NUTS3 (Nomenclature of Territorial Units for Statistics, 3rd level) regions of the UK. Data sources and transformations were the following:

Referendum results: the dependent variable in the regressions reported in Table 4, included as % of 'leave' votes. The other dependent variable is the % turnout (Table 5). The Electoral Commission provides results for 382 UK regions, of which Northern Ireland is a single region. Gibraltar, a very small territory of the UK, is also among the 382 regions. With the exception of Northern Ireland and Gibraltar, we used the local authority districts (LAD) to NUTS3 region mapping of the

Office for National Statistics to calculate the referendum results for the
NUTS3 regions. There is an unambiguous mapping between the LADs
and NUTS3 with the exception of three Scottish LADs, for which we
distributed the votes as half-half (when an LAD was part of two NUTS3
regions) and third-third-third (when an LAD was part of three NUTS3
regions). Northern Ireland has five NUTS3 regions. We found a break-
down of results for 18 Northern Ireland constituencies at BBC that we
approximated to the five NUTS3 regions using maps.

Share of young (from 20-34 years) and old (65 years and older):
included in the regression as the % of resident population. The source
is Eurostat's 'Population on 1 January by five year age group, sex and
NUTS 3 region [demo_r_pjangrp3]' dataset.

Education: included in the regression as the % of working age pop-
ulation. For England and Wales the source is 'Table KS501EW, 2011
Census: Qualifications and students, local authorities in England and
Wales' from the Office for National Statistics. For Scotland the source is
Scottish Statistics for qualifications of working age adults, also for 2011.
For Northern Ireland the source is the 'Labour Force Survey Local Area
Database' of the Northern Ireland Neighbourhood Information Servic
(NINIS), also for 2011.

*Gross disposable household income (GDHI) per head at current
basic prices:* included in the regression as the UK average = 100. The
source is Office for National Statistics for all UK's NUTS3 regions.

Non-UK born resident population: included in the regression as %
of resident population. The Office for National Statistics (ONS) pro-
vides detailed regional data for England, Wales and Scotland, plus
the total for Northern Ireland. For Northern Ireland, NUTS3 data is
provided by the Northern Ireland Neighbourhood Information Service
(NINIS). However, since the total for Northern Ireland as reported by
ONS and by NINIS are different, for consistency, we adjusted propor-
tionally the NINIS data to match the aggregate data provided by ONS.
For England, Wales and Scotland data is available at the local authority
districts (LAD) level: to calculate aggregates at the NUTS3 level, we

added up the number of non-UK born residents and the total number of residents for each NUTS3 region and calculated the ratio of non-UK born resident population from these aggregates.

Gini coefficient of income inequality (after taxes and transfers) in 2011: included in the regression as %. The source is the Regional Well-Being dataset of the OECD. This data is available for the 12 UK NUTS1 regions and therefore we use the same value for each NUTS3 region within a NUTS1 region.

Poverty rate (after taxes and transfers) in 2011 - Regional headcount ratios for disposable income, with poverty line set at 50% of the national median income: included in the regression as %. The source is the Regional Well-Being dataset of the OECD. This data is available for the 12 UK NUTS1 regions and therefore we use the same value for each NUTS3 region within a NUTS1 region.

Unemployment rate in 2014: included in the regression as %. The sources are Office for National Statistics for England and Wales; Northern Ireland Neighbourhood Information Service (NINIS) for Northern Ireland and The Scottish Government for Scotland. Data is available at the local authority districts (LAD) level: to calculate aggregates at the NUTS3 level, we added up the number of unemployed people and the number of people in the labour force for each NUTS3 region and calculated the unemployment rate from these aggregates.

Annex 2: Further indicators of income and wealth inequality

In this annex we report additional indicators on income and wealth inequality.

Income quantile distribution shows a relatively similar pattern across the EU with the lowest quantile having the least share on average around 7.7 percent, while the fifth quantile on average equals 38.7 percent (Figure 43). The combined share of the second, third and the fourth quantile is on average 53.6 percent across the EU. In Romania, Bulgaria, Spain and the Baltic states the share of income of the first quantile is the lowest from 5.6 percent to 6.5 percent, while in Cyprus, Bulgaria and Portugal more than 40 percent of the national income is allocated to the fifth quantile.

S80/S20 ratio displays the same pattern of inequality as the income share ratios (Figure 44). Romania, Bulgaria, the three Baltic countries and southern EU countries have the highest levels of inequality, while the Czech Republic, Finland and Slovenia have the least income quantile discrepancy.

The average ratio for EU countries is 5.2, which is similar to the levels of Korea and Japan, however the EU figure is much lower compared to the US and Turkey, where the ratio is around 8.

Additional useful indicators for uncovering inequality developments are the top ten and one percent income shares. Figure 45 shows the evolution of the income share (excluding capital gains) of the top ten percent, while Figure 46 shows the income share of the percent since the 1960s. Both figures seem to exhibit the same patterns. While

Figure 43: Income distribution by quintiles, 2015
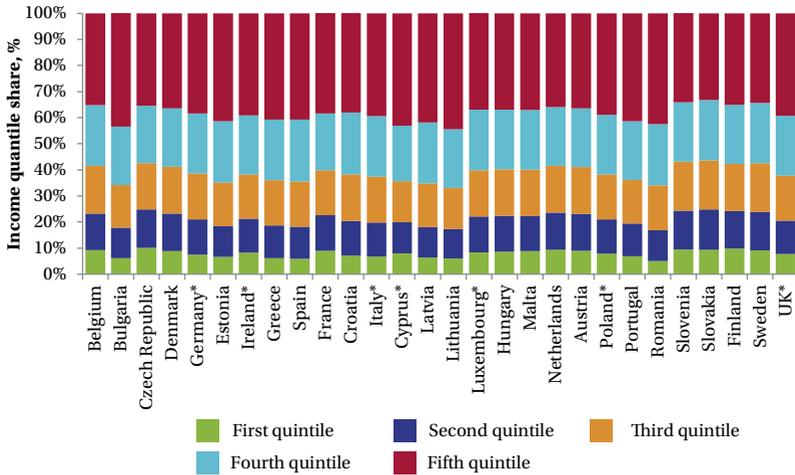
Source: Eurostat. Note: (*) Data for 2014 instead of 2015.

**Figure 44: S80/S20 Income quintile share ratio, 2015**
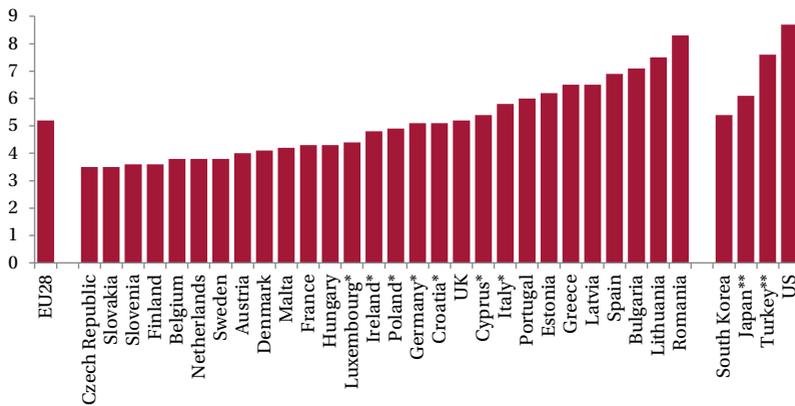
Source: Eurostat, OECD. Note: S80/S20 is the ratio of total income received by the top 20 percent of the population (top quintile) against an income received by the bottom 20 percent of the population (bottom quintile). All incomes are equivalised disposable incomes (income after tax and other deductions). (*) data for 2014, (**) data for 2013.

the US, UK, Italy and Germany are characterised by an upward trend, namely an increase of the top ten and top one income share over time, France and Spain present a flatter evolution.

A vital dimension of inequality is wealth distribution. While mean gross income obviously increases as net wealth goes up (Figure 47), the differences are actually much larger when looking at wealth distribution (Figure 48). Net wealth concentration at the top ten percent of net wealth distribution is extremely high.

Figure 45: Top 10 percent income share in total national income, 1960-2014
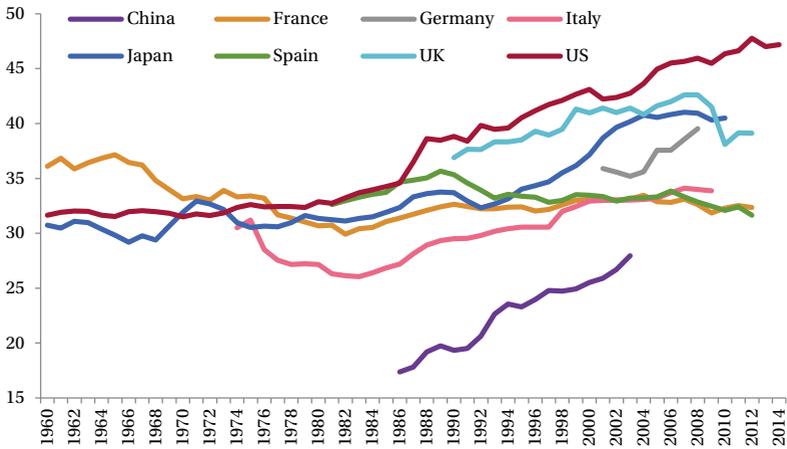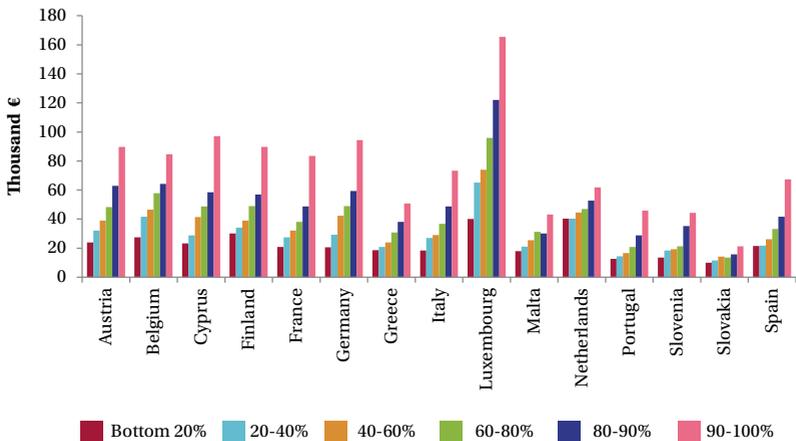

Source: The World Wealth and Income Database. Note: Income share excluding capital gains.

Figure 46: Top 1 percent income share in total national income, 1960-2014
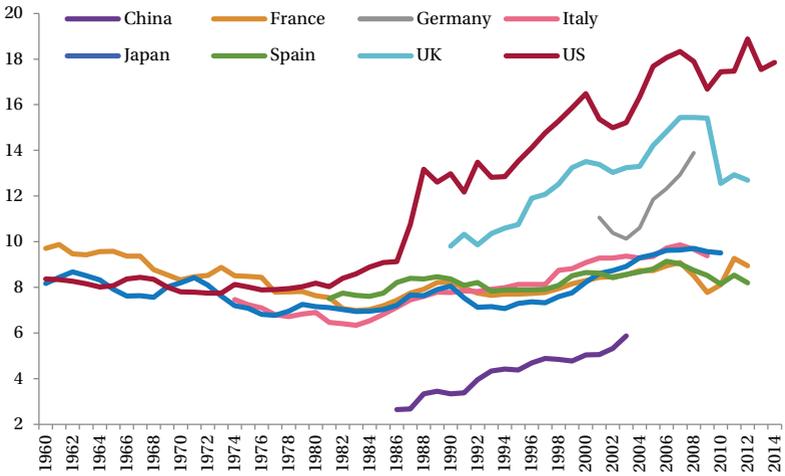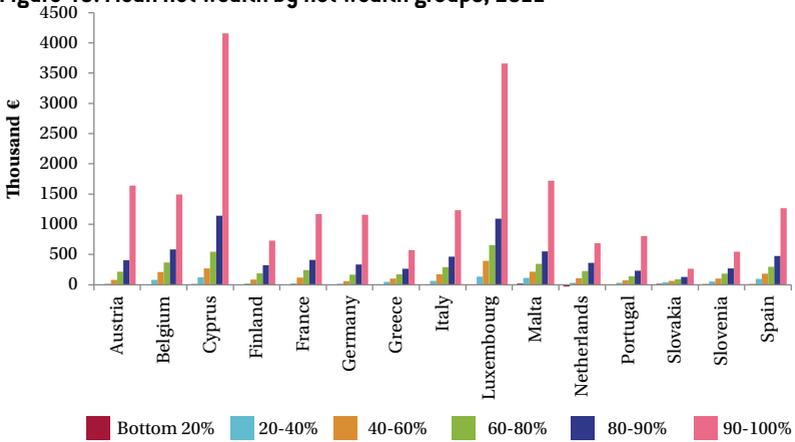

Source: The World Wealth and Income Database. Note: Income share excluding capital gains.

Figure 47: Mean gross income by net wealth group, 2011

Source: The Eurosystem Household and Finance Consumption Survey (HFCS); European Central Bank. Note: The HFCS only provides data for the EU countries included in the graph.

Figure 48: Mean net wealth by net wealth groups, 2011

Source: The Eurosystem Household and Finance Consumption Survey (HFCS); European Central Bank. Note: The HFCS only provides data for the EU countries included in the graph.

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AN ANATOMY OF INCLUSIVE GROWTH IN EUROPE

Zsolt Darvas and Guntram B. Wolff

With only seven percent of the world's people but about half of its welfare payments, the European Union's levels of inequality and absolute poverty are low in a global context. Nevertheless, unemployment remains high in a number of EU countries, while the intergenerational divide between the young and the old has widened. Social mobility is weak, in particular in the more unequal economies of southern Europe, limiting opportunities for the children of poor and disadvantaged families.

Striving for fairness in economic development is crucial in order for societies to be stable and citizens not to feel disenchanted. This volume sets out to inform the debate around inequality with a comprehensive breakdown of relevant indicators and comparisons, which together provide an anatomy of inclusive growth in the EU.

Although there are EU-level objectives related to reducing inequality, the policies needed to meet the objectives – dealing with education and welfare and tax systems, for example – are in the hands of national politicians. The EU can highlight best practices and apply peer pressure to its member countries, but this volume contains a warning: promising results without proper instruments could backfire and lead to a backlash against the EU if citizens perceive that promises are not being kept.

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