

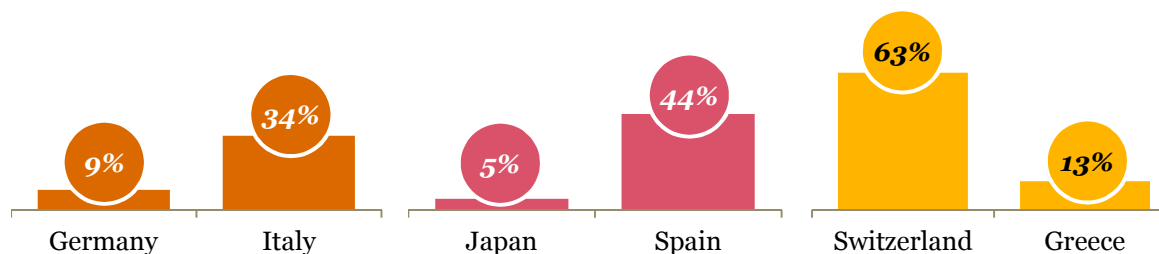
The \$1.2 trillion prize from empowering young workers to succeed in an age of automation



Share of youth not in
employment, education
or training

Youth unemployment rate

Youth employment rate



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Empowering young workers: The \$1.2 trillion prize from equipping young workers to succeed in an age of automation

A world in which young people are supported to take ownership of their future is a more productive and more innovative world in which our economic potential is fulfilled. In this report, we discuss how governments and businesses can support young people to engage with education and work and reap the rewards from playing their part in making this happen.

Young people today are facing a number of challenges.

- **Across the OECD, young people are 2.5 times more likely to be unemployed than adults.** During the crisis, youth unemployment took a large hit and has struggled to fall back down. Governments need to support unemployed youth through training and career advice, linking in with local businesses to prevent disengagement from the labour market at an early age.
- **In most OECD countries, opportunities and earnings potential remain linked to a young person's socioeconomic background.** Education and training should be broadened to include vocational subjects, using the dual education systems of countries like Germany and Switzerland as models. These systems create better opportunities for apprenticeships and alternative career pathways to university, opening up more doors to successful and gainful careers.

- **Automation will put many jobs at risk. For young people, it will disproportionately affect less qualified workers in sectors like retail.** As mentioned above, education should be broadened to create flexible young workers who can respond to changing job roles. Vocational subjects also tend to be less at risk of automation, for example STEM (science, technical, engineering and maths) subjects – and in fact the need for young skilled workers in these industries is growing continuously.

Our PwC Young Workers Index 2017 explores the large variation in outcomes for young people across the OECD.

We consider what policy lessons can be learnt from the top performers. We appreciate that not all specific policies will suit all countries – Germany's dual education system is very well suited to its large manufacturing sector for example. But the guiding principles, such as broader education and career pathways and engaging employers with schools, can provide important policy lessons for all countries across world.

Our estimates suggest there could be a long-term gain to the OECD of around \$1.2 trillion from improving youth outcomes. And this is in many ways moderate estimate based on the average GDP per worker – it does not consider the productivity boosts that might arise from young people being more engaged in study and work that truly inspires and motivates them. The benefits from greater mental health, community engagement and entrepreneurship could be endless.

In this report, we use the Netherlands as a case study to illustrate many of the issues that need to be confronted across the OECD – Regional disparities, social immobility and a lack of vocational training opportunities.

I was in the first cohort of young people in the UK to be affected by the tripling of university tuition fees and have since gained an interest in how public policy can promote alternative career pathways especially for those from lower socioeconomic backgrounds, hence promoting social mobility. **This report aims to highlight the challenges facing young people today and to stimulate conversations on how governments, businesses and society can work together to address these.** Please feel free to reach out to us – we would be more than happy to discuss how you could invest in the future of your organisation and benefit from unlocking the potential of young people.



Hannah Audino, 24 years old

Economist

PwC Strategy&

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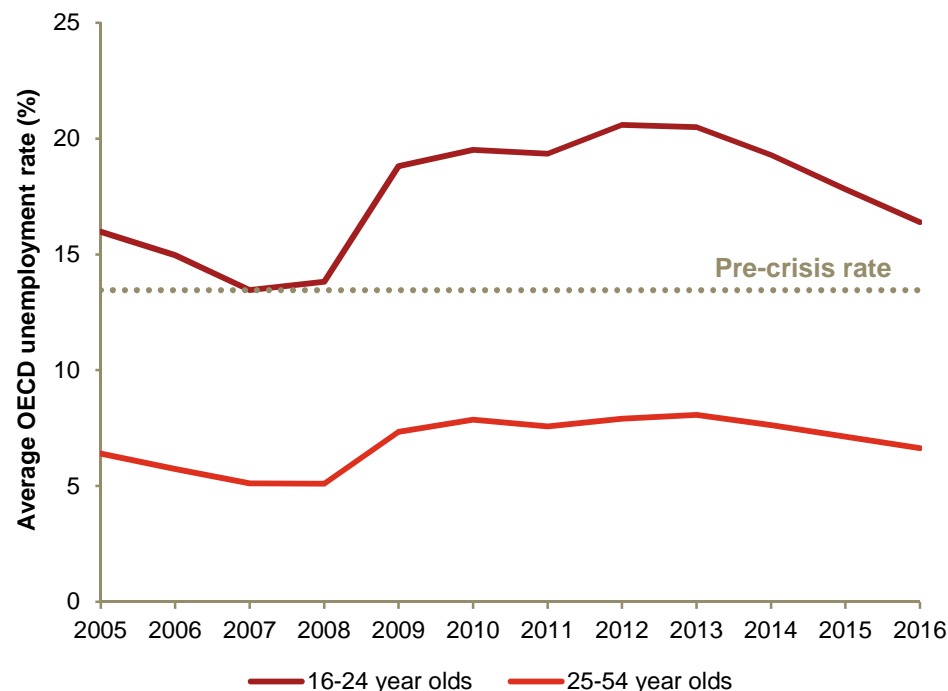
Executive summary

1

Youth unemployment across the OECD remains above pre-crisis levels and can have long-term adverse consequences for individuals and the economy

On average across the OECD, the employment rate of 16-24 year olds remains **below pre-crisis rates**, while **unemployment remains higher**.

A young person aged 16-24 is, on average, **2.5 x more likely to be unemployed** than someone aged 25-54.



Failing to engage young people in education or employment can have long-lasting consequences for the individual, the economy and society..



Estimates suggest that 'NEET' (not in education, employment and training) individuals can experience around.

10-15% lower wages in adulthood.

compared to non-NEETs¹ and discourage a young person from following a meaningful career path.

In comparison to their non-NEET peers, NEETs in 2001 were.

2.8 times as likely to be unemployed or economically inactive 10 years later².

having large fiscal implications for government tax receipts and welfare payments.



Mario Draghi, the President of the ECB, recently called upon governments and businesses to address youth unemployment

"Youth employment and productivity growth create a **virtuous circle**. When firms become more productive they are more likely to employ young people. And when young people have such opportunities, they can capitalise on their skills, adding to productivity growth, which among other benefits for society will lead to higher wages. **Youth unemployment breaks this virtuous circle: it is a drag on innovation and impedes knowledge diffusion by decreasing mobility.**"

Mario Draghi, 22nd September 2017

Sources:

¹ Gregg and Tominey (2004).

² Feng et al (2015).

³ Eurofound (2015).

Lowering NEET rates across the OECD to German levels could boost total OECD GDP by around \$1.2 trillion in the long term

The top 3 spots in the index are occupied by core European and Nordic countries

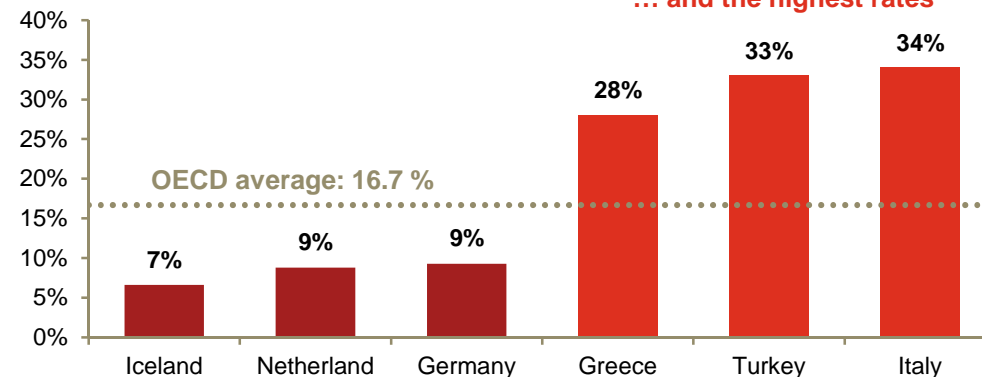


\$1.2 trillion

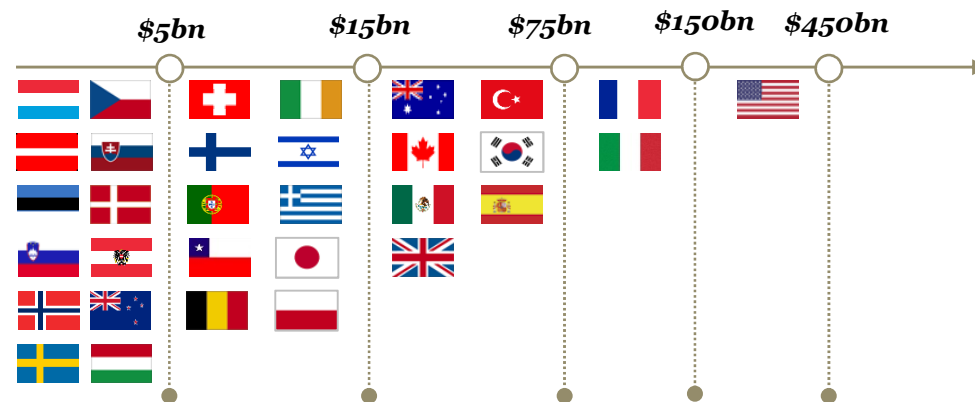
Our analysis suggests the OECD could experience a potential long-run increase in GDP of c.\$1.2 trillion by lowering NEET (not in education, employment or training) rates to German levels

Countries with the lowest NEET rates (20-24 year olds) ...

... and the highest rates



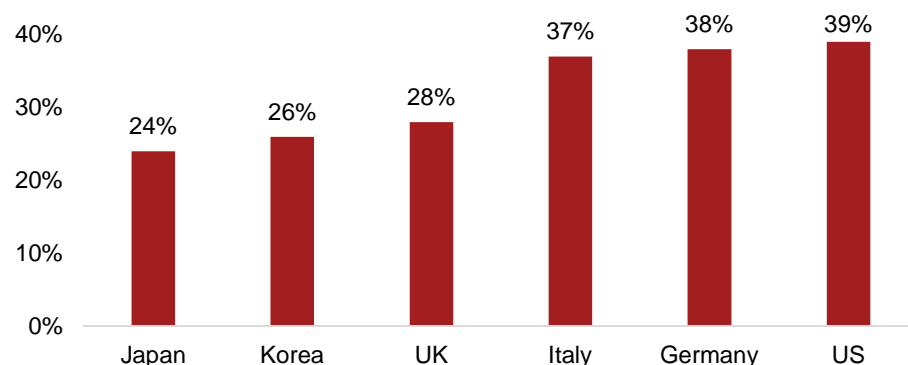
If OECD countries¹ lowered their NEET rates to German levels, they could experience a long-run boost to GDP of ...



¹ The Netherlands and Iceland are excluded from this analysis as their NEET rates are already lower than Germany's.
Sources: PwC analysis, OECD.

Governments across the OECD need to promote vocational learning to address the challenge of automation and emerging skills gaps in STEM industries

Across larger OECD countries, the percentage of **jobs at risk of automation for young workers aged 16-24** ranges from around 20-40%.



Workers with strong STEM (science, technology, engineering and maths) skills should be less at risk.

But skills gaps are emerging across the OECD – training needs to be especially focussed on disadvantaged young people.



On average, students from lower socioeconomic backgrounds are

3 times more likely



not to achieve a baseline level of proficiency in **science**.



Promote a broad variety of career pathways

1

- Broaden education and training options for young people during school, offering opportunities for both classroom and vocational training.
- This will open up more career pathways for young people, especially those from less disadvantage backgrounds who may have a preference towards practical, as opposed to classroom, learning.

Improve vocational training in STEM

2

- Vocational training should be focused in areas such as STEM – these jobs tend to be less at risk from automation and do not necessarily require a university education.
- The emergence of a skills gap in these industries in many OECD countries means the rewards for business will also be great.

Engaging employers in training strategies

3

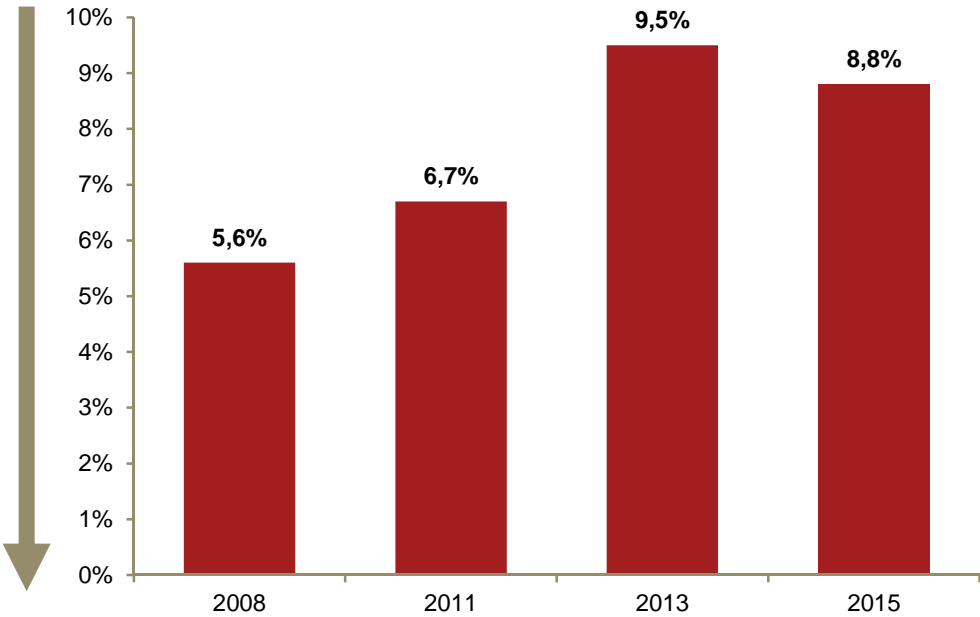
- Employers need to engage with government education and training policy to ensure programmes are producing market-relevant skills.
- Ensure training strategies are being constantly updated to reflect evolving business need in an ever-digital and automated workplace.

The economic crisis has hit Dutch youth hard, but NEET rates are still low compared to other countries and further recovering.

NL 9th The Netherlands ranks 9th this year in our index, the same as last year, but still middling within the OECD.

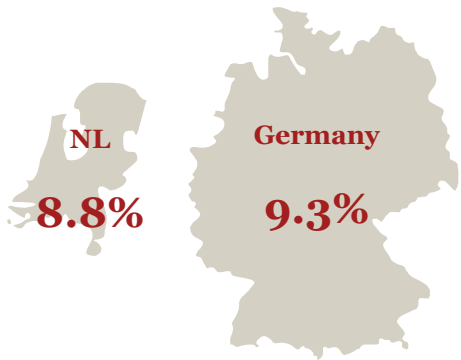
The Netherlands has seen a recovery in the educational and employment opportunities available to young people since the financial crash ...

NEET rates of 20-24 year olds since 2008 (NL)

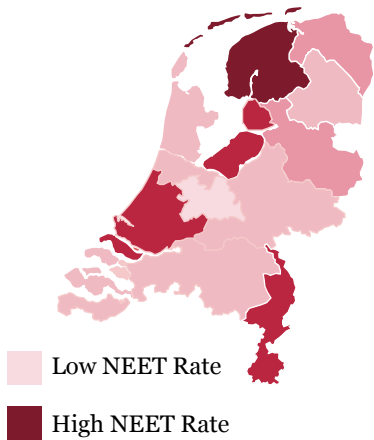


Sources: PwC analysis, OECD, Eurostat

The Netherlands performs even better than high performer Germany in terms of NEET rates of 20-24 year olds (2015)



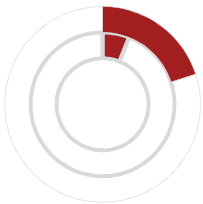
But there are disparities in NEET rates across the Netherlands ...



... and outcomes for young people continue to be linked to their socioeconomic background



More mbo students with a non-Western migrant background perceive difficulties finding an apprenticeship than native students.



Unemployment rates for workers with a non-Western migrant background are higher than for native Dutch workers.



Key results

2

Our Young Workers Index takes a holistic view of the labour market for younger workers across the OECD, combining eight key indicators into one comparable metric

Labour market indicators

The PwC Young Workers Index combines a broad range of labour market indicators as listed below with relative weights shown in brackets. Employment rates have the highest weights but other variables are included to present a more holistic picture:

- Employment rate, 15-24 year olds (20%)
- Rate of 20-24 year olds not in education, employment or training (20%)
- Unemployment rate, 15-24 year olds (10%)
- Relative unemployment of 15-24/25-54 year olds (10%)
- Incidence of long-term unemployment, 15-24 year olds (10%)
- Incidence of part-time work, 15-24 year olds (10%)
- School drop-outs, 20-24 year olds (10%)
- Enrolment rate of 15-19 year olds (10%)

Process

These indicators are normalised, weighted and aggregated to generate index scores for each country.

The index scores are on a scale from 0 to 100, with the average OECD value in the base year of 2006 set to 50. However, the average index values for 2011, 2015 and 2016 can be higher or lower than this 2006 baseline.

We can therefore compare how each country's performance has evolved over time in absolute terms, as well as the relative performance of countries in a particular year.

See Annex for more details of the methodology.

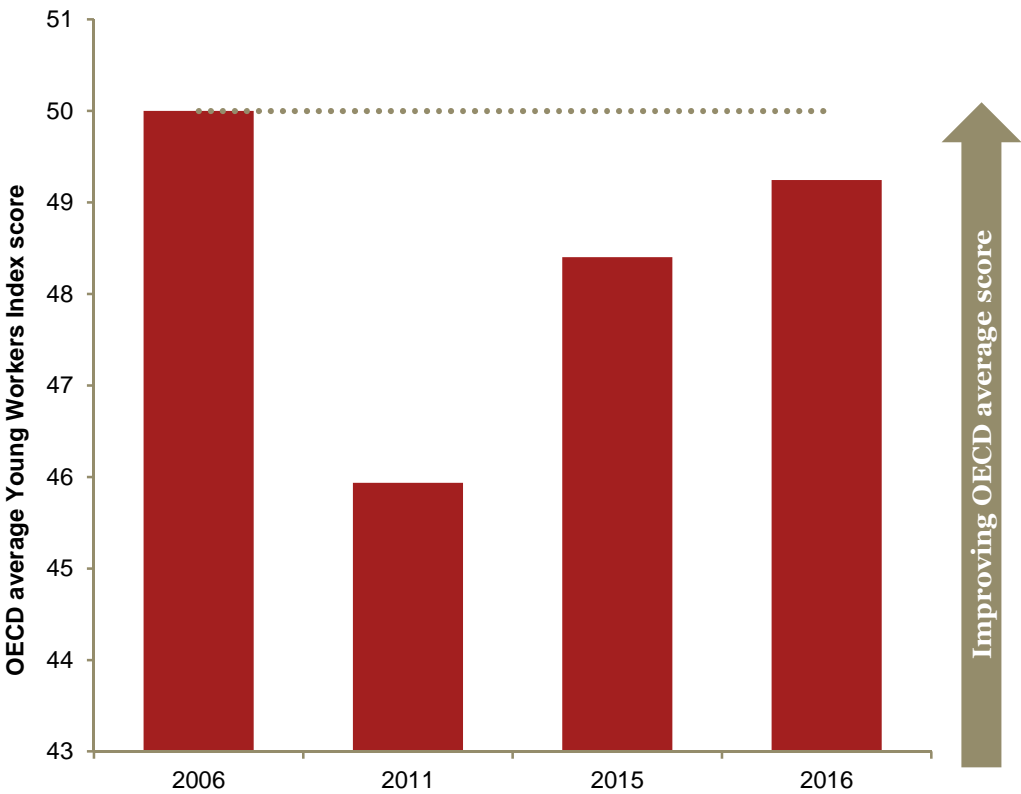
Labour market indicators

All data are taken from the OECD.

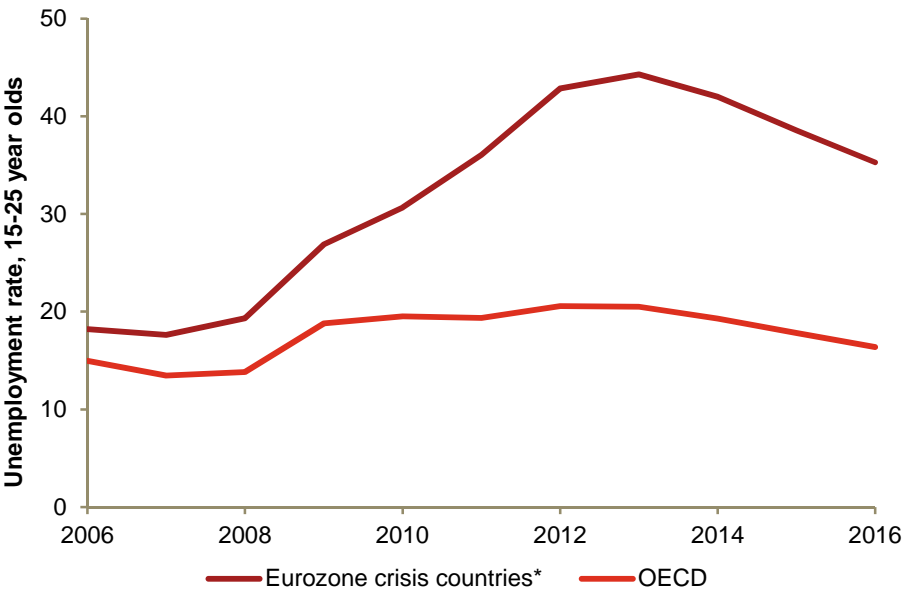
We focus mostly on the 15-24 age group for data reasons, but some variables are more applicable for the later age group of 20-24 year olds as there is more variation across countries and time. We use the latest available data from the OECD for each country which in most cases this is 2015 or 2016.

This year's update sees the OECD average score almost reach its pre-crisis level, driven by continued economic recoveries across the OECD and falling unemployment rates

In this year's update to our Young Workers Index, we see the OECD average continue to improve gradually back towards its stronger position a decade ago. This in part reflects the fact that many of the Southern European countries have seen recent improvements in their youth employment rates following the long-lasting impact of their recessions. We also see a number of the top performers, including Germany and many of the Nordic countries, make further improvements to their already high index scores.

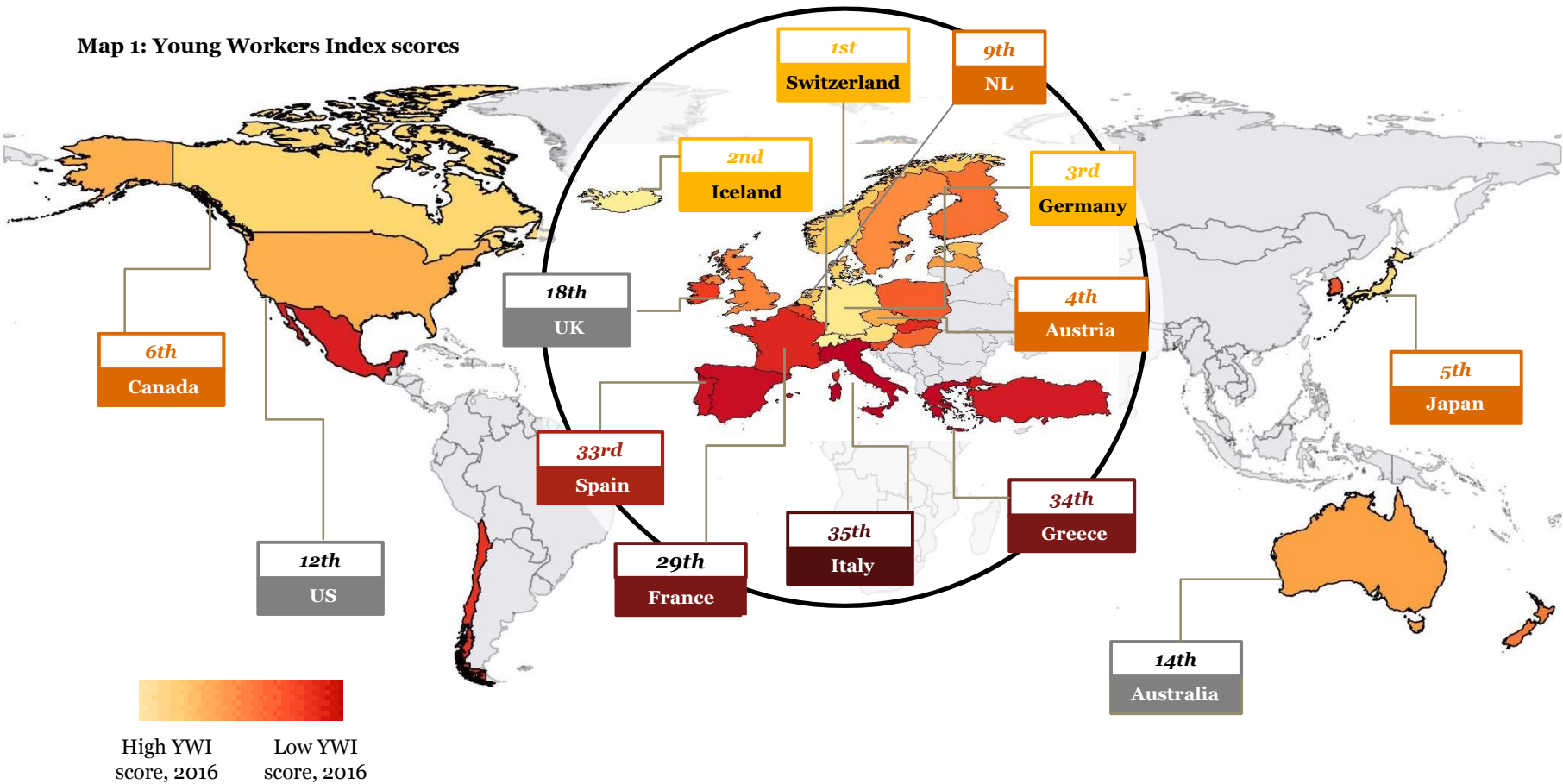


One factor driving the improvement in the OECD average score is the continued economic recovery of the Eurozone countries, who have continued to make steady progress in lowering their unemployment rates back towards their pre-crisis levels. The graph below, however, shows that there is still progress to be made.



Our Young Workers Index shows the large variations in the economic prospects of young people across 35 OECD countries

Many of the central European and Nordic countries continue to perform well on the index, while the Southern European countries rank towards the bottom. The US and the UK perform outside of the top 10, while Japan and Canada are some of the top performers.



Sources: PwC analysis, OECD.

Switzerland, Iceland and Germany continue to occupy the top positions on the Index, while the Eurozone crisis countries remain towards the bottom

Core European countries continue to dominate the table, with Switzerland holding 1st place. This year, Iceland takes 2 place, but Germany is still the leading EU country in the index.

Over the past few years, the Netherlands had a stable position in the top 10, although its index score is slightly decreasing.

The OECD average score is almost back up to its pre-crisis level this year.

Ranking				Country	Index score			
2006	2011	2015	2016		2006	2011	2015	2016
1	1	1	1	Switzerland	68.6	70.1	67.7	68.9
5	10	3	2	Iceland	63.2	54.2	63.9	67.1
10	2	2	3	Germany	57.8	65.6	66.1	65.7
4	3	4	4	Austria	64.5	65.2	63.2	62.1
11	9	5	5	Japan	57.5	56.1	62.3	61.3
7	7	8	6	Canada	62.3	58.1	59.7	59.9
2	5	7	7	Denmark	67.3	58.7	59.8	58.8
6	8	6	8	Norway	62.5	57.5	59.9	58.2
3	4	9	9	Netherlands	65.5	63.3	58.2	57.3
14	15	10	10	Estonia	55.3	48.2	56.6	56.9
28	17	16	11	Luxembourg	40.6	46.2	51.7	56.8
12	14	14	12	United States	56.4	49.1	54.6	56.2
20	13	15	13	Czech Republic	50.0	49.5	54.4	55.3
8	6	13	14	Australia	61.7	58.1	55.9	55.2
16	29	11	15	Latvia	52.7	36.5	56.3	55.0
33	23	12	16	Israel	36.1	42.7	56.1	54.5
22	16	17	17	Sweden	45.8	47.4	51.6	52.8
21	22	20	18	United Kingdom	49.4	43.0	48.9	51.2
15	18	18	19	New Zealand	53.2	46.1	50.2	51.2
13	11	19	20	Finland	55.5	52.4	49.4	51.1
25	25	22	21	Hungary	42.8	38.5	46.3	48.5
29	21	23	22	Poland	39.3	43.9	44.6	46.9
18	19	24	23	Korea	51.1	44.9	42.8	46.7
17	12	21	24	Slovenia	52.3	51.9	48.0	46.6
23	20	26	25	Belgium	45.8	44.4	42.0	43.3
9	31	28	26	Ireland	59.6	31.1	38.7	42.5
26	26	25	27	Chile	41.2	38.3	42.3	42.3
30	30	29	28	Slovak Republic	38.3	33.2	38.5	42.0
27	24	27	29	France	40.7	41.6	40.5	39.9
31	27	30	30	Mexico	37.7	37.6	38.1	38.6
35	32	31	31	Turkey	12.9	27.8	35.4	34.8
24	28	32	32	Portugal	45.2	36.7	31.1	33.9
19	33	33	33	Spain	50.4	25.4	23.9	24.6
32	34	34	34	Greece	36.9	23.8	23.3	23.2
34	35	35	35	Italy	29.9	20.7	12.0	13.8
OECD Average					50.0	45.9	48.4	49.2

Key

- High performance
- Middle performance
- Low performance

Nordic countries also perform strongly, with Norway and Denmark closely following the top 3.

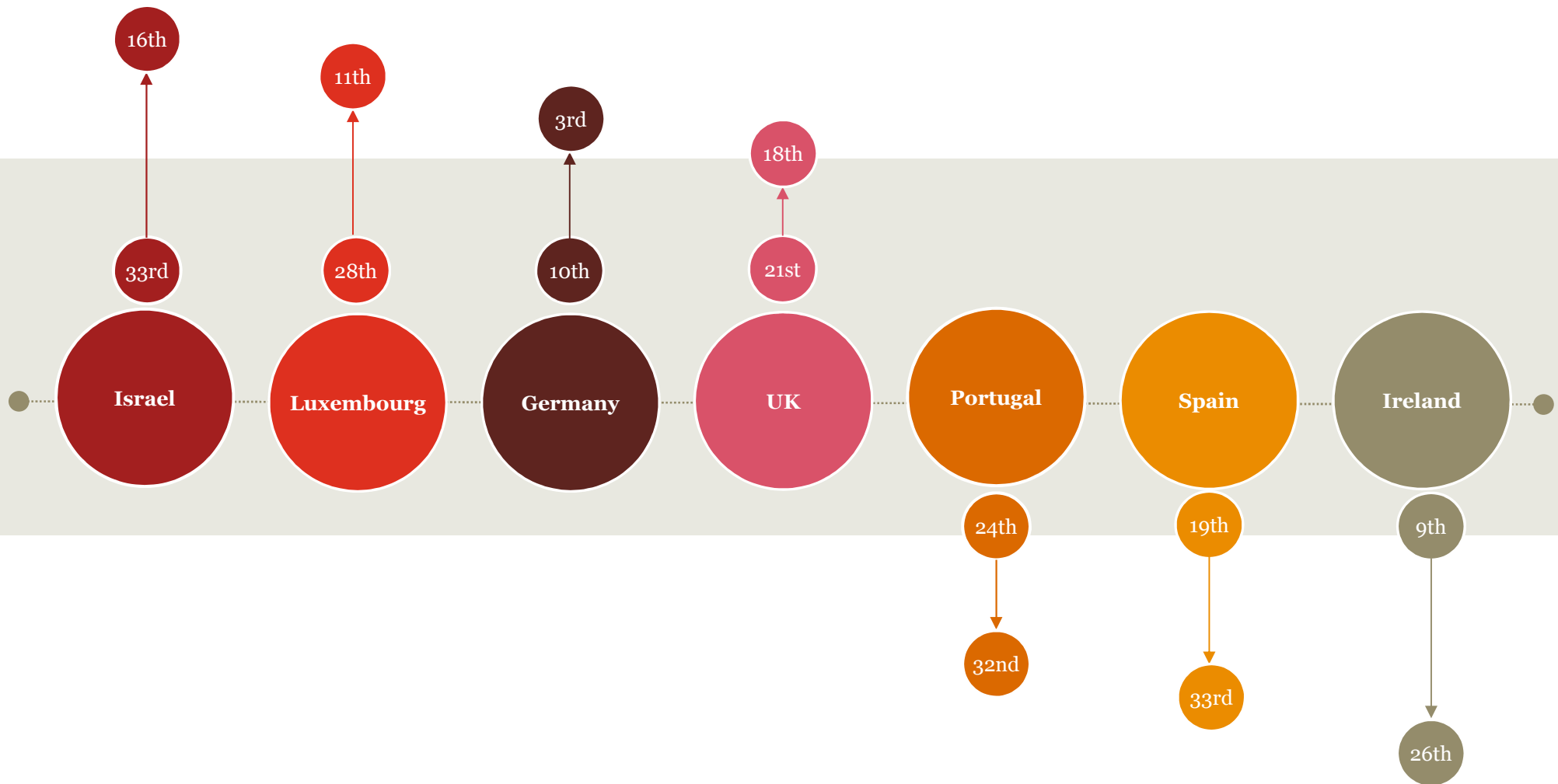
The UK moves up a further 2 places this year to 18, marking its best position yet on the index.

The Southern European countries are beginning to make small improvements in their overall index score, but there is still lots of progress to be made.

Sources: PwC analysis, OECD.

* Please note that the PwC Young Workers Index 2017 edition uses the latest available data from the OECD. As a result, some of the historical rankings may have changed from last year's index.

Israel and Luxembourg have both made significant climbs up the index between 2006 and 2016, while Germany has also risen 7 places. The UK has also improved its relatively position somewhat since 2006



Sources: PwC analysis, OECD.

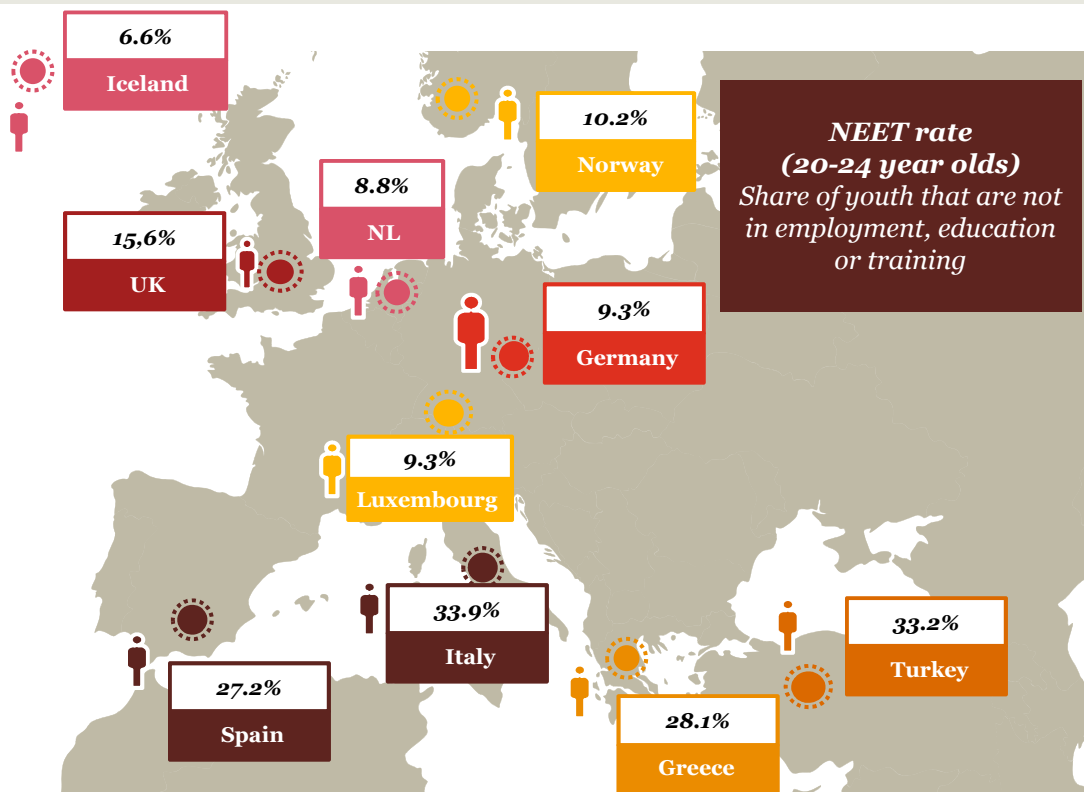


Potential boost to GDP

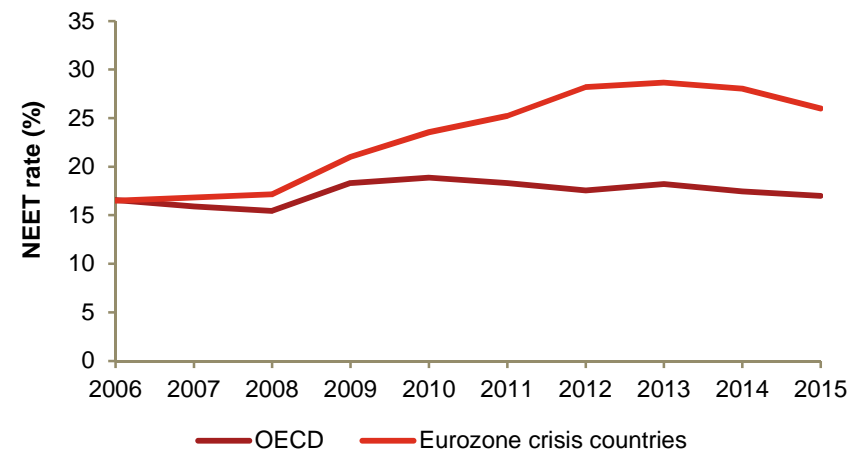
3

There is significant variation across the OECD in the number of young people not in education, employment or training (‘NEETs’)

There is huge variance in NEET rates across the OECD, ranging from around 10% in Germany (the leading EU country in our index) – to over triple that in Italy, at around 34%, where over a third of young people are not in employment, education or training. Based on these variations, we estimate the economic gain from lowering NEET rates to the levels of Germany.



- On average across the OECD, NEET rates are back down to their pre-crisis level – having risen up to almost 19% in 2010, they are now back down to 17%.
- However, in many of the Eurozone crisis countries, rates remain significantly higher. On average (Greece, Ireland, Italy, Portugal and Spain), NEET rate still remain around 25%, almost 10 percentage points higher than pre-2008.



Sources: OECD

* We use the latest annual available data for NEET rates across the OECD.

We estimate that the long-run gain from improving NEET rates of 20-24 year olds to match German levels could be around \$1.2 trillion

The OECD could add around \$1.2 trillion to total GDP in the long run if countries with higher NEET rates among 20-24 year olds lowered their rates to German levels

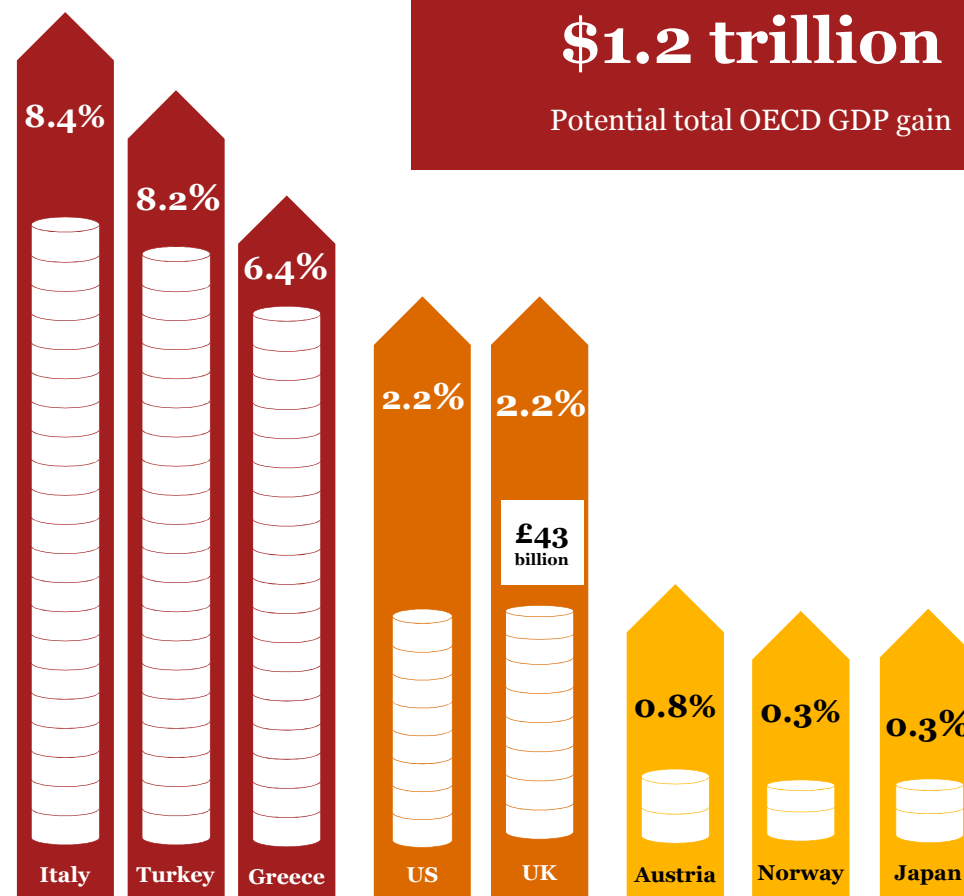
- Our analysis provides an estimate of the broad order of magnitude of potential gains from lowering NEET rates to match those of Germany – a top ranking EU economy in our index*.
- The potential GDP boost from lowering NEET rates for 20-24 year olds varies significantly across countries, from around 0.1% in Luxembourg, who already perform relatively well, to around 8.4% in Italy.
- Within the G7, the overall gain could be c.\$770 billion, which accounts for roughly two thirds of total potential GDP gains for the whole OECD. The EU GDP gain accounts for 66% of that of total OECD gains.

Those who scored lower on the Young Workers Index have the most to gain in the long-run from lowering their NEET rates

- Italy, who ranks last at 35th place, and Turkey, who comes in at 31st, could experience the largest economic gains of around 8-8.5%.
- For top scorers, who perform strongly in our index, the gains are lower as their NEET rates are closer to German levels already.

The UK could achieve an increase in GDP of around 2.2%

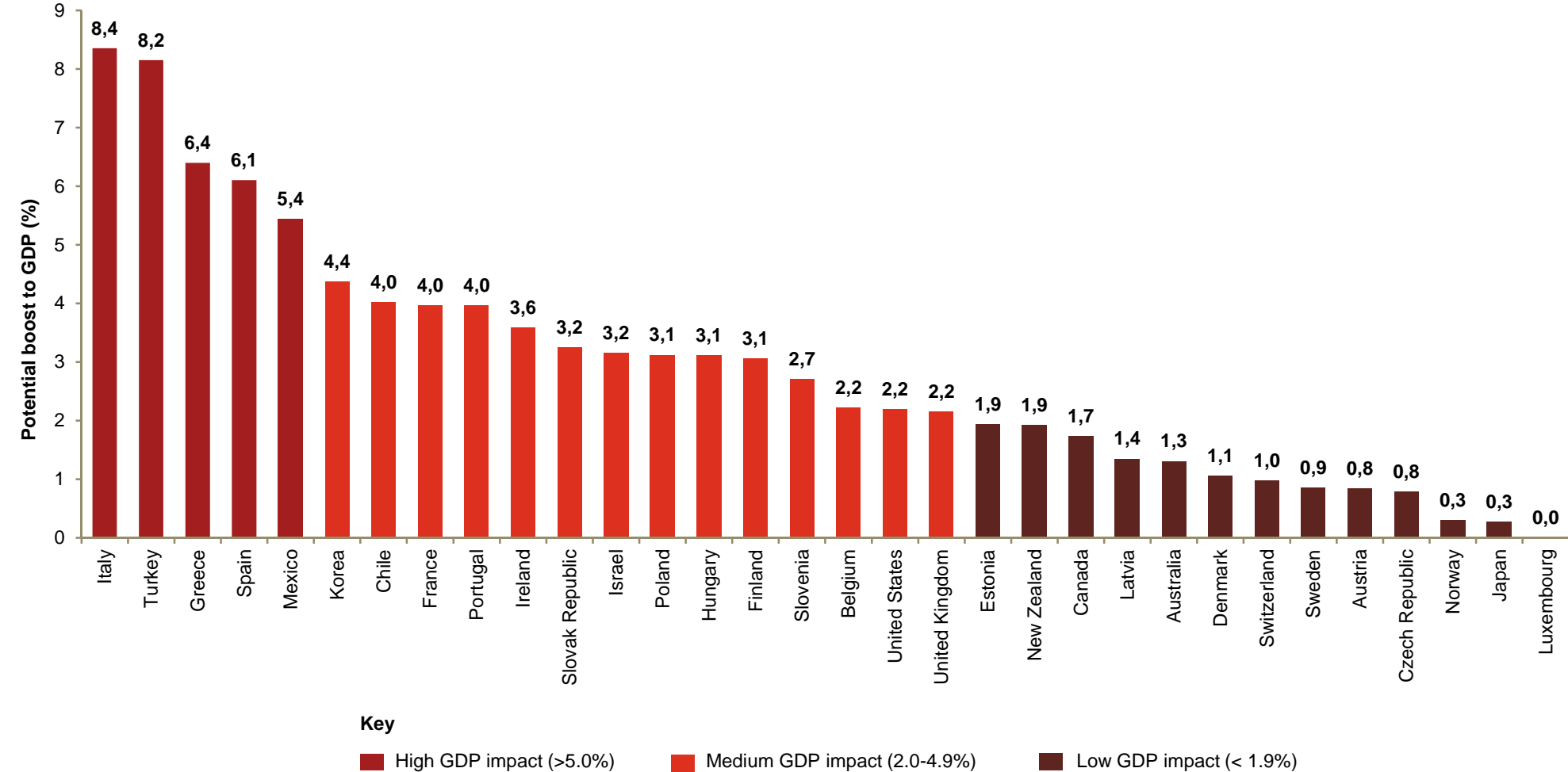
- While Germany has gradually lowered its NEET rate for 20-24 year olds between 2006 and 2014, the UK's rate has drifted upwards between 2006 and 2012, from 18.2% to 20.2%. However, the UK has made considerable progress in the last two years, with its rate falling to 15.6% in 2015 – but this is still above Germany's of 9.3%.
- By matching the NEET rates of 20-24 year olds in Germany, the UK could increase its GDP by around 2.2%, or around £43 billion at 2016 GDP values. This would take time to build up, so should be interpreted as a long-term potential boost to the economy.



* Luxembourg, Iceland and the Netherlands perform slightly better than Germany in terms of NEET rates, but are considered less relevant benchmarks as they are relatively small economies.

The lower performers on the index generally have the most to gain from improving their NEET rates to Germany levels

Figure 1: Potential long-run GDP boost





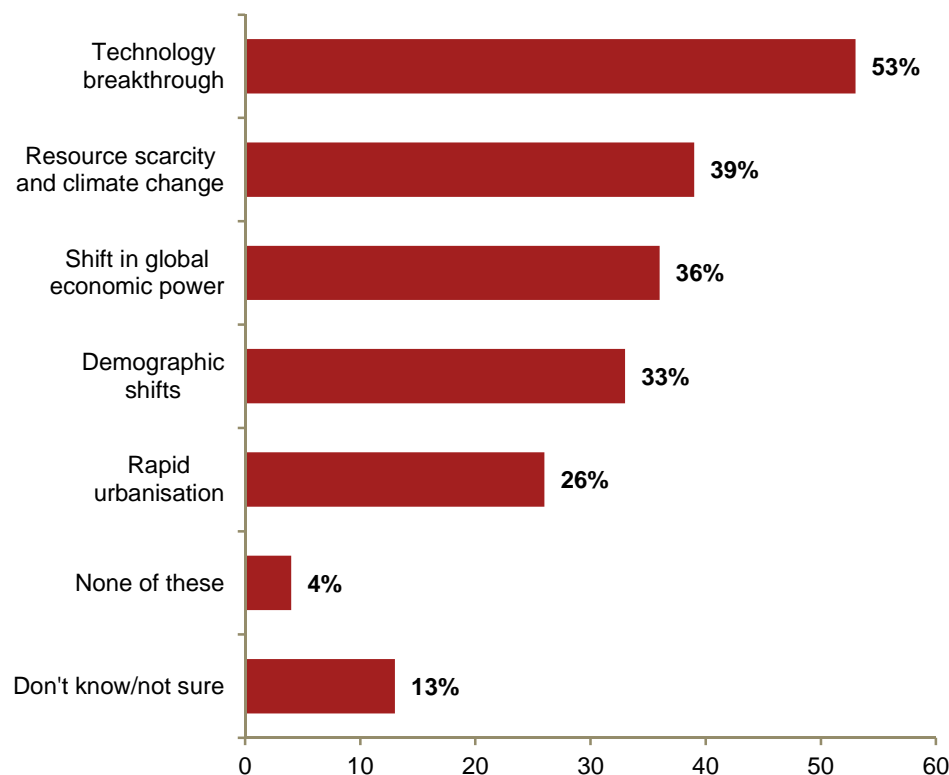
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Focus on: Automation and youth employment

The way that we work is fundamentally changing – disruptive innovations are putting traditional jobs at risk, but at the same time creating new industries and business models

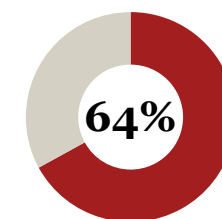
The world of work is experiencing a pervasive nature of change at an unprecedented pace. Recent analysis by PwC suggests that the biggest perceived driver of change to the world of work is **technological innovation**.

Figure 2: What will transform the way people work over the next 10-15 years?



As workforces become more diverse and people work longer; traditional career models may soon become extinct. Many of the roles and job titles of the future may be ones we haven't even thought of yet.

64% of people around the world believe that technology will improve their job prospects.



2 out of 5 people around the world believe that traditional employment won't be around in the future. Instead, people will have their own 'brands' and sell their skills to those who need them.

44% of people around the world said that the most important thing in a job for them is job security.



Sources: PwC (2017).

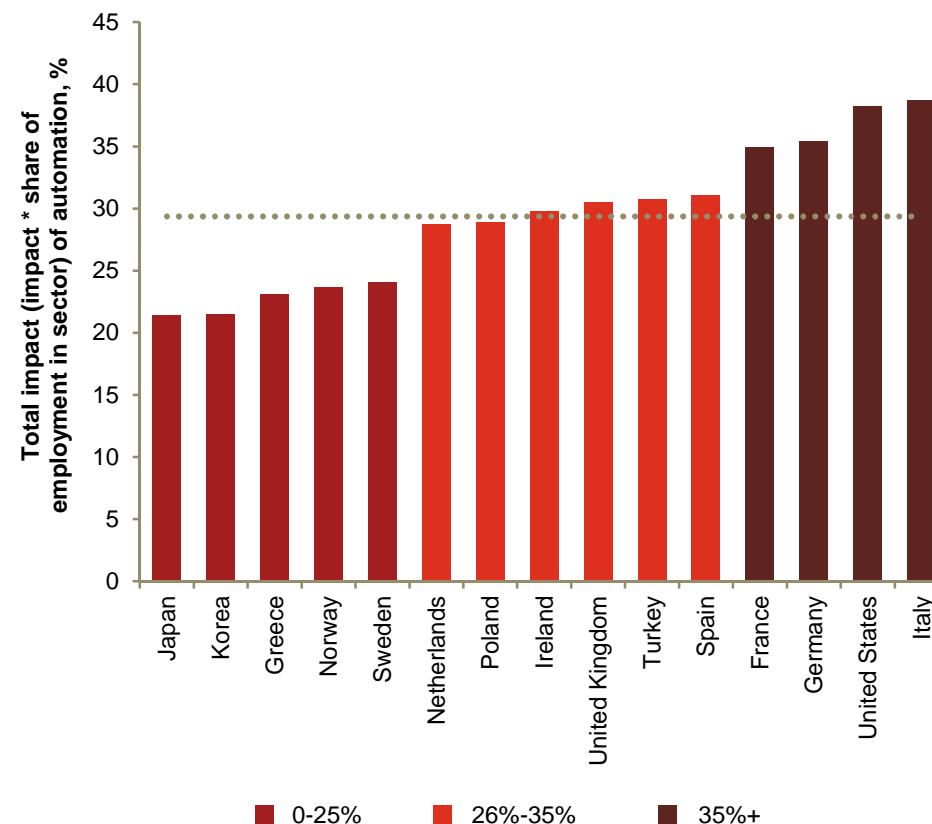
* These results are from a PwC survey of 10,000 members of the general population based in China, Germany, India, the UK and the US.

Increasingly, automation is posing a risk to jobs in a number of industries – around 30% of jobs on average across OECD countries

Over the past few years, fears of technology-driven job losses have intensified with advances in robotics, artificial intelligence and other digital technologies producing innovations which have the potential to replace the need for humans in many industries – driverless cars and trucks, intelligent virtual assistants and healthcare robots. So what are the implications for younger workers?

By the early 2030s, our analysis suggests that around 30% of jobs could be at risk of automation in many large and OECD countries*

- Recent [PwC analysis](#) has found that the potential jobs at high risk of automation could range from around 20-40% in many OECD countries.
- These estimates are based on an algorithm which links automatability to the characteristics of the tasks involved in different jobs and the characteristics of the workers doing them.
- The potential risk of automation varies quite considerably by sector, with manufacturing, transport and retail facing some of the largest risks.
- The graph to the right illustrates the estimated total impact per country, averaged across sectors and accounting for the share of workers within each sector – industries which have a greater risk of automation and also employ a greater share of the workforce are therefore most at risk.
- In Italy, for example, combined almost 45% of the workforce are employed in manufacturing and wholesale/retail trade, which are two of the sectors at greater risk of automation.



*Average across Austria, Belgium, Chile, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Korea, Poland, Netherlands, Norway, Russia, Singapore, Slovenia, Slovakia, Spain, Sweden, Turkey, United States and United Kingdom.

Of the industries at high risk of automation, the wholesale and retail sector is particularly important for many young workers

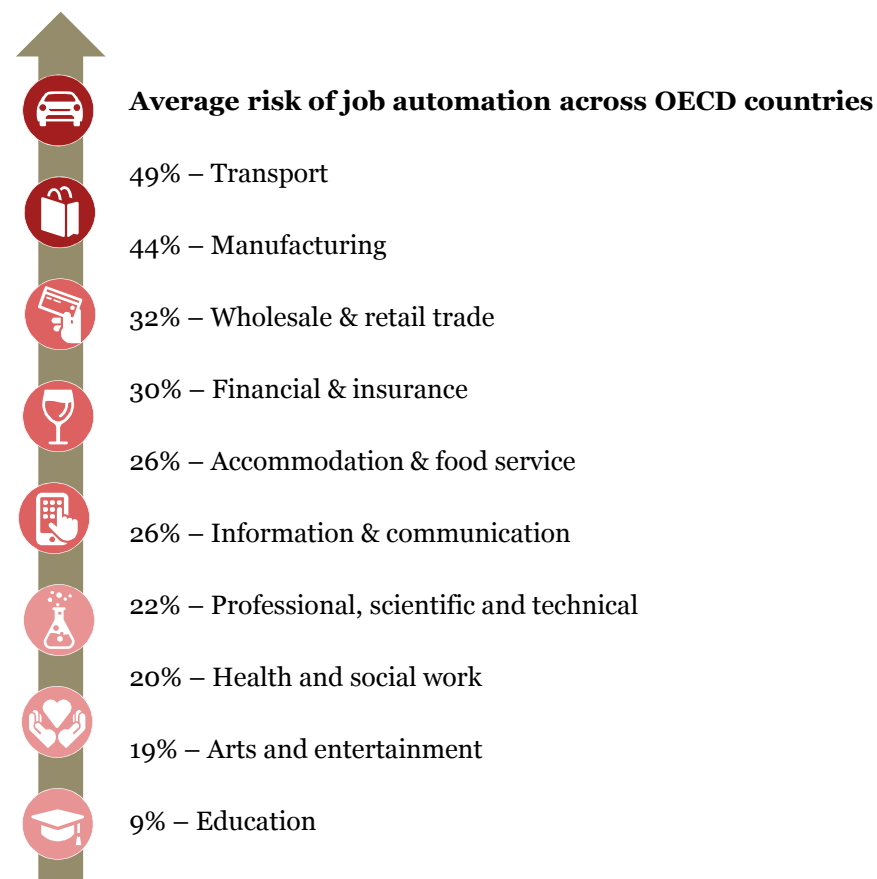
Young people across the OECD tend to be employed in the retail and accommodation and food industries. For the former, the risks of automation are large. As such, public policy needs to be focussed at promoting young people into sectors such as science and technology which have lower risks of automation.

Which industries are most at risk?

- The risk of automation varies considerably across industries, as shown in the list to the right.
- This is partly explained by the composition of tasks involved in these sectors – the sectors most at risk often involve manual or routine tasks, for example filling forms or solving simple problems. In contrast, sectors at low risk such as education and health care place a much greater focus on social and literacy skills which are relatively less automatable.

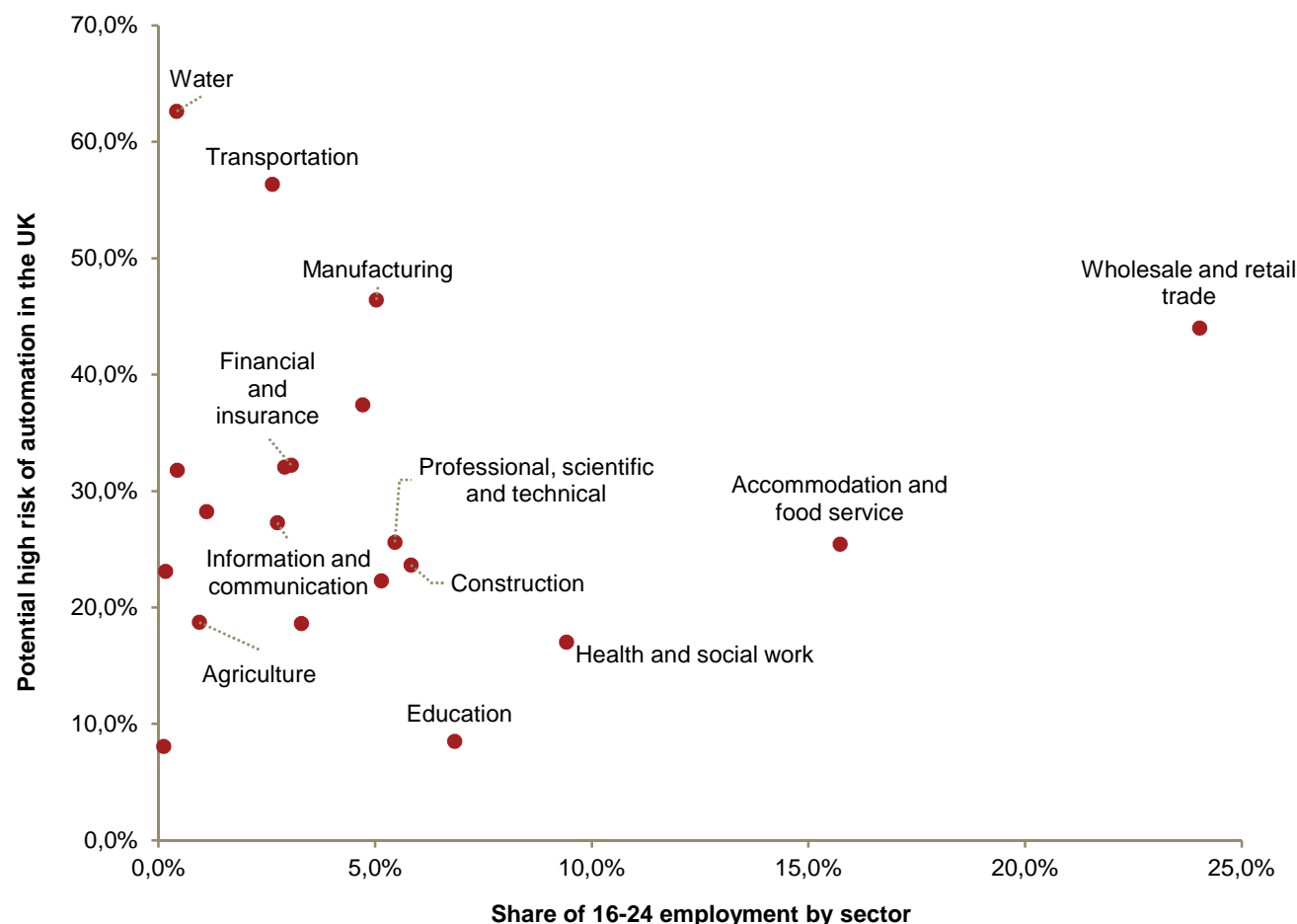
What are the implications for young workers?

- Based on these estimated sector impacts, we can draw out the implications for young workers. Across most OECD countries, young workers tend to be employed within the retail, accommodation and food service industries. These jobs are at some of the greater risks of automation by the early 2030s, meaning young workers will potentially bear a relatively large proportion of the automation risk. The following slide takes a closer look at the implications for young people, using the UK as a case study.
- The workers within these sectors also tend to be relatively less skilled, with lower educational attainment and qualifications, potentially limiting their ability to flexibly move between industries and into new jobs in response to automation.
- However, while these sectors remain large employers for the 20-24 age group, employment does tend to shift more to health, education and social care and banking and finance as young people leave school and move out of part-time employment – and these industries have relatively lower risks of automation.



In the UK, our analysis suggests that 28% of jobs of 16-24 year olds could be at risk of automation by the 2030s

Figure 3: The sectors young people are employed in and their risk of automation



Young people and automation in the UK

- In the UK, the story is very similar to that of the OECD on average, with around 30% of young workers at risk of automation. The risks for young people are focussed in the wholesale and retail industries.
- Within this sector in the UK, 28% of all workers are low education employees with GCSE¹ (or equivalent) or less.
- In contrast, only around 5% of young people are employed in industries such as STEM – which carries a much lower risk of automation by almost 20 percentage points than wholesale and retail trade.

Implications for public policy

- For young people employed full-time in these industries, training should be provided, with a focus on lower qualified workers so that young people have the opportunity to broaden their skill set and move into new industries.
- For part-time employees who work in retail alongside education, schools should engage with businesses to offer apprenticeships and other paid internships to students in alternative industries.

¹ Secondary education
Source: PwC (2017), APS (2016).

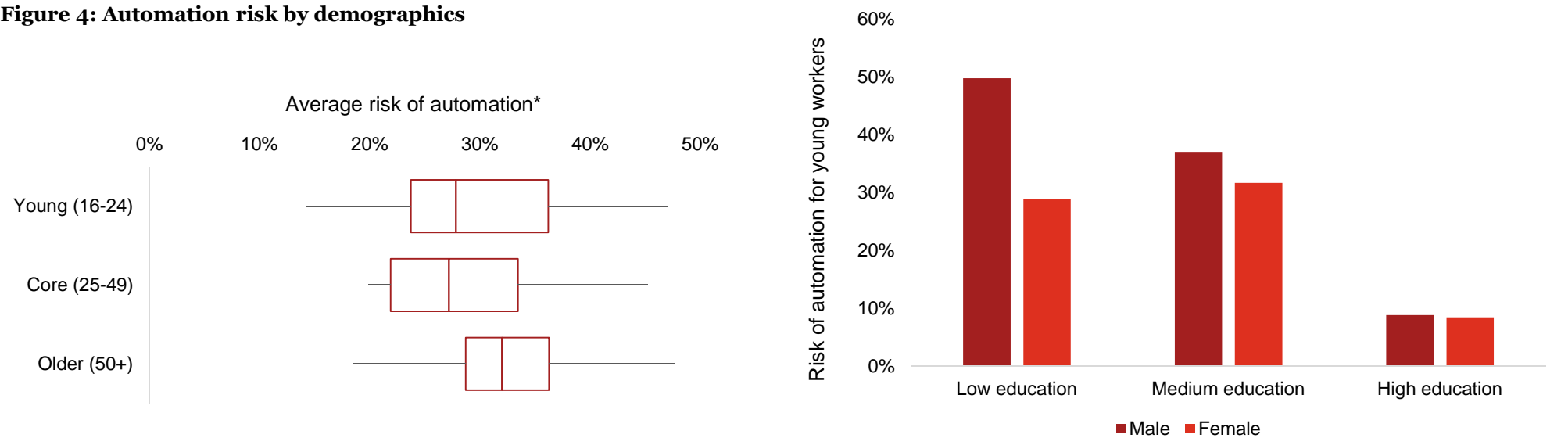
Young people as digital natives are well positioned to take advantage of opportunities created by technological progress, if supported by education

Automation presents many opportunities for young people, but education is key

- Based on job characteristics and the industries in which young workers are employed, they are only marginally more likely to be at risk of automation than core adult workers.
- But, in many cases young people might be better positioned as digital natives to take advantage of the opportunities created by new automation technologies in areas like AI, which is set to create some totally new jobs in the digital technology area.

- However, as indicated in Figure 4, the ability of young people to take advantage of the opportunities created by automation is largely influenced by their education levels.
- The disparity in automation risk for those less educated (GCSE or lower in the UK and equivalents elsewhere in the OECD) is especially pronounced for young men, who could be at 50% risk of automation, compared to 10% for higher educated (graduates) men.
- Therefore, a focus on providing young people with the right education and training will be key in preparing them for the more automated workplace of the future.

Figure 4: Automation risk by demographics



*Average across Austria, Belgium, Chile, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Korea, Poland, Netherlands, Norway, Russia, Singapore, Slovenia, Slovakia, Spain, Sweden, Turkey, United States and United Kingdom.

Education and training policy will be key to ensuring young workers have the correct skills for an evolving workplace and can be flexible to changing jobs

Invest in education and training for an automated world

Governments should invest more in the types of education and training that will be most useful to people in this increasingly automated world. It is likely that this will require a greater focus on vocational training, offering qualifications in digital and STEM industries that are less at risk of automation and also have less need for a university education. This will help young people utilise their current advantage having grown up as 'digital natives', honing their skills for a digital workplace.

1

Digital natives will be well positioned to take advantage of new jobs created by technological progress

- An important caveat to keep in mind is that while automation will lead to job losses in many industries, it will also generate completely new jobs related to these new digital technologies.
- To ensure that these opportunities do not disproportionately to higher-educated young workers in digital sectors, public policy should be focussed on providing the appropriate education and training to match these emerging opportunities – this should be delivered outside of formal education through vocational qualifications which do not specify a university educational path.
- More broadly, there will also be offsetting gains through boosts to productivity from new automated technologies. This will generate extra incomes and eventually feed through into the wider economy as this income is spent and invested – in turn, this additional demand will generate jobs and incomes across the economy.

Career development and re-training support

For those affected or likely to be affected by job losses, governments need to ensure career advice and re-training is provided. This should be focussed in industries less at risk from automation, for example in education or STEM. Local job centres should encourage and offer support for completing courses and qualifications. They should also forge links with local businesses in need of new skilled workers to offer employment pathways afterwards.

2

Invest in the digital sector to generate new jobs

To support the offsetting job gains from technological progress, governments should invest in digital sectors that can generate these new jobs. For example, this could be achieved through university research centres or science parks. Support could also be given to start-ups – for example, through tax incentives.

3



5

Implications for policy and business

There are three key policy lessons countries can learn from top performers to help ensure their workers can respond to the challenges of automation

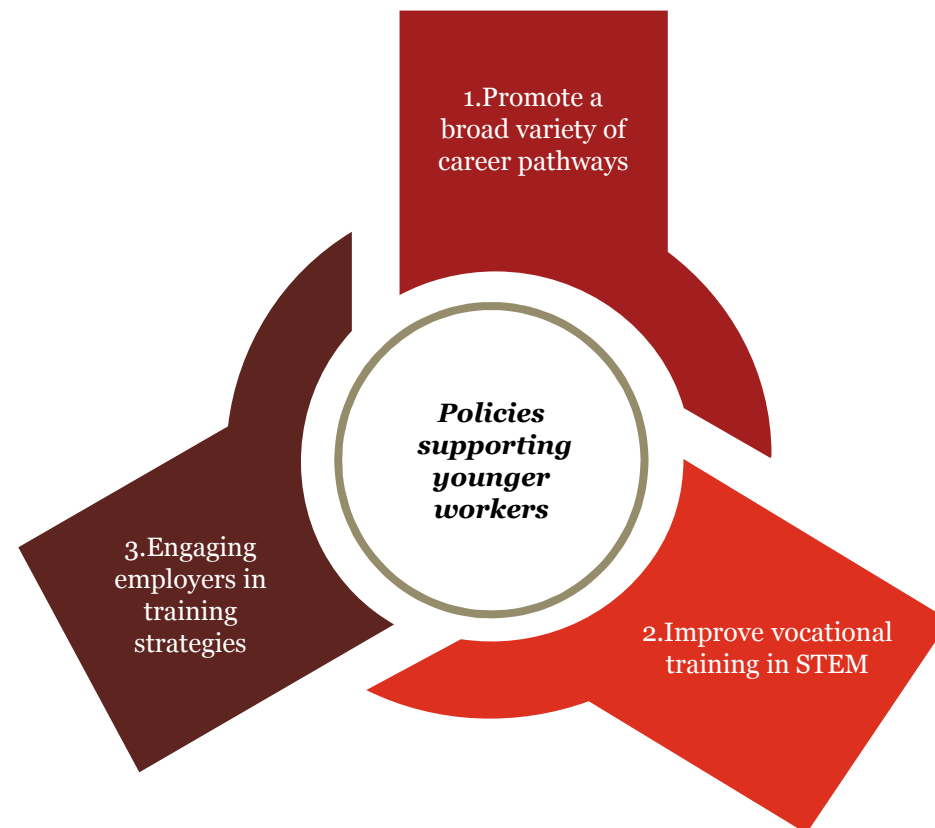
Education systems need to offer young people with a broad range of career pathways – from apprenticeships to university education. Schools need to offer advice and encourage students to consider both traditional subjects and technical training, shifting cultural perceptions towards apprenticeships.

1

Vocational training needs to be promoted during school. These career pathways are growing in importance with the emerging skills shortage in subjects such as STEM (science, technology, engineering and mathematics). Jobs in these areas do not necessarily require a university education route and also tend to be less at risk of automation.

2

Education policymakers need to engage with businesses, ensuring programmes are producing young workers with market-relevant skills. This will also ensure training strategies are being constantly updated to reflect evolving business need in an ever-digital and automated workplace.

3


Vocational training is the key to opening up alternative career pathways to university and much can be learnt from top performers like Germany

In many OECD countries, there remains a cultural bias towards attaining a formal university education. But in today's diverse and digital economy, technical training and work experience may actually be the key to empowering young people to chose a career path that suits them, promotes social mobility and supports individuals from all backgrounds into gainful employment.

A recurring feature of the top performers on our index is a 'dual education' system which incorporates vocational training alongside classroom learning.

By exposing young people to both academic and practical subjects at a young age, individuals can make a more informed choice about their future career paths, providing them with more options and a more diverse set of skills.



By engaging students with employers from a young age, individuals will gain valuable employability skills. Allowing employers to design training strategies will help reduce future skills mismatches and help ensure that young people have the skills for a digital workplace.



By embedding technical education in the school curriculum, cultural biases towards university education will begin to shift. For countries such as the UK this will be crucial – rising tuition fees combined with its poor relative supply of apprenticeship schemes (compared to other OECD countries) is greatly limiting future career pathways for those from lower income families.



Germany's dual education system puts more than **50% of school students in one of over 300 training opportunities.**

The Vocational Training Act provides over **500,000 company-based training contracts a year.**



In Switzerland, over **70% of young people** participate in the Vocational Education and Training System (VET) which offers apprenticeships and qualifications in over 200 **different occupations.**

Around **1/3 of Swiss companies** engage in apprenticeship training programmes.



In Austria, the Youth Guarantee Scheme **entitles every young person** interested in an **apprenticeship** to a place.

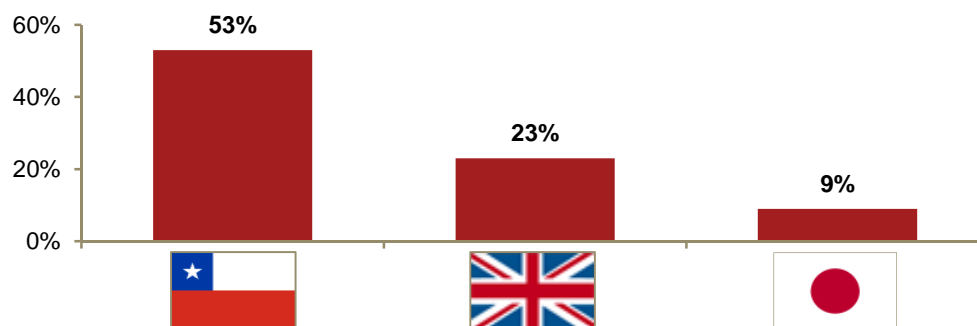
Initiatives have also been launched introducing girls from the age of 12 into technical careers through career fairs and advice.



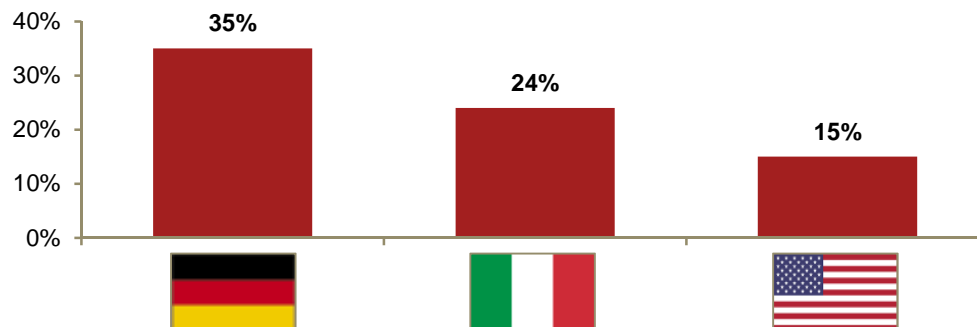
One area vocational training should be focussed on is STEM subjects which continue to demand more skilled workers across the OECD

Across the OECD, STEM (science, technology, engineering and mathematics) remains a low employer of young workers. But demand for skilled workers is on the rise in these industries and is outpacing the growth of STEM skilled workers leading to a skills gap. Education policy should focus on changing perceptions of these industries to boost youth employment and support business and innovation.

The percentage of young adults (16-24) with only basic or elementary numeracy proficiency varies widely across the OECD ...



... as does the share of graduates graduating with a STEM subject ...



The **unemployment rate** in STEM industries remains **significantly below** that of other industries.

In 2013, unemployment rates in the EU were:
2% in STEM
11% total u/e rate¹

On average, **10% of females graduate in STEM subjects**, compared to over **26% of male graduates**²

Across the OECD on average, **female participation in STEM subjects lags considerably below** that of males.



There is an emerging **skill shortage** of workers within STEM industries that needs to be addressed.

In the UK, the proportion of businesses reporting **problems recruiting STEM employees more than doubled from 2013 to 2015 to 26%**³

Sources:

¹ European Parliament's Committee (2015).

² OECD Statistics (2012).

³ CBI/Pearson Education and Skills Survey (2015).

Government and businesses need to work in partnership to improve training for young people in STEM and close the growing skills gap

STEM industries will be the engines of growth, productivity and innovation. They will provide the jobs of tomorrow.

Over the last decade, the contribution of STEM industries to the global economy has grown considerably. In an increasingly digital world, it is crucial that we equip young workers with the skills needed in these growing industries and reduce the risks of job losses from automation. Providing education and training from a young age in these subjects will not only help meet growing business need for skilled workers, but will also continue to drive innovation, technological and scientific progress.

This slide outlines some of the ways governments and businesses can work together to promote young engagement and training in STEM.

London borough of Haringey – United Kingdom

- Haringey Council is the regional leader in London's efforts to close the STEM skills gap, setting up a **STEM Commission** to engage with businesses, school leaders and governors in order to encourage youth towards STEM careers.
- As part of this agenda, they have been actively setting up **post-16 opportunities** to support young people in specialist education and training in STEM.
- One such opportunity is the opening of the **National College for Digital Skills** in Tottenham Hale, which will provide BTEC Level 3 courses to Sixth Formers as well as 19+ apprenticeships, with a specially tailored curriculum focused on technical, creative and entrepreneurial skills.

Stem Alliance – EU

- The STEM Alliance is a cross-EU initiative aimed at promoting STEM education and careers to young people.
- The Stem Alliance aims to increase links between STEM education and careers, by **involving schools and businesses** throughout Europe.
- One company who have joined the STEM Alliance is Shell, who assist teachers and students in STEM subjects in 32 schools within the Netherlands. The aim of this initiative is to **improve their technical education and motivate students towards a STEM career**.
- **Active involvement of businesses in designing training** will ensure growing business demand for skilled workers is met.

TechHire initiative – United States

- In 2015, President Obama launched the TechHire initiative to expand local technology sectors through the training of young people.
- **Over 1300 employers are signed up to the initiative**, committing to providing tools to support training strategies in over 70 communities. Since the initiative was launched in 2015, over 4000 job placements have been offered.
- Over \$100 million was also pledged in federal funding, with the majority of the funding going directly to **partnerships that will train and support young people**. A proportion of the funding was also specifically allocated to support individuals from disadvantaged backgrounds.

Companies across the world are investing in STEM education for young people to bridge the skills gap and create a young digital workforce

Education policy needs to be supported by businesses who promote training in the skills that they require and that will be more robust to automation.

Increasingly, businesses are taking a more proactive role in offering training to young people. This allows them to match young people to the roles they need and support the future growth of their industries.

This slide documents some of the initiatives that companies are taking around the world to improve skills in STEM industries.

Governments need to recognise these efforts and work to promote these programmes in schools to encourage uptake, especially amongst disadvantaged youth.

Google – Worldwide

- Every year, Google presents RISE (Roots in Science and Engineering) Awards to non-profit organisations who promote computer science education opportunities.
- The Awards are given to organisations across the world, with particular focus on initiatives that reach **girls, underrepresented minorities, and students from a disadvantaged background**.
- Recipients of the award receive a **\$10,000-\$25,000** grant and leaning resources from Google experts and volunteers. In return, recipients are expected to report to Google on their programmes success and **share resources across the local community**.

Life is Tech! – Japan

- Since 2011, Life is Tech! has been running **teenage IT educational events in co-operation with universities**, IT companies and schools across Japan.
- So far they have **provided IT education to about 13,000 participants**, with the aim of engaging with 200,000 Japanese students in the future.
- In 2014, Life is Tech! were awarded with a Google RISE Award, the first company to receive this in the East Asia region.
- They have since expanded internationally, running educational camps at the National University of Singapore and more recently at the University of Melbourne in Australia.

IBM – United States

- In 2016, IBM sponsored **Girls Who Code (GWC)**, a national non-profit organisation whose aim is to close the gender gap in technology.
- IBM helped GWC run **summer immersion camps and after-school coding clubs**, teaching girls how to use applications like Watson API, Bluemix, Java and Python.
- Local IBM offices also provided speakers and facilitators for the summer camps.
- Since 2012, the camps have served 40,000 girls in all 50 states. By 2020, they aim to teach **one million** girls how to code.

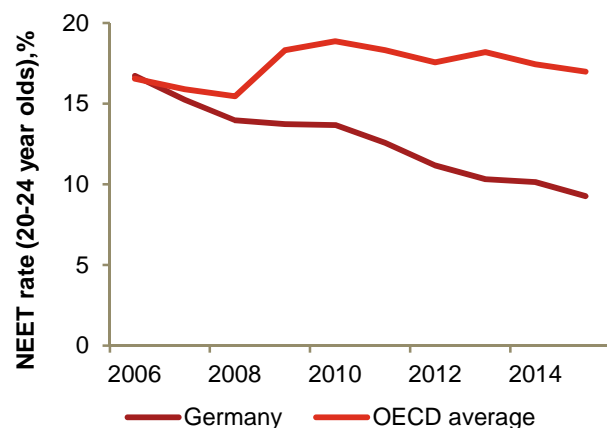
Focus on: German's dual education system goes hand in hand with promoting STEM training

Germany has been a consistently high performer on the index over the past 10 years. As discussed in the previous slide, vocational education and training are deeply embedded and respected in German society. The engagement of employers is well integrated in the system and permits a mutual screening between potential employers and employees during training.

Germany performs significantly above the OECD average on many indicators, with over half the rate of youth unemployment...



... and a continually falling NEET rate



Germany's dual education system naturally incorporates a focus on STEM industries.

Standardised training, testing and qualifications in over 300 recognised occupations means all apprentices are guaranteed the same level of training regardless of location or company.

1

The system naturally promotes training in STEM industries, which often require more technical training such as computing, as opposed to classroom learning.

2

Engagement of employers in the system ensures young people are receiving market-relevant training that matches the demand for workers in an increasingly digital world.

3

Germany – 'Go MINT'

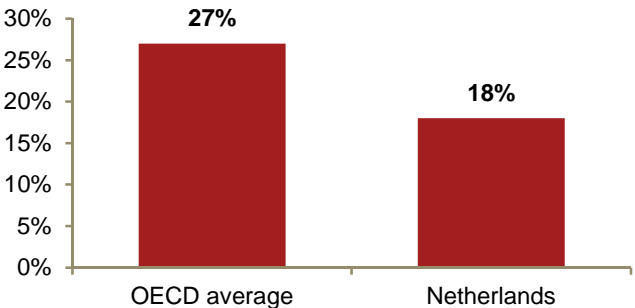
- 'Go MINT' is a national project within Germany to increase female participation within MINT (Mathematics, Informatics, Natural Sciences and Technology).
- The initiative was launched in 2008 and has so far had more than **220 partners** supporting a wide range of activities and projects to **advise young women on studies and careers in MINT**.
- According to current information from the Federal Office of Statistics, the 'Go MINT' campaign has seen over **40,000 female students opt for an engineering degree in 2014 – three times the number in 1995**.
- Similarly the number of female students has increased from 21,000 in 1995 to 64,000 in 2014.

Focus on: How the Netherlands are increasing youth engagement in STEM subjects and skills

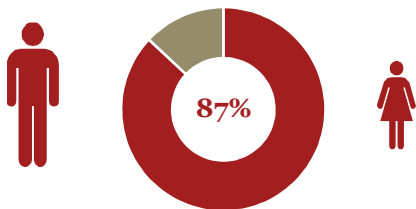
The Netherlands has previously lagged behind the rest of the OECD in terms of getting young people into STEM. But over the last 15 years, the government has tried to reverse this trend, introducing a series of initiatives to promote youth take-up in STEM education and careers.

Historically the Netherlands has seen low numbers of young people pursue STEM education and careers, particularly females:

Figure 4: Percentage of new students* choosing a STEM field of study (2015):



* Tertiary educated students.



87% of people in technical and engineering jobs within the Netherlands are men.

The National Technology Pact (2013) aims to provide greater alignment between education and the technology job market.

The initiative has 3 lines of action:

Choosing for technology: get more students to choose a technological study. This will focus on engaging pupils with STEM at an earlier age and empower teachers to teach STEM subjects at all levels.

Learning in technology: get more students and technology graduates to work in STEM careers. This will focus on alignment between local business communities and educational institutions, as well as providing a sufficient number of suitable apprenticeships.

Working in technology: retain workers and reposition those with a STEM background who are unemployed. The focus is to promote collaboration between regional and industry sector networks, and offer better access to labour market information.

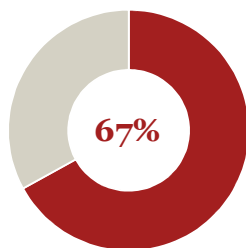
With targets set for each:

By 2020, **7,000** primary schools will have science and technology on their curricula.

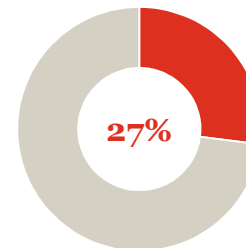
Central government, employers and the regions will each contribute €100m to invest in public-private education partnerships within the region.

The government will put forward €300m to finance training and schemes to help redundant workers find alternative work.

PwC's technology degree apprenticeship is an example of businesses providing young people with alternative career pathways



PwC research reveals that over two thirds (67%) of UK CEOs find it difficult to recruit people with digital skills, higher than their global peers.



Recruiting women with these skills is particularly challenging – a separate PwC study found that only 27% of female A-level and university students would consider a career in technology compared to 62% of males.

Six facts about PwC's technology degree apprenticeship ...

- 1** PwC has created a new, fully-fledged technology degree apprenticeship to give more young people from a broader range of backgrounds the opportunity to get into technology.
- 2** The programme will start in **September 2018**, and will see 80 students a year combine university life with practical work-based technology projects at PwC.
- 3** The four year course is being developed by PwC in partnership with the University of Birmingham and Leeds, and participants will be based in the same city they are studying in.
- 4** It will be one of the first and largest examples of the new **Level 6 Degree Apprenticeships** in action. Students will be PwC employees from the first day and receive a salary throughout.
- 5** At the end of the programme they will graduate with a degree in Computer Science and a job at PwC if they meet performance criteria.
- 6** PwC will particularly target its technology degree apprenticeship at females interested in technology careers, as well as using its Back to School programme to raise awareness of the programme with students in more disadvantaged areas.



Kevin Ellis

Kevin Ellis, Chairman and Senior Partner, shares his thoughts on the new programme ...

Why is the technology apprenticeship important?

‘For the UK to prosper post-Brexit we need to invest in creating a vibrant tech sector right across the country and more people with the skills needed to help businesses transform. The demand for technology advice is rapidly increasing, while the pool of available tech talent is shrinking. Our technology degree apprenticeship is an exciting way for us to start to grow the future of the UK's technology industry and to open up these careers to a wide range of students across the UK’.



Jon Binner

Professor Jon Binner, College of Engineering and Physical Sciences at the University of Birmingham, said:

‘At the University of Birmingham, we are passionate about providing our students with the best opportunities and experiences possible to prepare them for the world of employment. We are delighted to develop this four-year course with PwC, which will provide our students with the skills set, expertise and experience that are highly in-demand from industry. Like PwC, we too believe in addressing the UK's technology skills gap and improving the industry's diversity, and are proud to be instrumental in educating the industry's future talent’.



6

Focus on: The Netherlands

The Netherlands has a steady index score in 2016 as enrolment rates and youth employment rates are high and NEET are low – but part-time work and high drop-out rates¹ hamper better rankings

The Netherlands has a steady position in the top 10 of the index, closely following the top 3 European countries. However, many challenges still remain – and these issues are not unique to the Netherlands.

The Netherlands is one of the top performers regarding enrolment rates (15-19), NEET rates (20-24) and youth employment (15-24).

1

The Netherlands has the highest incidence of part-time work across the OECD. This may benefit younger workers who are looking for a flexible transition from unemployment to permanent full-time employment, but may also reflect an inability to obtain full-time contracts.

2

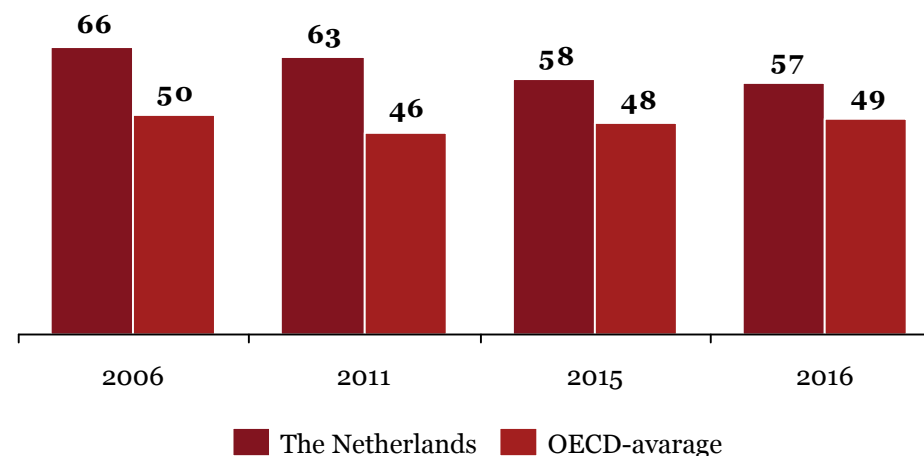
Inequality due to socioeconomic backgrounds and regional differences in educational quality and employment opportunities are key focal points for governments and businesses.

3

How has the Netherlands performed?

- Despite other OECD countries making steady improvements since the global recession, the Netherlands hasn't been able to increase its score.
- Since 2006, the Netherlands saw its absolute index score fall by over 9 percentage points. Since 2011, the drop was sharpest in wake of the financial crisis, as youth unemployment increased, as it did in many OECD countries.
- The OECD average has recovered since 2011 and this year has almost reached its pre-crisis peak. However, the Netherlands has yet to recover.
- Several OECD countries outperform the Netherlands on the index. For example, Germany's unemployment rate of 15-24 year olds is 3.8 percentage points lower than the Netherlands, indicating scope for further improvement.

Figure 5: The Netherlands and average OECD index scores over time



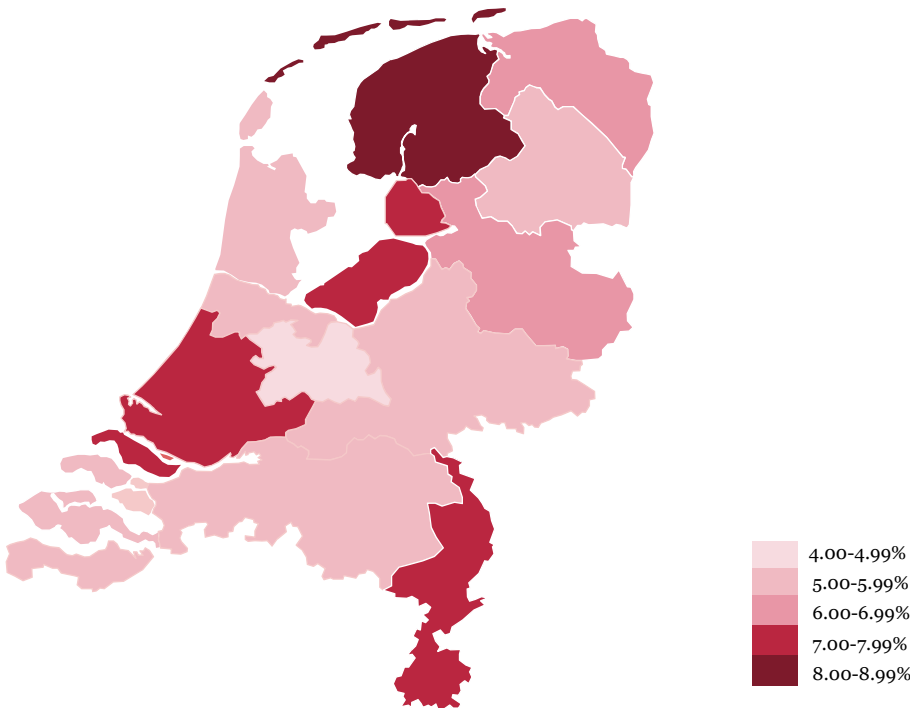
¹ Data from 2011, as more recent comparable data for all OECD countries is not available.
Source: PwC Analysis.

Youth educational and employment outcomes vary considerably by region – Public policy needs to revive regional prospects and create opportunities

There are large differences in the outcomes of young people within the Netherlands. This reflects not only lower educational attainment in regions such as the province of Groningen, but also a relative lack of labour market opportunities for young people compared to regions such as the province of Utrecht.

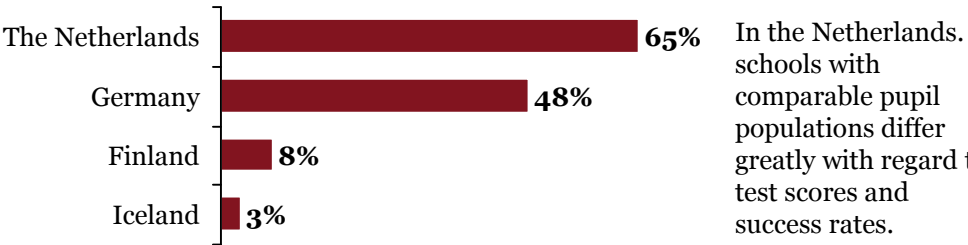
There continue to be disparities in NEET rates across the Netherlands.

Map 2: NEET Rates in the Netherlands (18-24, 2016)¹



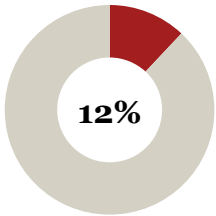
¹ NEET data from Eurostat differs from OECD NEET data.
Source: Eurostat (2017), Inspectie van het Onderwijs (2017)

The Netherlands has the highest level of disparity between schools of all OECD countries, based on PISA scores.



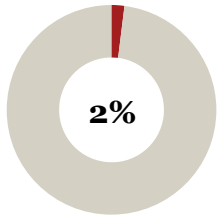
Differences in education quality and therefore attainment also play a large role.

Groningen has the highest percentage secondary schools ...



Groningen

... that were classified as **under-performing** in the latest review of the Onderwijsinspectie.



This compares to 2% in Zeeland.

Outcomes for young people continue to be linked to their socioeconomic background – Education policy needs to focus on disadvantaged youth

Although the last decade has seen a significant amount of government effort and money invested in schemes promoting social mobility, including widening the access to higher education and changing the recommendations system for secondary education, outcomes for youth populations have been less tangible.

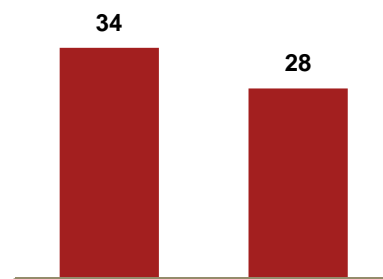
The social mobility problem in the Netherlands is often linked to the increasing inequality within the education system

Pupils with less-educated parents are less likely to earn a high-level diploma than pupils with highly-educated parents. Pupils with less-educated parents get lower recommendations for secondary education, are more likely to select a broader or lower-level transition class, attend higher education less often and are more likely to drop out.



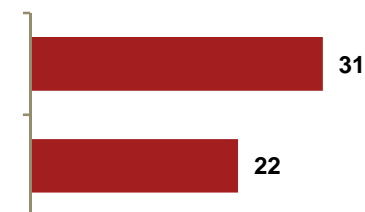
This means that those from higher socioeconomic backgrounds achieve better educational outcomes

Families where both parents are highly educated spend on average around **34** minutes a day on educational activities with their young children compared to **28** minutes a day for those with low education.



Inequality in work-placement opportunities ...

Students with a non-Western migrant background are significantly disadvantaged in finding a work-placement. 31% of BOL students with a migrant background say they have difficulty finding a work placement compared to 22% of students with a native Dutch background.



... and inequality of job opportunities affect graduates with non-Western migrant backgrounds most.

Graduates with a non-Western migrant background – especially MBO graduates – have more difficulty finding a job than the other groups of graduates. 6% of native Dutch graduates of the school-based vocational track (BOL) are still unemployed one year after graduating, compared to 20% of BOL graduates with a non-Western migrant background. **Having a migrant background is a much greater cause of inequality than the parents' education level**, and the inequality has been increasing in recent years. In 2001, the difference in the unemployment rates of native Dutch and non-Western MBO graduates was 5 percentage points, compared to 12 percentage points in 2015.





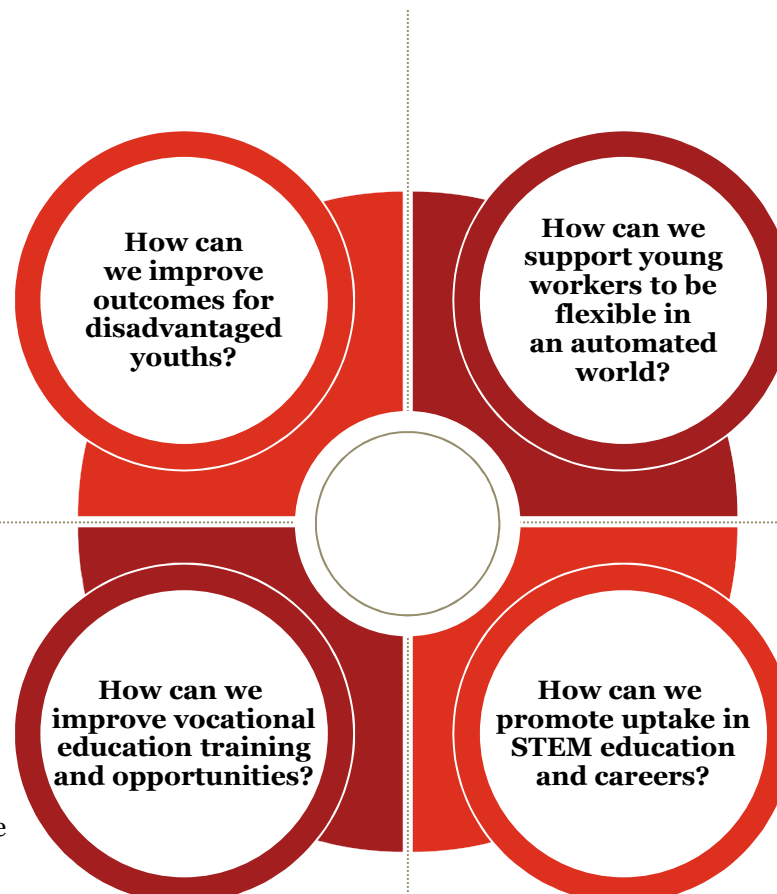
Conclusion

7

Conclusion

4 key learnings for government and business

- Governments should invest in education systems within disadvantaged areas in order to reduce attainment gaps and promote social mobility.
- Policymakers should also make sure that appropriate careers advice is provided to disadvantaged youths so that they can make a well-informed decision about their future career path.
- Employers should continue to offer vocational schemes to provide better opportunities for those less suited to academic learning.



- Governments should invest in education and training that will be most useful to young people in an increasingly automated world. Training strategies should be designed with businesses to ensure that the skills young people develop are relevant to an evolving workplace.
- Re-training and careers advice should be offered to those whose jobs are most at risk (e.g. in retail), with particular focus on those who are lower qualified, so that they have the opportunity to broaden their skill set and move into other roles and/or industries.
- An increased effort should be made by both governments and business to encourage STEM uptake at primary and secondary schools, particularly for girls. This could take the form of careers fair and linking up with businesses to offer work experience opportunities.
- Governments and employers should also continue to fund projects aimed at promoting STEM awareness and look to increase the number of STEM apprenticeships available to young people.

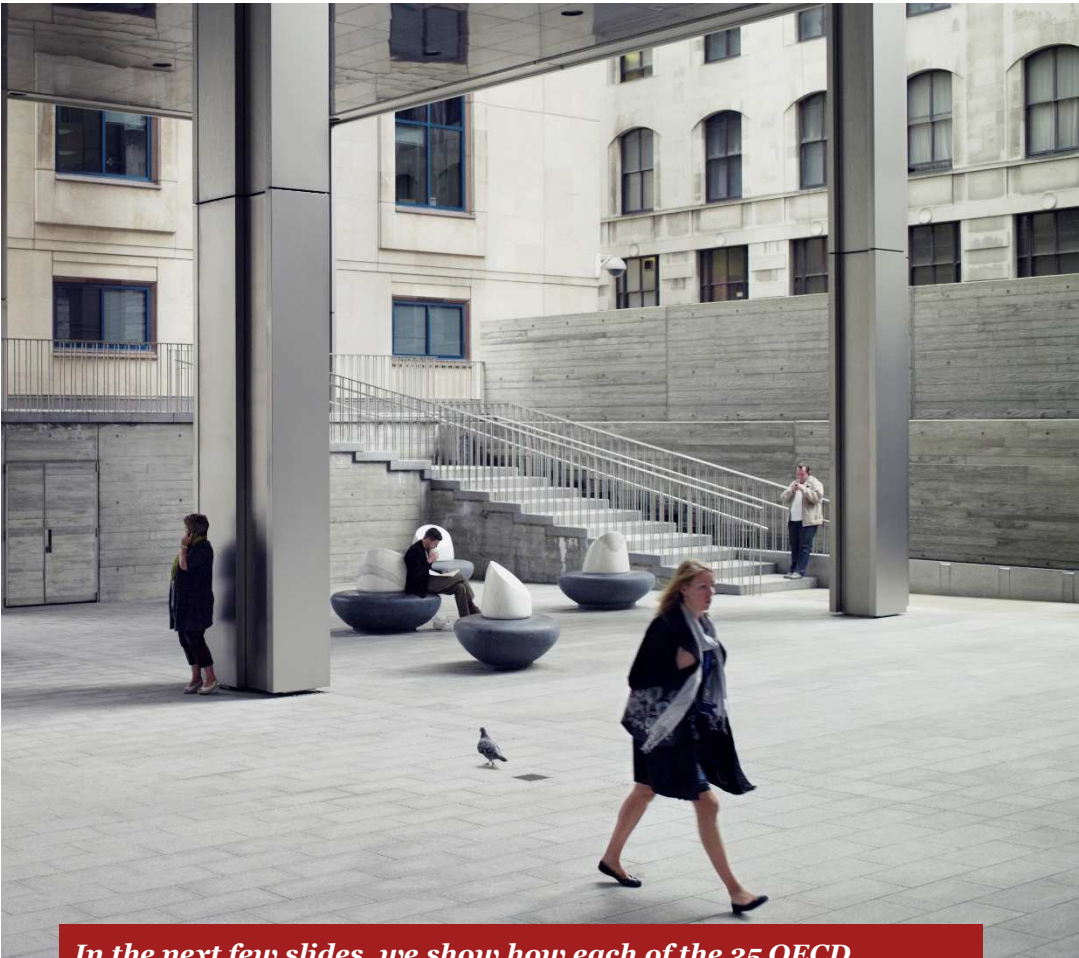
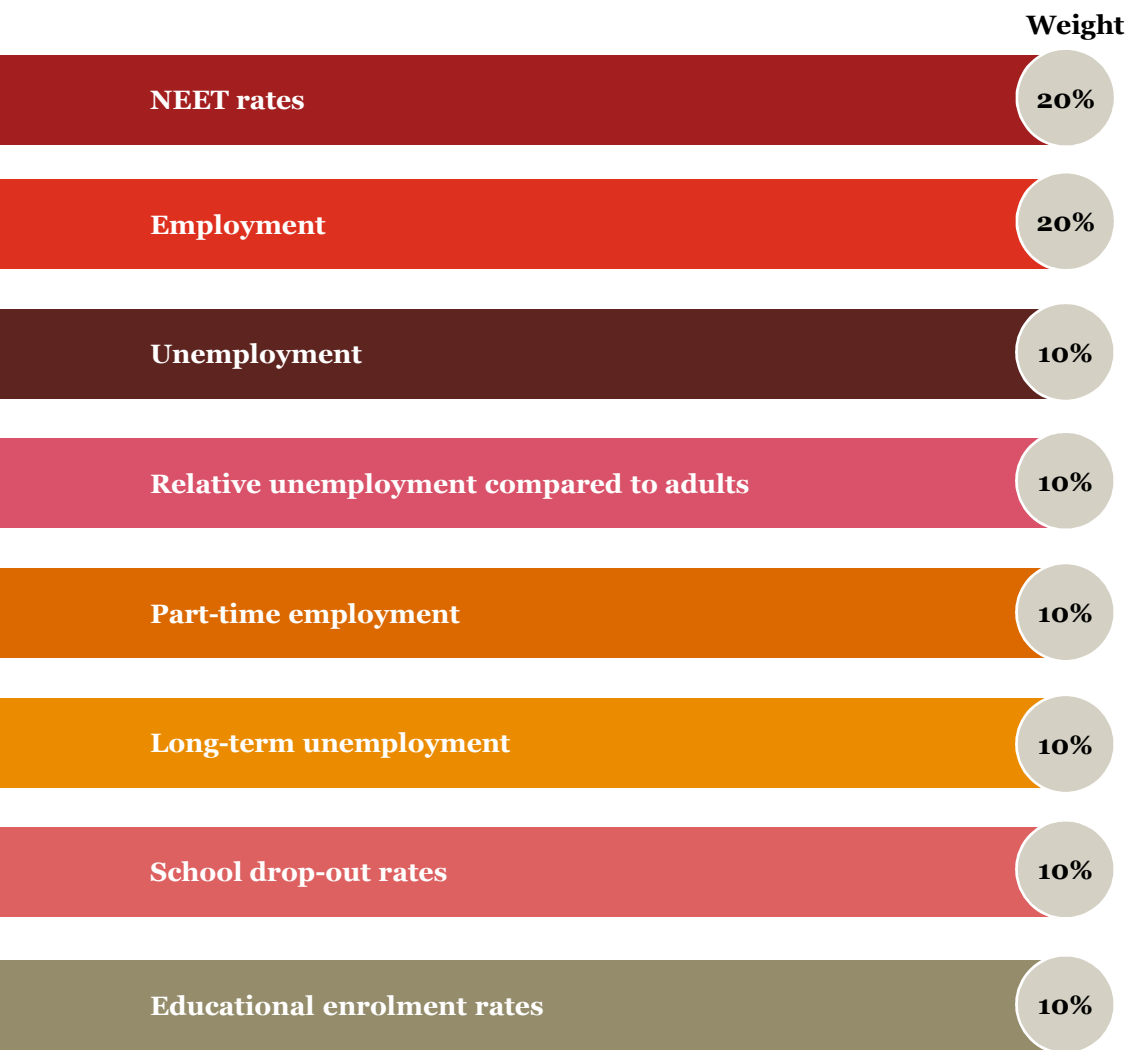


Appendices



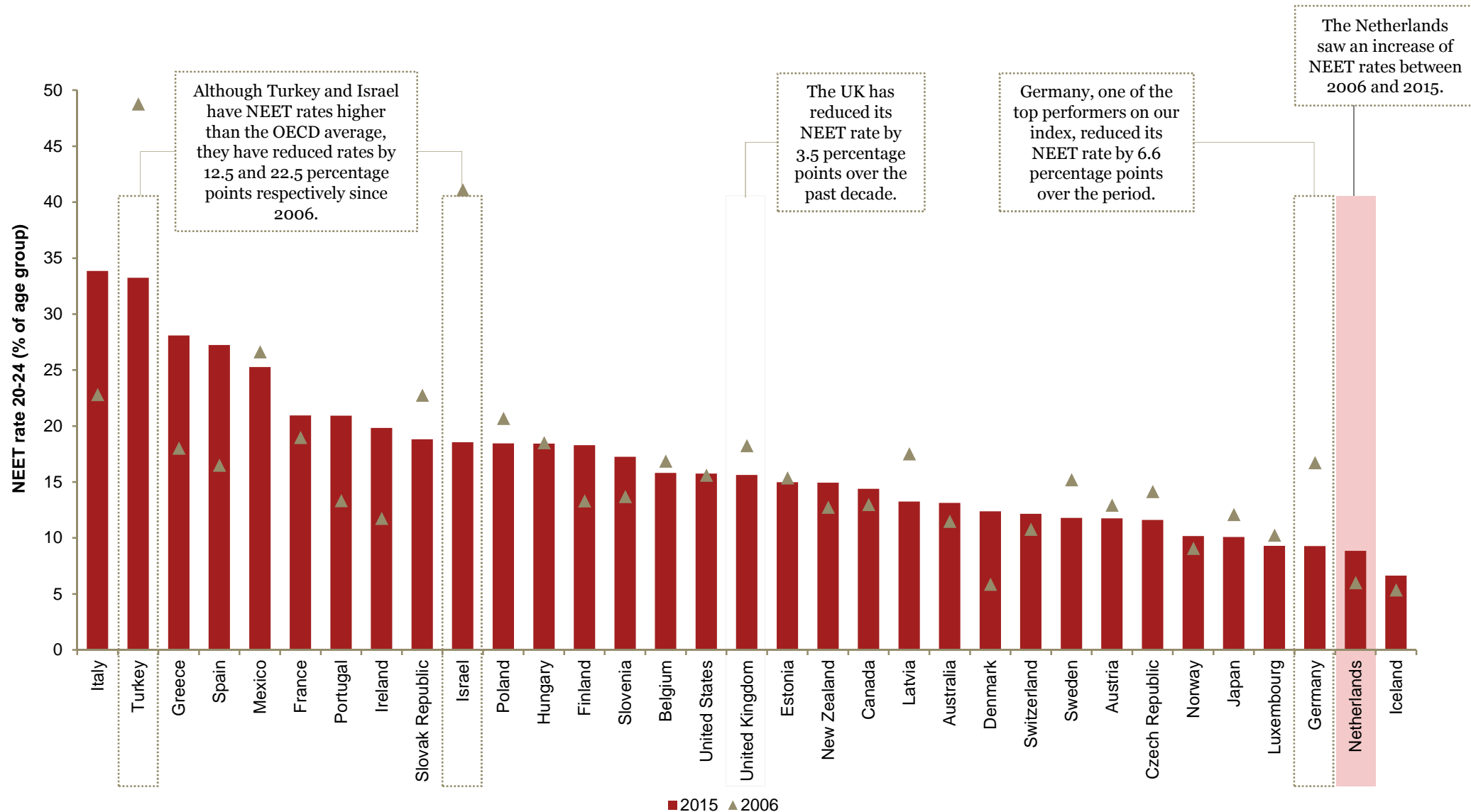
A1: Individual labour market indicators

Our Young Workers Index is constructed using 8 key labour market measures that reflect labour market activity and educational participation

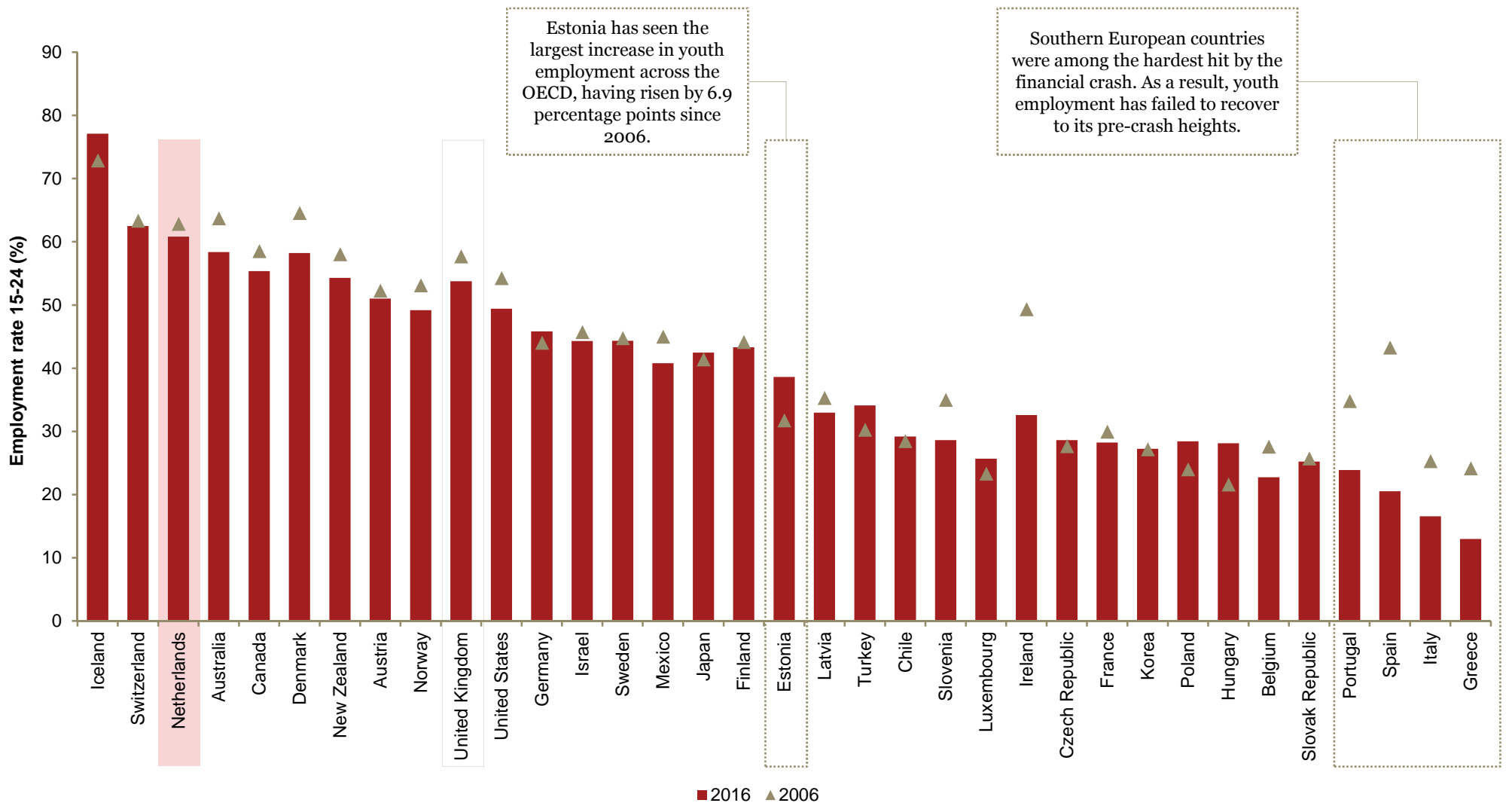


In the next few slides, we show how each of the 35 OECD countries perform on these labour market indicators.

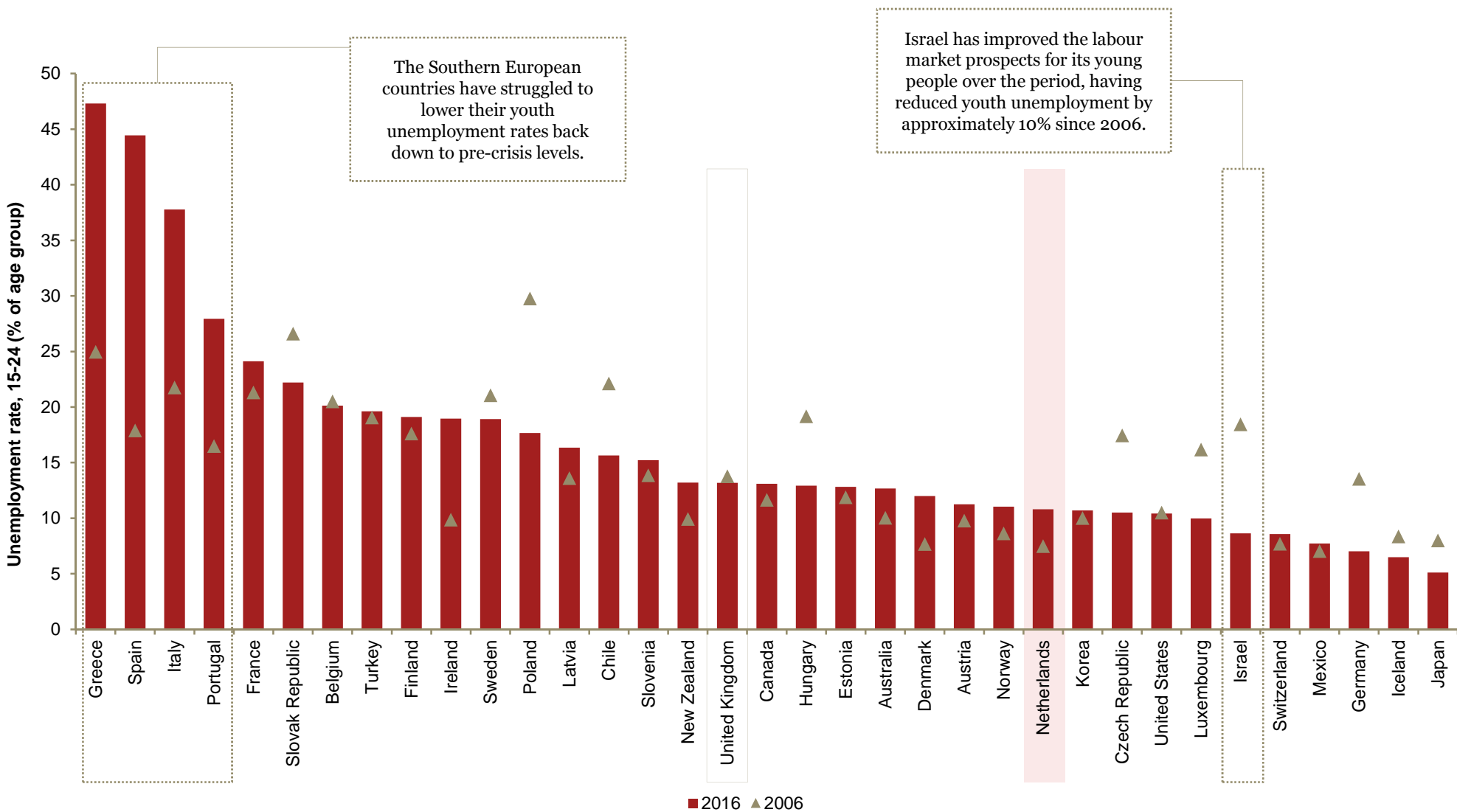
NEET Rate 20-24 (% of age group)



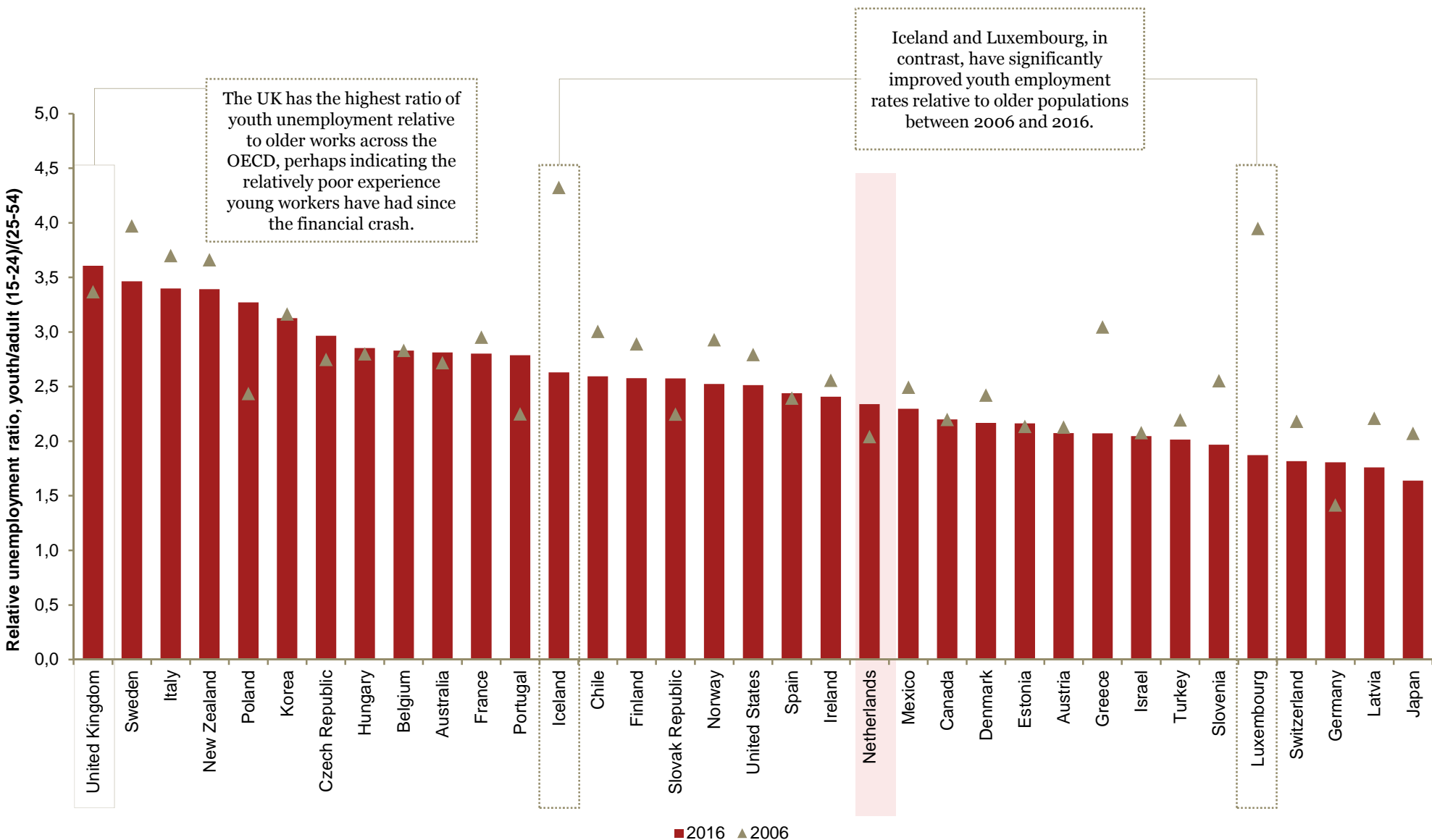
Employment rate of 15-24 year olds



Unemployment rate of 15-24 year olds



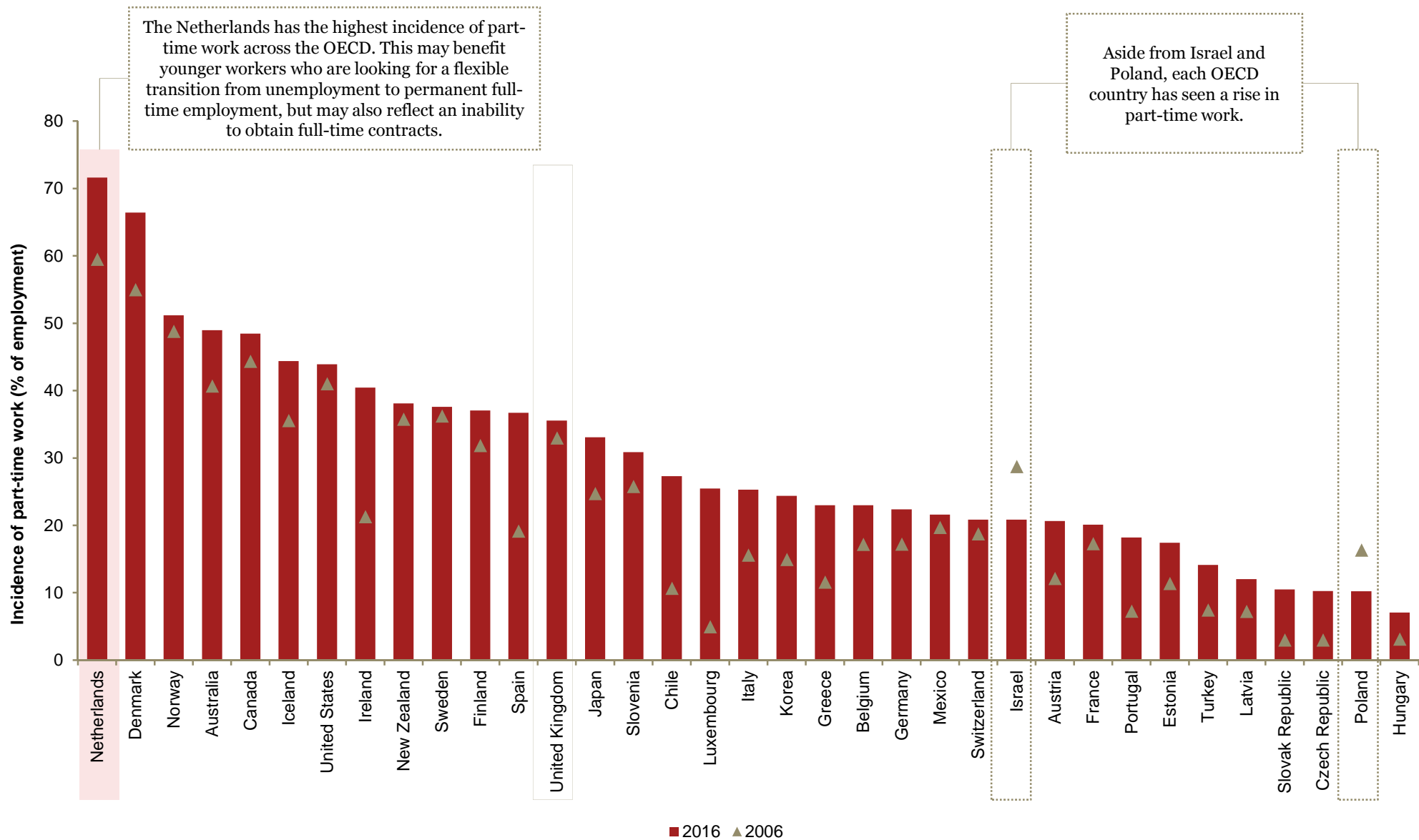
Relative unemployment ratio, youth/adult (15,24)/(25-54)



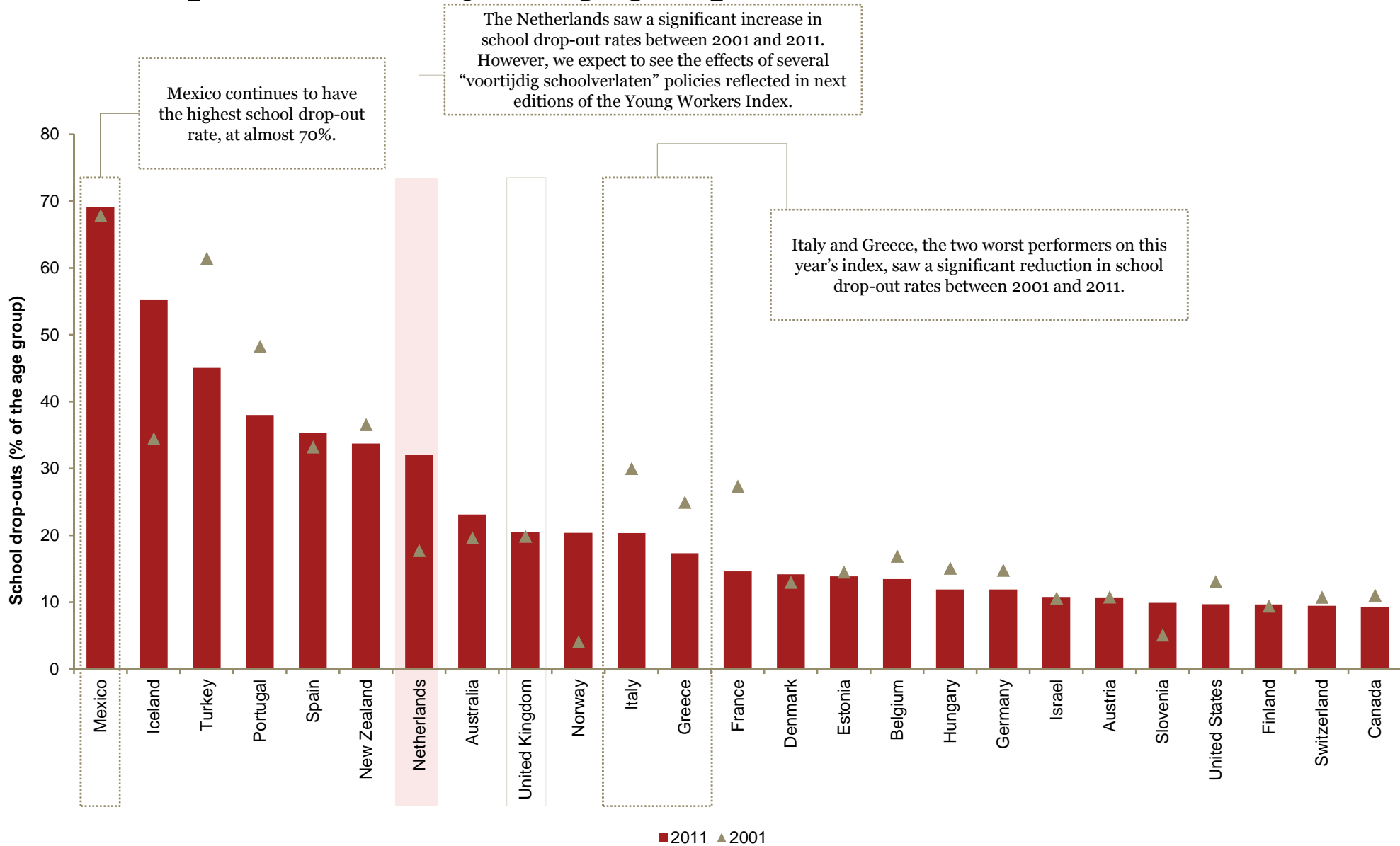
Incidence of long-term unemployment for 15-24 year olds (% of unemployment)



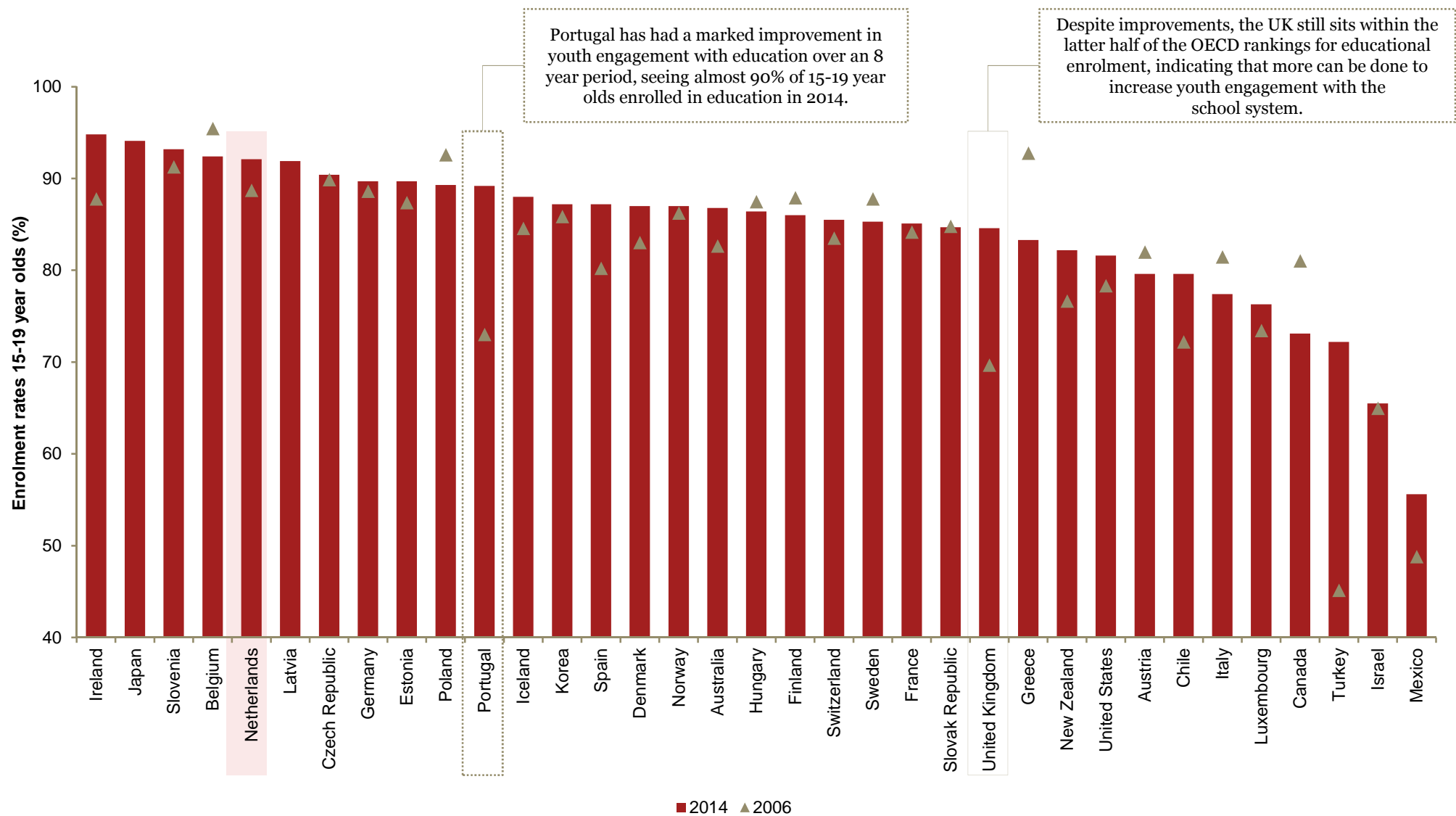
Incidence of part-time work (% of employment)



School drop-out rates (% of the age group)



Educational enrolment rates for 15-19 year olds (%)





A2: Comparison with other measures

Summary of relationships with other measures

What can we learn?

We analysed the relationship between our Young Workers Index and other measures and found a positive correlation with all the variables considered. However, we note that a positive correlation might not necessarily be evidence of a causal link, as there may be other contributing factors and reverse causality may apply in some cases.



GDP per capita

Correlation (+0.44)

Economies that invest in younger people are more likely to have higher incomes, although many other factors will play a part here.

1



Educational Spend

Correlation (+0.47)

Countries that invest a greater amount in education tend to perform stronger on the Young Workers Index.

2



Digital Skills

Correlation (+0.68)

Policymakers should make sure that young people receive digital skills training in order to meet changing labour market demands.

3



Mathematical skills

Correlation (+0.47)

Governments should promote core transferrable skills, like STEM, in order to improve youth employability and tackle the skill's gap.

4



Older workers

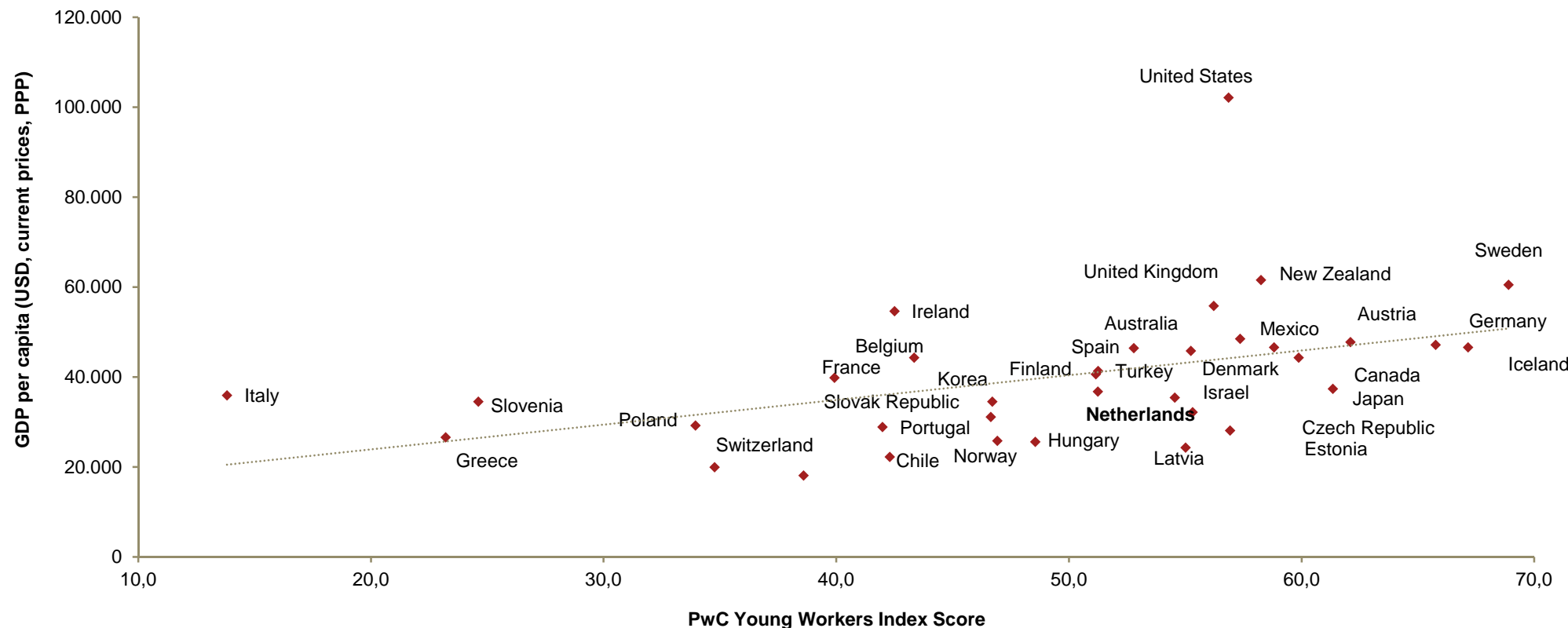
Correlation (+0.53)

Contrary to the 'lump of labour fallacy', our analysis suggests that older workers do not 'crowd out' younger workers.

5

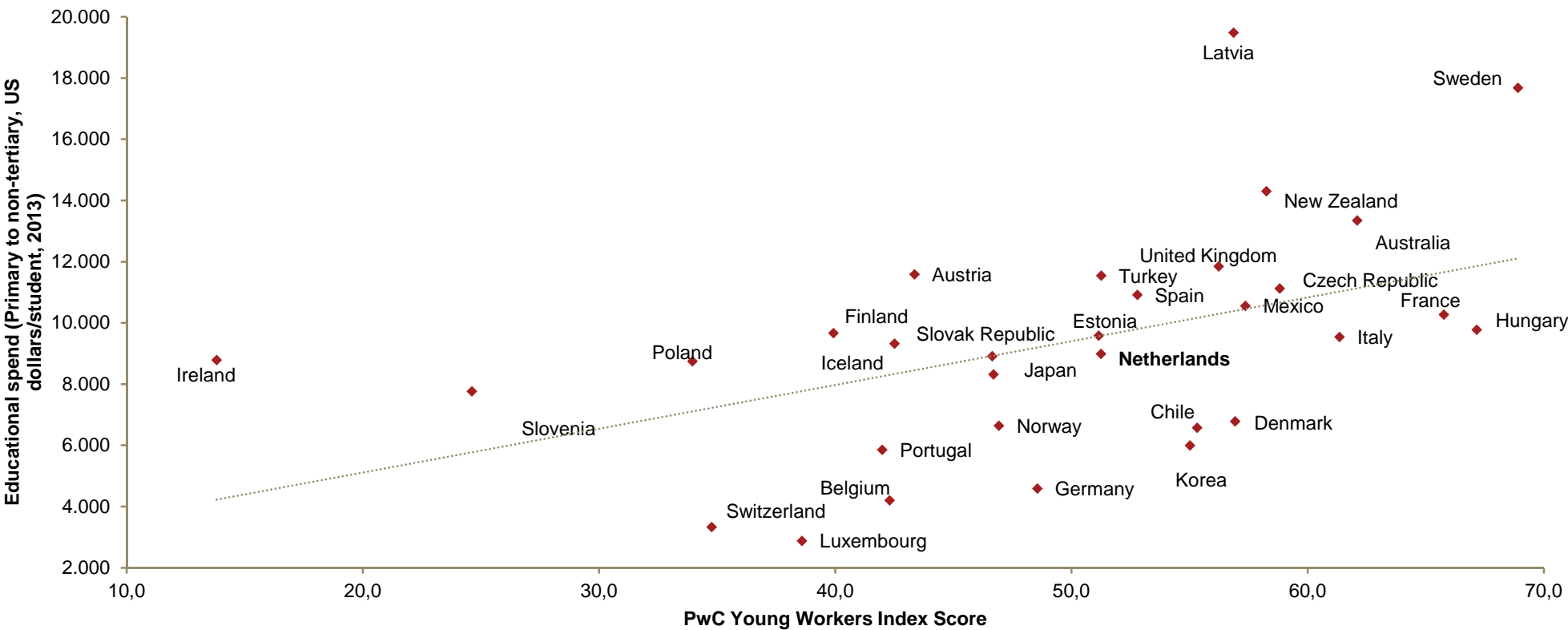
Countries with a higher GDP per capita tend to perform stronger in our index, perhaps as result of education investment and greater job opportunities

There is a clear positive correlation between our Young Workers Index scores and GDP per capita, implying that it can pay dividends when countries are able to develop the economic potential of young workers. However, it could also suggest that rich countries are more likely to invest in their younger populations.



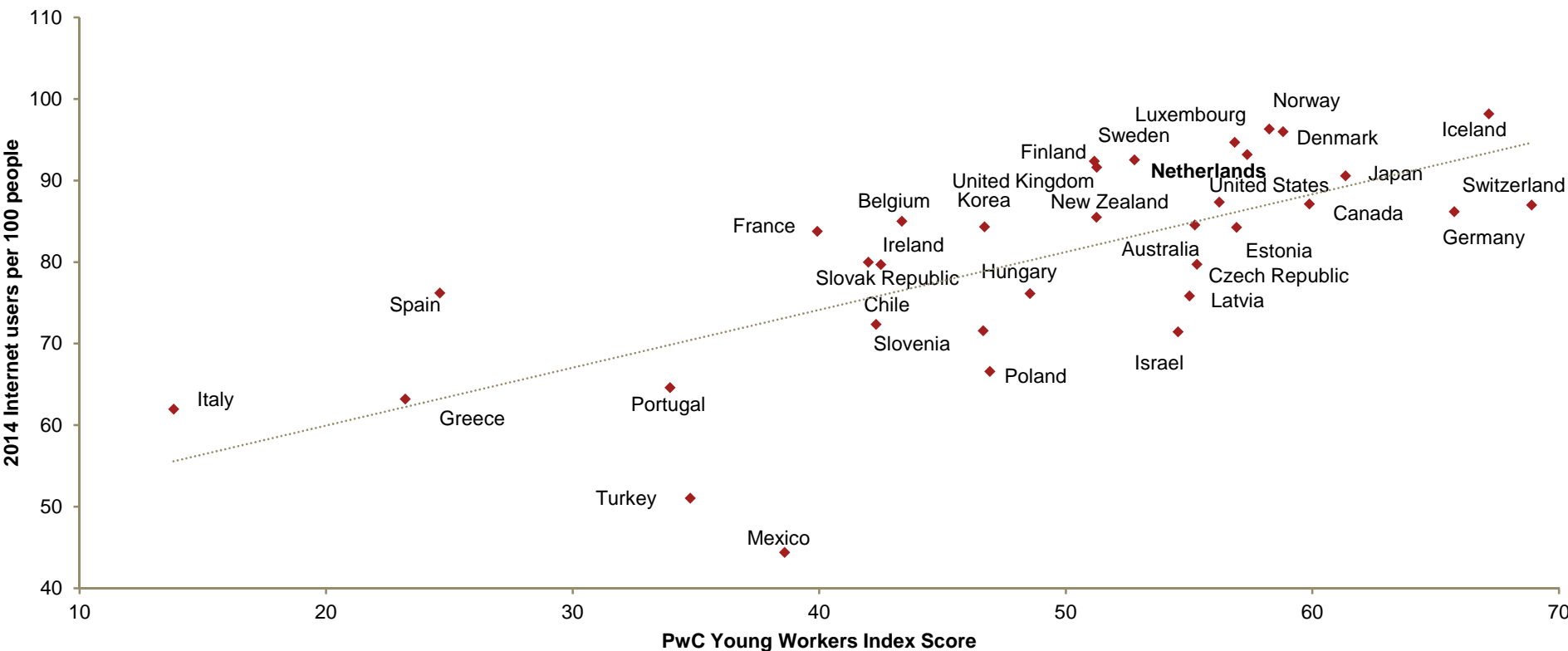
High performing countries in our Young Workers Index tend to invest more in the education of young people

The strong correlation between educational spend and performance on the Young Workers Index highlights the importance of education in developing the economic potential of young people. In order to boost youth employment, policymakers should focus on maximising the learning opportunities available to young people.



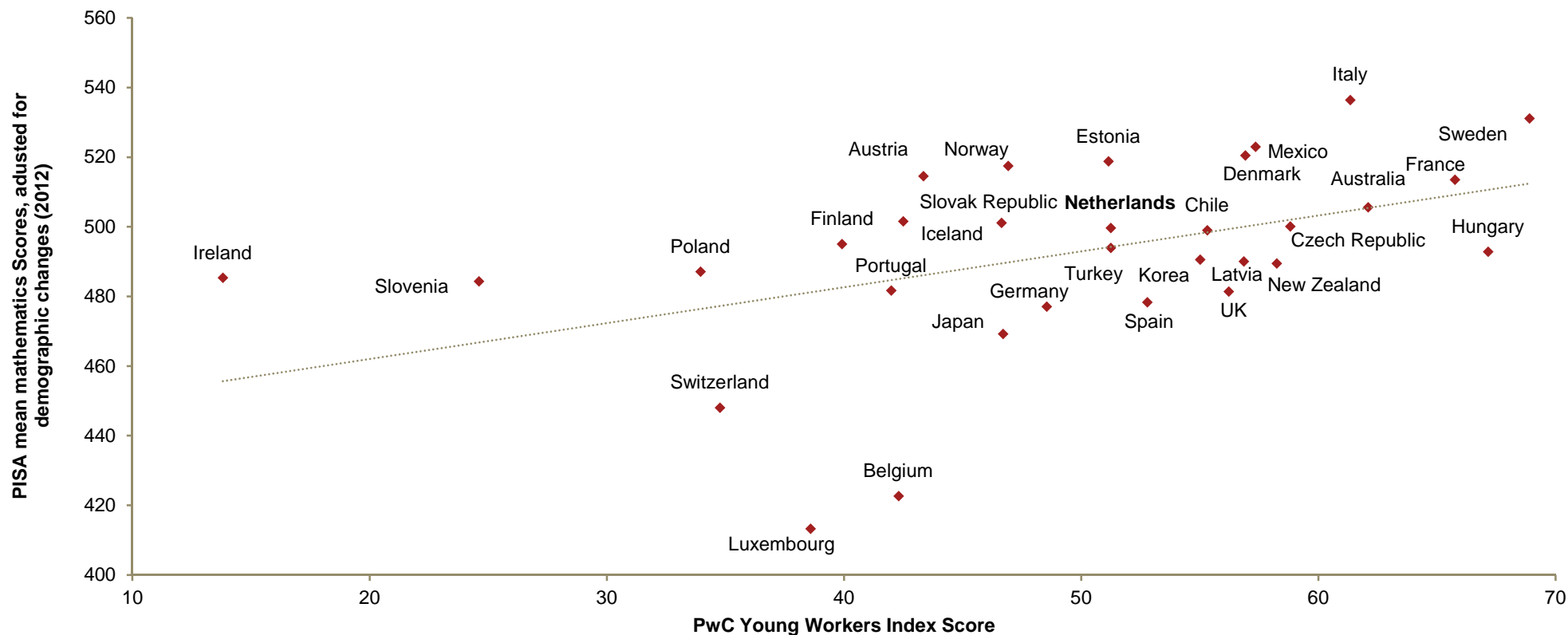
Policymakers should promote digital literacy in order to prepare young people for the changing world of work

Countries with the highest ‘internet penetration’ are more likely to perform well in our Young Workers Index, suggesting that Governments should place increased weight on young people’s access to digital skills and training. This will be especially important given the risk posed by automation and the disruptive influence that technological innovation will have on the world of work.



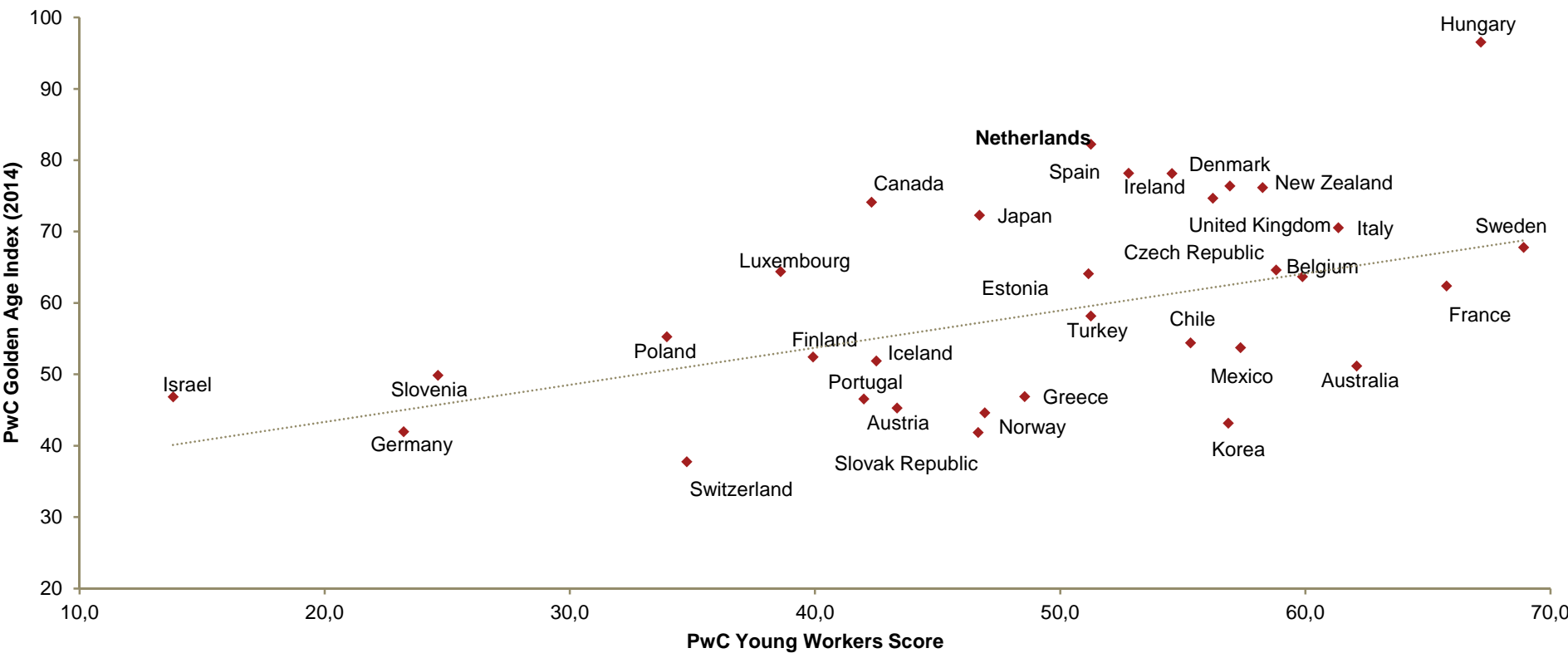
Increased emphasis should be placed on core transferable skills, such as mathematics, in order to improve the long term employment prospects of young people

Policymakers should develop an educational curriculum and training initiatives that promote the learning of transferable skills, such as STEM (Science, Technology, Engineering and Mathematics), in order to equip young people with the core skills required to succeed in a number of working environments. This will also benefit the wider economy, as it will mean young people have greater technical knowledge and can help solve the OECD-wide skill's deficit.



Countries who perform well in the Young Workers Index tend to perform well in our Golden Age Index

The positive relationship between our Young Workers Index and the Golden Age Index suggests that older workers do not ‘crowd out’ young workers, and that there is in fact a complimentary relationship at the economy-wide level. Businesses could benefit from the transfer of knowledge through initiatives such as reverse mentoring (see PwC Golden Age Index report for more information).





A3: Methodology

PwC Young Workers Index methodology

Variables included in the index

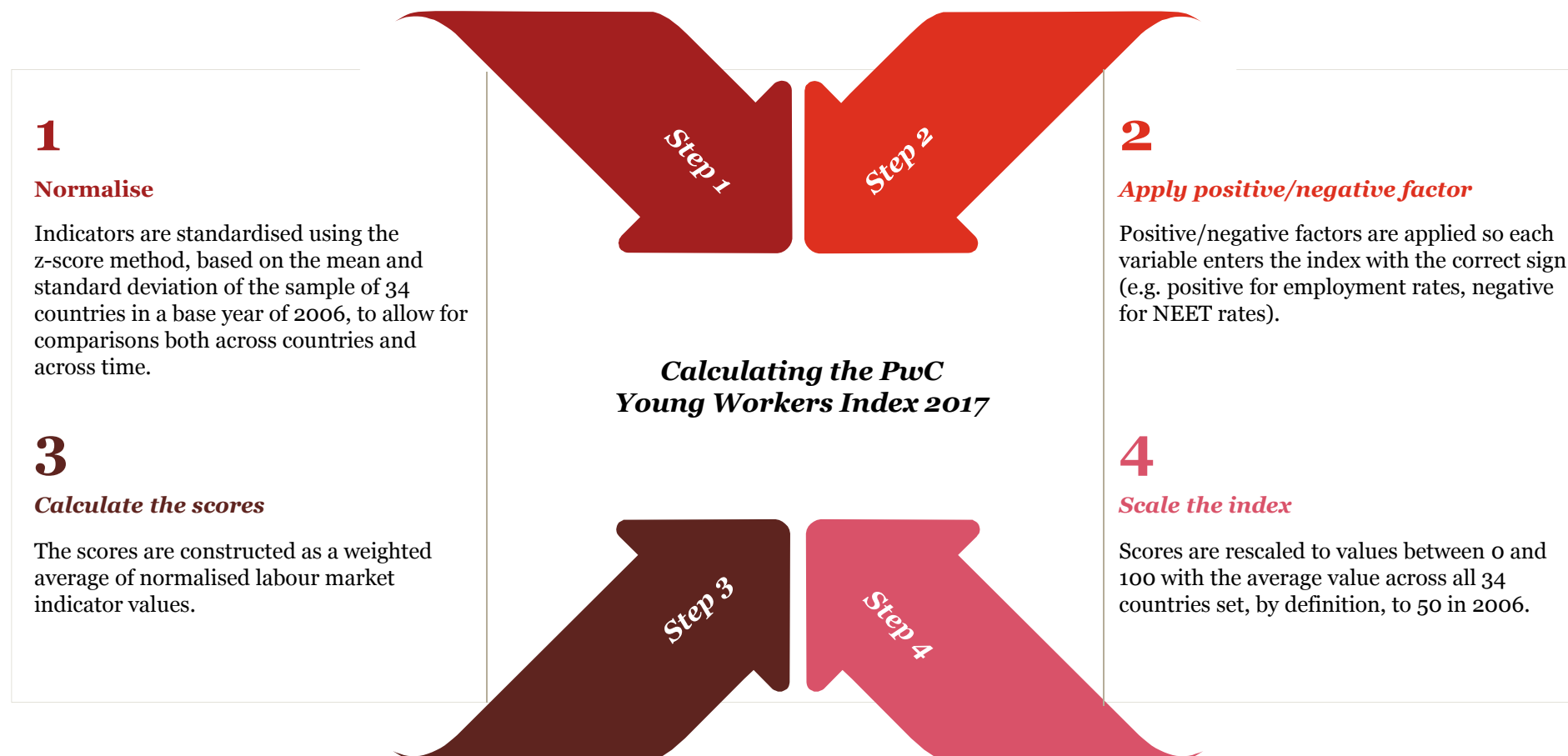
Variable	Weight	Factor*	Rationale
NEET rate 20-24 (% of the age group)	20%	(1)	This measure can imply a wider range of vulnerabilities among youth, including unemployment, early school leaving and labour market discouragement. It can also represent economic and social costs. We use it as the basis for estimating the potential boost to UK GDP in the long run if NEET rates could be reduced to German levels for this age group.
Employment rate 15-24 (% of the age group)	20%	1	The proportion of 15-24 year old workers in employment is an important measure in our index and so has quite a high weight of 20%. But it is less critical for younger than older workers as for young workers education and training is a valid alternative to employment.
Unemployment rate (UR) (% of the labour force)	10%	(1)	This is the proportion of the labour force that is unemployed but actively seeking employment (as opposed to in education or inactive). This represents a cost to both young people and to the wider economy as there could be social costs to having a large number of unemployed young people (e.g. increased crime and drug use).
Relative UR youth/adult (15-24)/(25-54)	10%	(1)	The relative unemployment rate is included to reflect how young people fare in the labour market relative to older members of the labour force. Equality would imply equal opportunities across age groups but in many countries young people are more likely to be unemployed, reflecting the difficulty of getting into the workforce in the first place.
Incidence of long-term unemployment (% of unemployment)	10%	(1)	The youth long-term unemployment rate reflects the economic vulnerability of young people. Being unemployed for over a year can have longer-term impacts in the form of skills erosion and increased reliance on benefits. This could also damage confidence and lead to long-term detachment from the labour force, increased crime rates and drug use.
Incidence of part-time work (% of employment)	10%	(1)	Part-time employment may adversely affect earnings, pensions and job security, but this is given a lower weight in the index since some younger workers (e.g. students or young parents) may prefer part-time work due to its greater flexibility.
Enrolment 15-19 (% in education)	10%	1	This indicator recognises that young people may still be in education or training and therefore are still contributing to the economy and enhancing their productivity even if not yet employed.
School drop-outs (% of the age group)	10%	(1)	This is an indication of the number of young people becoming detached from school at an early age, which will also tend to worsen their job prospects in the short and long term.

* Indicates whether higher values of an indicator are positively or negatively scored in the index.

PwC Young Workers Index methodology

How does it work?

We used a standard method to construct this index, similar to the one used in the PwC Women in Work, Golden Age and ESCAPE indices, and by many other researchers constructing such indices.





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This study forms part of our wider Megatrends research programme:

<http://www.pwc.nl/nl/themas/megatrends.html>

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