Chapter 2

Investing in human capital and responding to long-term societal challenges [1]

1. Introduction

Five years after the recession hit the European Union (EU) the prospects for a robust labour market recovery are still uncertain. With unemployment persistently remaining above 10 %, and almost one out of four economically active young people without a job, the current situation not only presents a serious concern for labour market policy making, but also a long-term challenge to the social welfare of our society.

From today's perspective, long and persistent spells of unemployment prevent people from achieving a self-sustained living and participating fully in society — a situation which places strong pressure on current labour market policies to find solutions without further delay. However, the urgency of today's situation should not divert attention from the detrimental long-term impact of unemployment. The exclusion of people from the labour market today means a waste of human resources and undermines tomorrow's production capacity, just as human capital depreciation destroys a major part of previous social investment. In that sense, current labour market developments should also be seen as a difficult starting point into an era in which Europe faces strong, partly new, challenges. Those challenges require a shift in policy focus, with long-term human capital formation as the central component of social investment:

Globalisation has already led to fast structural changes in both factor and product markets. It bears many opportunities as it improves worldwide factor allocation and generates income to industries engaged in both export and import businesses. Companies exposed to global competition have a strong incentive to reduce inefficiencies, better exploit innovation potential and come to stronger productivity gains. However, as a result of such pressure, firms also exploit the potential of **technological progress** and automation to substitute low-profile jobs by capital [2]. Apart from substitution, outsourcing of such activities to other parts of the world in search of competitive (cost) advantages will continue being a wider-spread phenomenon. These adjustments may happen at the expense of social peace, unless policies manage to implement reforms that combine alleviating the pressure on those most affected with a focus on adapting the skills supply to the changing needs of the economy. Globalisation should be seen as an opportunity for stronger EU exports of goods with high value added, and evidence shows that firms tend to focus their expansion of labour demand [3] on workers with higher skills.

Demographic ageing will reinforce the competitive pressure that the EU is already exposed to. Other parts of the world will mostly continue to benefit from a demographic dividend [4] since their working-age population will continue to expand over the next decades, while the EU will face a sizeable workforce decline [5]. As the workforce shrinks, the EU economy can only continue to grow if future productivity growth becomes a multiple of what it was in the past. In fact, it is foreseeable that, even with ambitious employment rate targets, productivity growth will eventually become the only source of potential economic growth as employment growth turns negative. Hence, to the extent human capital investment helps maintain a productive workforce, including in times of a declining working-age population, this is the obvious policy response to this challenge unless Europe engages in a mere substitution of labour by capital. Given

[1] By Paolo Pasimeni, Jörg Peschner and Monika Velikonja.

[2] Autor et al. (2003) argue that, in contrast to more complex tasks, manual tasks and those 'following explicit rules' face higher risk of getting substituted by 'computer capital' (p. 1279).

[3] Expansion means demand for workers where there is a net increase of employment (not just a substitution), see Cedefop (2012a), p. 7.

[4] As working-age population increases, this will help potential GDP to increase even in the absence of shifts in the employment rates. See Coomans (2012), p. 200.

[5] See, for example, the European Commission's 2012 Ageing Report (European Commission, 2012f), esp. p. 69.

technological change and rapid improvement in technology, investment in human capital is a crucial condition to securing sustainable levels of employment.

Both challenges lead to workforce shortages in many sectors, and the crisis has clearly shown that high unemployment can coincide with such shortages due to skill mismatches. Hence, it is a dangerous fallacy to rely on changing demographics to relieve Europe's labour market problems. In the absence of a demographic dividend for economic growth, ensuring decent prospects in standards of living and social welfare in Europe in the future will require better utilisation of existing labour capacity through better skills matching, allowing for more rapid productivity gains.

In view of the above, this chapter explores the role of human capital investment as a tool for creating the skills that changing globalised markets require. It also looks at the economic, social and employment implications of such investment, which differ depending on the groups that are targeted.

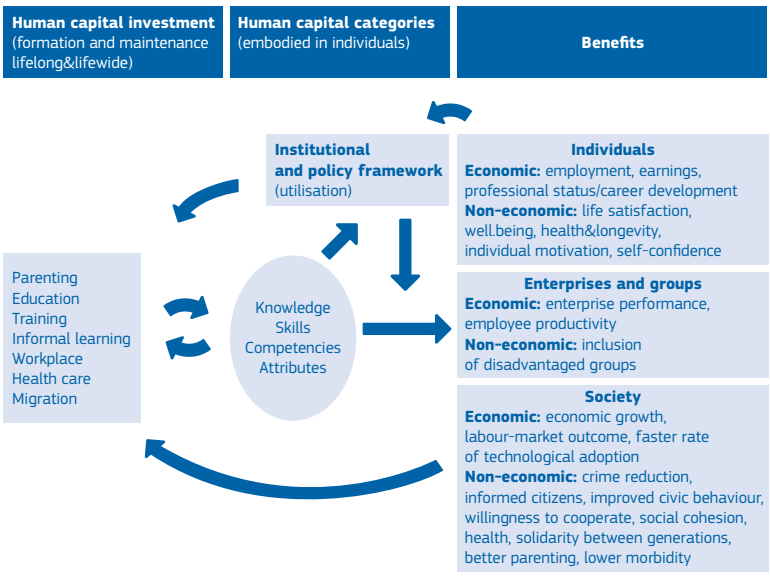
Given the EU's demographic ageing, qualified migration will be another important element in forming and maintaining EU human capital stock in the future. The complex issue of migration, which is extensively dealt with for instance in recent Commission-OECD research [6], however, goes beyond the scope of this chapter, which focuses on investing in the human capital of the existing EU population and labour force as the central issue.

[6] The joint EU-OECD research project 'Matching economic migration with labour market needs' shed light on the following key questions: what policies and practices are needed to ensure that economic migration and free movement contribute to meeting the labour market shortages that are expected to arise over the short-to-medium term? How to ensure a better use of migrants' skills? What are the lessons learnt from non-European OECD countries, particularly in the management of labour migration? Its findings have been published in two reports, 'Free Movement and Workers and Labour Market Adjustment. Recent Experiences from OECD Countries and the European Union' in 2012 and 'Matching Economic Migration with Labour Market Needs', (http://dx.doi.org/10.1787/9789264216501-en).

Box 1: The concept of human capital

Human capital can be defined in overall terms as 'the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being' [7] (Chart 1) — an approach that is much broader than earlier definitions that focused essentially on the 'productive value' of human capital [8].

Chart 1: Human capital: the links between formation, composition and benefits



Sources: Developed based on CEDEFOP (2013), Boarini et al. (2012) and Heckman and Kautz (2013).

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Human capital categories, except for attributes, can be described by the European Qualifications Framework (EQF) [9]. Knowledge is the body of facts, principles, theories and practices related to a field of work or study and can be theoretical and/or factual. Skills mean the ability to apply knowledge and to use know-how to complete tasks and solve problems. In the EQF they are described as cognitive and practical [10].

Competence means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. Competence goes beyond cognitive elements and encompasses functional aspects, interpersonal attributes and ethical values [11].

[7] OECD (2001).

[8] Human capital analysis has gained more interest in research since late 1950s although it appeared in the economic analysis already in the 18th century in Adam Smith's book *The Wealth of Nation.* The motive for its rebirth was the need to explain a huge residual in growth accounting and to better understand the variance in labour incomes that was one of the largest components of income inequality in the US according to Mincer (1997). The beginners of the human capital theory are researchers such as Becker, Schultz, Mincer or Ben-Porath.

[9] Broad EQF approach is used for two reasons. First, EQF defined key terms to support common understanding of key concepts and, second, key terms are shared by all the EU Member States, EEA and candidate countries participating in the EQF. Recommendation of the European Parliament and of the Council on the establishment of the European Qualifications Framework for lifelong learning (2008/C 111/01); European Qualifications Framework, Key Terms, http://ec.europa.eu/eqf/terms_en.htm and CEDEFOP (2014).

[10] Currently favoured typology of skills distinguishes between cognitive (e.g. reading, writing, problem solving, numeracy, IT etc.), interactive (all forms of communication and other activities for cooperative working and engagement with customers and suppliers, including emotional and aesthetic labour) and physical skills (strength and dexterity) according to Green (2013). Author also presents some other typologies, e.g. based on where or how the skills are used (skills according to domain of activity, generic or occupation-specific), who pays for them and who benefits from them (firm-specific or transferable), or based on the skills' complexity (basic skills).

[11] CEDEFOP (2014).

Attributes are implicitly included in the EQF via competences. They refer to an individual's innate abilities, such as genetics, motivation, personality or physical, emotional and mental health ([12]). The division between skills and attributes is blurred and some authors consider attributes as skills to emphasise that, as with knowledge and skills, they can be influenced and changed over the life-cycle by the external environment, including learning ([13]).

Human capital is formed and maintained, throughout one's lifetime, by different investments (ways) which must be of good quality and sufficient quantity. More usual forms of human capital investment are education and training that, at younger ages, tend to be formal, compulsory and initial, while more non-formal, voluntary and continuing in the later ages. This can be privately or publicly financed and provided by private or public market actors. Investments in education and training are complemented by the impact of families, informal learning, workplaces and investments in health ([14]). Finally, country level human capital can be formed and maintained by attracting qualified and skilled foreign workers.

As for forming human capital, there is a growing consensus about the crucial role of human capital investment at very early ages on a child's and later adult's capacity for skill development ([15]). Several long-term studies have highlighted that the impact of quality childcare on child performance can be felt many years after exposure, including during adulthood ([16]).

The workplace contribution to (investment in) human capital formation and maintenance goes beyond training provided by employers. It encompasses job content and work tasks, as well as the broader work environment determined by career prospects, working conditions (benefits), affiliation and the learning culture of the employment contract ([17]). A wider range of tasks and greater complexity offer more chances to acquire knowledge and skills. Motivation for personal and professional growth is higher if work offers promotion prospects, a sense of belonging to a company, and salary improvements linked to responsibility and jobs' skill requirements rather than seniority ([18]).

Measuring human capital stock and returns on investment is challenging. Existing approaches are based on indicators or monetary measures ([19]). The first uses a single proxy for human capital, such as educational attainment, years of schooling, school enrolment ratios or indicators based on assessing cognitive skills of students or adults (e.g. PISA ([20]), PIAAC) ([21]). Monetary measures, which have recently become more popular, translate various dimensions of human capital into a single unit (money) using indirect/residual, cost-based or income-based approaches. Indicators are simple to use, but are less able to capture various dimensions of human capital. Monetary measures facilitate the comparison of human capital with physical capital and across countries, but they might hide some information. Hence the best approach is generally seen to be to use both.

Investments in human capital generate various economic and non-economic benefits for individuals, companies and/or societies. The most widespread and developed are estimations of the benefits for investments in education and training (early childhood, initial and continuing, i.e. lifelong learning) ([22]). At the individual level, research shows a positive impact on wages ([23]), employment and career prospects, and health ([24]). For firms, investment in continuous vocational training and education improve performance (increased customer satisfaction, employees' performance or innovation) ([25]). At the society or macro levels, research shows the positive economic benefits of education and training (e.g. growth) ([26]). For non-economic benefits at society level, research shows a reduction in crime, development of civic competences and better functioning of democracies ([27]).

([12]) OECD (2001); Mincer (1997); Heckmann and Kautz (2013), Mumford et al. (2000).

([13]) Heckmann and Kautz (2013) recently introduced the concept of 'character skill' that captures personality traits, goals, motivations, and preferences. See also explanation of 'interactive skills' in Green (2013).

([14]) The Commission Staff Working Document on Investing in Health (European Commission 2013f) presents how smart investments in health can lead to better health outcomes, productivity, employability, social inclusion and the cost-efficient use of public resources.

([15]) This is mainly due to 'self-productivity' and 'complementarity' of skills. 'Self-productivity' means that prior skills are augmented by skills learnt at later stages, while later investments are necessary to fully enable people's potential ('complementarity' of skills). See Cunha et al. (2006); Currie and Almond (2011); European Commission (2013a).

([16]) See European Commission (2013a).

([17]) European Commission (2013b); CEDEFOP (2011a); Autor and Handel (2009); Gathmann and Schönberg (2010); Green (2013); Tamilina (2012).

([18]) See Chapters 3 'Workplace learning' and 4 'Management and training processes that generate innovation' in European Commission, 'Adult and continuing education in Europe, Using public policy to secure a growth in skills', Publications Office of the European Union, Luxembourg, 2013c. http://ec.europa.eu/research/social-sciences/pdf/policy_reviews/kina25943enc.pdf#view=fit&pagemode=none

([19]) See Boarini et al. (2012) for a detailed review of methodologies, challenges in implementing them, possibilities for improving the quality of monetary measures and overview of national initiatives in measuring the stock of human capital. Authors suggest developing experimental satellite accounts for education to better understand how human capital is produced and the linkages between education and its non-monetary outcomes.

([20]) The Programme for International Student Assessment (PISA) aims to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students in reading, mathematics and science. It is carried out every three years and involves more than 70 economies. The latest wave was carried out in 2012. http://www.oecd.org/pisa/

([21]) The OECD's Programme for the International Assessment of Adult Competencies (PIAAC), also known as the Survey of Adult Skills, measures the key cognitive and various generic skills and competencies needed for individuals to participate in society and to contribute to economic prosperity. Skill proficiency in literacy, numeracy and problem solving in technology-rich environments has been tested with the Survey. The first wave of the Survey assessed the skills of about 166 000 adults aged 16–65 in 24 countries, of which 17 are EU Member States. http://www.oecd.org/site/piaac/

([22]) Detailed presentation and discussion of the benefits by various types of education and training and related methodological problems (like causality, reverse causation, problem of omitted and/or unobservable variables, heterogeneity, the long-term nature of benefits) is beyond the scope of this section. We refer interested readers to several recent publications of CEDEFOP (CEDEFOP 2013, 2011b, 2011c, 2011d, 2011e, 2011f); Card (1999); Bassanini et al. (2005); EC-OECD seminar on Human Capital and Labour Market Performance, that was held in Brussels on 8 December 2004, available at ec.europa.eu/social/BlobServlet?docId=1946&langId=en, Hanushek et al. (2013).

([23]) See overview in CEDEFOP (2013); Harmon and Walker (2001); Leuven (2006); Bassanini et al. (2005).

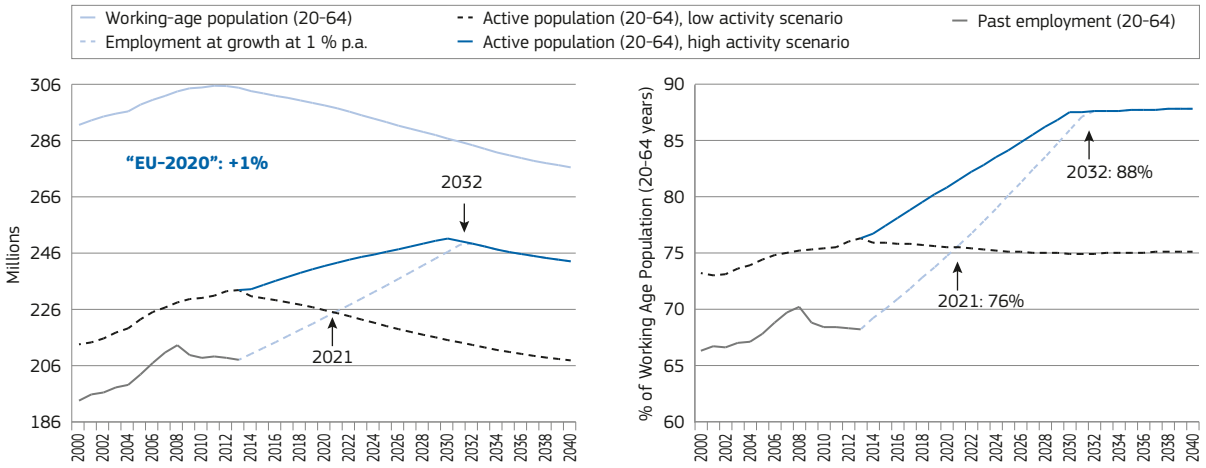
([24]) See overview in CEDEFOP (2013).

([25]) See overview in CEDEFOP (2013); CEDEFOP (2011c, 2011d). Investments in formal job training can yield comparable returns on investments in physical capital or schooling according to Almeida and Carneiro (2009).

([26]) See overview in CEDEFOP (2013); Sianesi and Van Reenen (2000); Gennaioli et al. (2013). Woesman (2003) even argues that existing research severely underestimates the development effect of human capital. This is because indicators used are poor proxies of human capital (e.g. adult literacy rates, school enrolment ratios, and average years of schooling of the working-age population). The FP7 research project (LLLIGHT in EUROPE) is investigating how successful enterprises actively employ Lifelong Learning for their competitive advantage. The project uses Complex Problem Solving (CPS) skills as a measure of human capital. http://www.lllightineurope.com/

([27]) See overview in CEDEFOP (2013).

Chart 2: Potential employment path assuming different activity scenarios, EU-28



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Source: Update of Peschner and Fotakis (2013), p. 13–15.

2. LONG-TERM CHALLENGES THREATENING JOB-RICH AND INCLUSIVE GROWTH

This section considers how workforce shrinkage and increased global competition increase the pressure to generate higher productivity gains over future decades. It provides evidence that there will be no alternative to human capital investment given Europe's need for stronger productivity gains to generate economic growth rates strong enough to maintain current welfare levels.

Ageing imposes a particular challenge to the EU. After decades in which a demographic dividend helped feed economic growth with an increase in the working age population, the situation from now on is liable to move into reverse. Moreover, the shrinkage of the workforce will materialise at a time when global competition is expected to require more skilled workers in many industries which are under pressure to become more innovative and productive. The obvious outcome is fiercer global competition for talents with human capital becoming a decisive factor in the success or otherwise of businesses in an increasingly globalised environment. Workforce decline could reduce employment growth, leaving productivity growth as the only leverage to sustain economic growth and to maintain current welfare levels.

Potential employment growth will depend on the success of EU policies in ensuring that larger shares of a shrinking working-age population enter the labour market. Chart 2 displays working age population projections together with two scenarios of how labour force participation could develop (low and high activity scenario) ([28]). The low activity scenario (dashed dark curve) assumes no further progress in the age, gender and education-specific activity rates. By contrast, the high activity scenario (blue curve) suggests a quantum leap: no gender gap in the age-specific activity rates by 2030; a doubling of past success in terms of increasing older-worker activity rates (+20% pts. by 2030) and a further gradual shift towards a more highly educated labour supply (activity increases with higher education) ([29]). The result indicates the theoretical upper limit of what activation policies might achieve: starting from today's EU activity rate of around 76%, the EU would approach activity rates of around 88% by 2032 under the high activity scenario.

With no further progress in activation (low activity scenario), it is clear, from Chart 2, that the EU will see employment growth turn negative relatively soon — around 2021. However, even using very optimistic assumptions, EU employment growth will be unable to follow the 1% sustainable growth path for more than ten years. At the latest, it would turn negative around 2032. In this purely theoretical 'best possible' scenario, the EU would have arrived by 2032 at an employment rate of 88% with no unemployed reserve.

The difference between the low and high activity scenarios constitutes the theoretical maximum potential ([30]) of activation policies to encourage people into the labour market. The difference is some 35 million workers (13% of working-age population in 2040). This difference shows the potential to defer the time when EU employment stops growing. Under the assumptions made, activating labour resources would extend the policy window by ten more years — time to implement further reforms aimed at safeguarding higher productivity gains. Those will be needed in the decades to come when employment growth, due to higher activation, would no longer contribute to potential economic expansion.

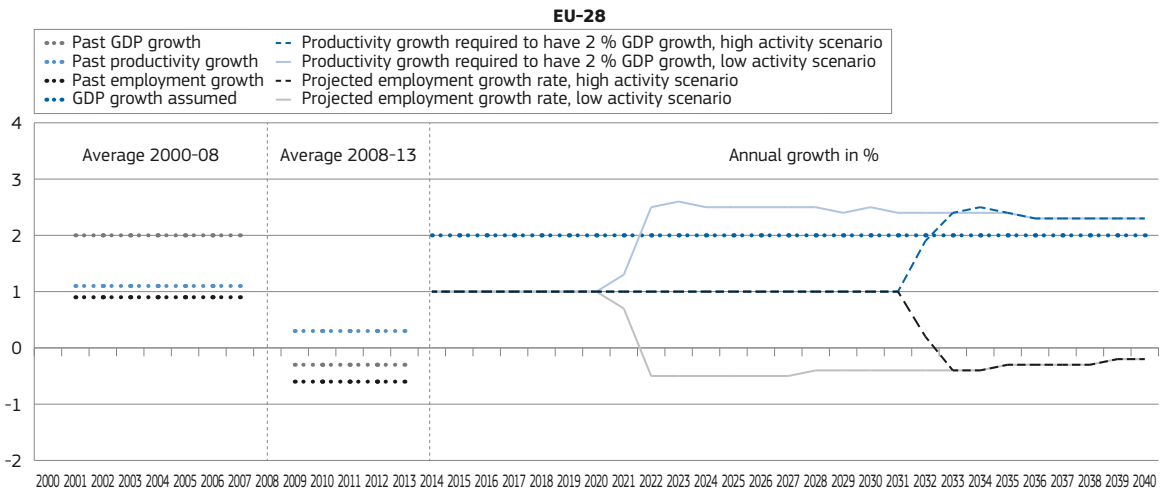
Obviously this would have implications for productivity growth in the future. Chart 3 shows that, before the crisis, the EU's economy grew by an average of around 2% each year: the sum of 1% employment growth and 1% productivity growth on average. Were the economy to continue growing at this pace in times of negative employment growth, the EU would have to more than double the rate of annual productivity gains. Activation policies, no matter how successful, would not remove the challenge to productivity, although they could postpone the point in time when productivity becomes the only source of economic growth.

([28]) Analysis assumes that an annual employment growth of 1% is achieved from now on for as long as possible. Such a growth rate in employment is equivalent to the long-term trend prior to the crisis in 2008, and is also consistent with meeting the 'EU2020' employment objective for the EU by 2020. Starting with a 68% employment rate for people aged between 20 and 64 years in 2013, the rate would be no less than 75% in 2020.

([29]) Peschner and Fotakis (2013), pp. 10–12.

([30]) Breaking down this potential by educational attainment level, it is obvious that low-qualified people would contribute the most to this potential as their activity rate today is way below the average (2013: 64% vs. 76% in EU-28 for the age group 20–64 years). Source: Eurostat LFS (http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database, table lfsa_argaed).

Chart 3: Employment and necessary productivity growth at 2% GDP growth (% p.a.), EU-28



Source: Update of Peschner and Fotakis (2013), p. 17.

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This implies that the EU has to obtain much faster productivity growth rates in the near future than it has in the past, if the current productivity gap relative to the EU's main competitors ([31]) is to be closed. This may become increasingly difficult to the extent the pressure to generate higher productivity growth rates results only in rationalisation and capital deepening, but without sufficient investment in the existing stock of human capital.

This underlines the argument for seeking to generate higher productivity gains by investing in skills and making physical capital investment complementary to, rather than a substitute for, human capital accumulation. In this respect, the evidence suggests that there is a strong complementarity between capital and skills in today's globalised production chains ([32]) and that investment, growth and productivity rates and levels correlate with the share of higher skills in the labour force.

Demand for skilled workers will continue to increase in the EU's strategy to ensure higher productivity gains. According to model projections by Cedefop, there will be more than 80 million additional job openings in the EU over the current decade, and 90% of these job openings will be in medium- and high-skilled employment. Looking only at the expansion in demand (new, rather than replacement, jobs), Cedefop anticipates almost 20 million more high-skilled job openings, while in the low-skilled area, expansion demand will decline by almost 14 million ([33]). This increased demand for higher labour skills coincides with the continued 'general shift towards employment in services and the knowledge economy' ([34]) with the main drivers being 'demography, globalisation, international competition and cost pressures' ([35]).

To conclude in these respects, global competition and workforce shrinkage will increase the pressure to make rapid productivity gains in the EU a reality. Research in this chapter shows that such strong productivity gains must come from investment in human capital if it is to be socially sustainable. There is strong evidence that competitive businesses take this challenge very seriously and do relate human capital concerns directly to productivity performances (Box 2). At the same time, productivity gains from only substituting missing workers with capital would further reduce the national income share of workers relative to capital. Investing in human capital to meet increasing skill requirements is therefore seen as the socially sustainable option for generating higher productivity growth in line with greater investment in new innovative technologies. The following sections will discuss the different options of human capital investments, describing the policy framework and, based on model projections, showing its potential impact on the labour market and the economy.

([31]) Van Ark et al. (2013).

([32]) Timmer et al. (2014); Krusell et al. (2000); DG EMPL's Labour Market Model incorporates the capital-skills-complementarity, see Berger et al. (2009), p. 3.

([33]) CEDEFOP (2012a), p. 85 (table 12).

([34]) Ibidem, p. 19.

([35]) Ibidem, p. 35.

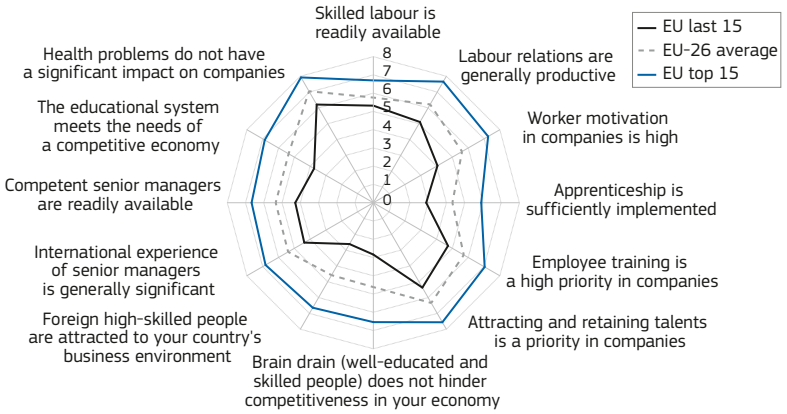
Box 2: Human capital, competitiveness and productivity

Business surveys show how the availability of skilled labour is an important, common feature among the most competitive EU countries (Chart 4). Results show that various strategies and investments in forming, maintaining and using human capital are complementary and not exclusive. Educational systems that meet the needs of a competitive economy are supplemented by companies that: actively provide training; prioritise the attraction and retention of talent; provide a quality job environment. This increases workers' motivation and offers good general labour market conditions with productive labour relations.

What matters is having a skilled workforce at all levels — i.e. including with enough, readily available, competent senior managers. If necessary, top competitive countries can use the pool of foreign workers for whom they represent an attractive destination. These countries also tend to better use their human capital and have high activity and employment rates.

Chart 4: Complementing various human capital strategies helps top EU competitive countries to have better skilled workforce at all levels

Index values (0-10 index points) for respective statements — unweighted averages, 2014



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Sources: IMD World Competitiveness Yearbook 2014, International Institute for Management Development.

Notes: *Top EU countries include EU countries that were in 2014, according to the overall competitiveness ranking, among the top 15 competitive countries (out of 60) and the last 15 EU countries includes those ranking in places from 46–60. **TOP_EU countries: SE, DE, DK, LU, NL, IE. *** LAST_EU countries: IT, HU, SI, EL, RO, BG, HR. ****EU-26 (no data for MT and CY). *****Overall ranking of the World Competitiveness Yearbook is based on four main factors: Economic Performance; Government Efficiency; Business Efficiency and Infrastructure.

The survey shows significant cross-country variance in how businesses assess the availability of human capital and the various qualitative aspects associated with it. The higher the score, the stronger the agreement with the respective statement on average in a given country. That is, the higher the score, the stronger the confidence amongst businesses concerning the issue raised in the statement. A factor analysis of the country differences across the twelve statements in the survey reveals two main strands of human capital strategy amongst businesses: from a productivity-related company perspective (factor 1: Firms' productivity), this mainly reflects the organisation's competitive position and how it is affected by human capital; while the workers' perspective focusses on the individual's endowment with skills and his/her health (factor 2: Workers' capital). Table 1 shows how the extracted factor correlates to the original twelve statements.

Table 1: Extracting a firm-related and a workers-related factor of human capital

Matrix of factor loadings (rotated)

	Factor	
	Firms' productivity	Workers' capital
Skilled labour is readily available	.060	.911
Labour relations are generally productive	.870	.195
Worker motivation in companies is high	.813	.484
Apprenticeship is sufficiently implemented	.753	.215
Employee training is a high priority in companie	.898	.125
Attracting and retaining talents is a priority in companies	.833	.229
Brain drain (well-educated and skilled people) does not hinder competitiveness in your economy	.559	.772
Foreign high-skilled people are attracted to your country's business environment	.760	.381
International experience of senior managers is generally significant	.774	.372
Competent senior managers are readily available	.517	.790
The educational system meets the needs of a competitive economy	.643	.631
Health problems do not have a significant impact on companies	.186	.742
Principal Component Analysis, factor loadings after varimax-rotation		

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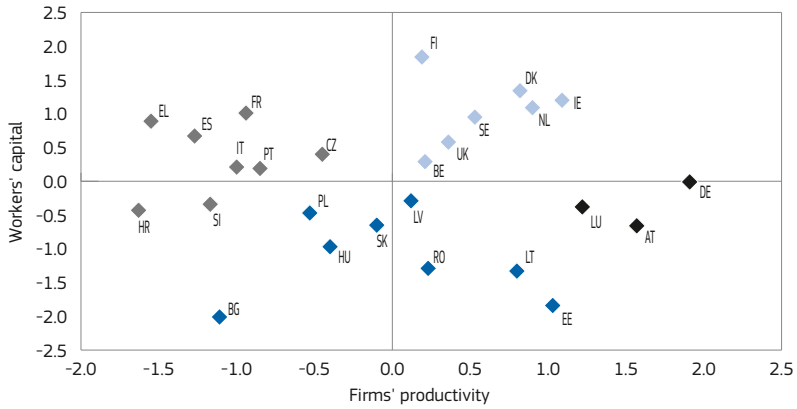
Source: DG EMPL calculations based on IMD World Competitiveness Yearbook 2014, International Institute for Management Development.

The two principal components of human capital identified above explain almost 80% of the cross-country variability in the twelve original statements. Taking these as a basis, the subsequent cluster analysis depicts how businesses in Member States position themselves in the context of firm- and worker-related human capital concerns.

Member States are divided into four clusters with respect to their scores in the two principal components extracted. The result is shown in Chart 5. A score of zero in each of the components is equivalent to the non-weighted average of factor scores across Member States. The Southern/Mediterranean Member cluster combines Member States (Greece, Spain, France, Italy, Portugal, Croatia, but also the Czech Republic and Slovenia) in which firm-productivity-related confidence plays little role in businesses' regard for their own situation. On the other hand, worker-related confidence (good health, skill-equipment) is clearly under-represented in Eastern Europe (Bulgaria, Hungary, Poland, Slovakia, Latvia, Romania, Lithuania and Estonia).

In contrast, businesses in the Northern Cluster (Denmark, Finland, Sweden, the Netherlands, as well as the UK, Ireland and Belgium) place strong emphasis on both factors, whereas organisations in the Central Cluster (Germany, Austria and Luxembourg) seem to pay particular attention to the competitive environment (high importance of firm-related/productivity considerations).

Chart 5: Clustering Member States with relation to two Principal Components of Human Capital



Source: DG EMPL calculations based on IMD World Competitiveness Yearbook 2014, International Institute for Management Development.

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3. Policy and institutional framework

The following analysis seeks to demonstrate the potential of the EU Member States to improve their economic and labour market outcomes, and at the same time to prepare for the long-term challenges with a better skilled, and more productive, workforce. In order to reap the benefits and realise that potential, however, the institutional and policy framework will need to be able to provide incentives or direct support for human capital formation, maintenance and use ([36]). This chapter sets out the institutional framework for **forming**, **maintaining** and **using human capital**. It presents evidence on how countries perform on indicators from, among others, recent PIAAC and PISA surveys. It tries to give evidence on the large extent to which the EU is currently wasting human resources and points to a variety of policy approaches to better activate them while investing in higher productivity.

3.1. Forming human capital

Education is one of the main channels for human capital formation, hence it figures among the headline targets of the Europe 2020 strategy. This section analyses in detail the different aspects of policies aimed at forming and enhancing people's capabilities. It also seeks to identify both barriers to progress and good practice examples.

This section cannot touch exhaustively upon all relevant issues ([37]). It limits itself to discussing investment in forming human capital from the existing population, while it does not touch upon acquiring human capital from outside the EU. As it can't cover all levels and aspects of education and training, it focuses mainly on inequality aspects and early childhood education and care (ECEC). The access to education and educational performance are often influenced by an individual's (child's) socio-demographic/economic background. Reducing inequalities in skills and education is important, not only for reducing income inequalities but also for broadening the pool of candidates for higher education and high-skilled jobs and, by implication, for improving long-term labour productivity. The focus on ECEC follows from its potential to overcome inequalities and its long-term importance for the future formation of human capital ([38]). For a more detailed analysis of educational and training systems, see the Education and Training Monitor 2014 (European Commission, 2014d).

3.1.1. Early childhood education and care: double dividend

The benefits of early childhood education and care (ECEC) are two-fold — it improves child development and facilitates labour activity, especially female involvement in the labour market ([39]).

([36]) See for example OECD (2012a).

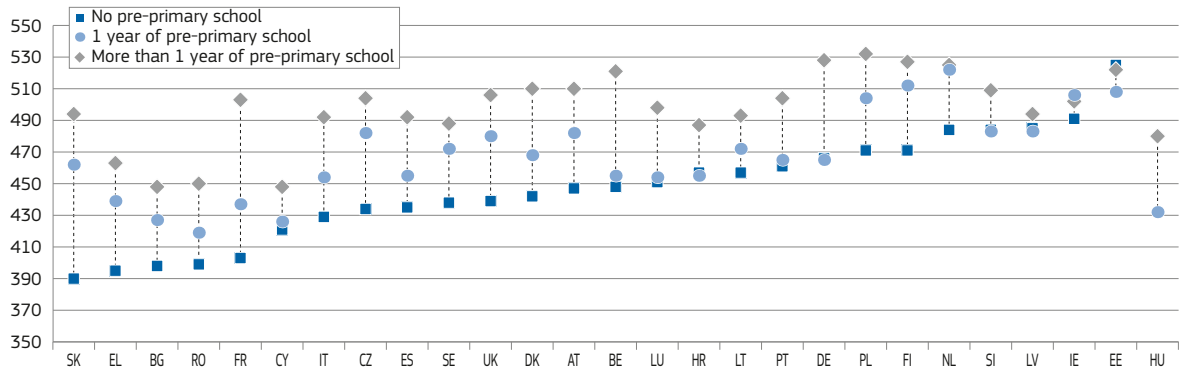
([37]) See European Commission (2014d): Education and Training Monitor (2014).

([38]) See for instance Box 1.

([39]) For more on female activity, see section 3.3.3.

Chart 6: Higher score in math 15 year-olds who participated in ECEC

Achievement in maths by participation in pre-primary school (PISA score points, 2012)



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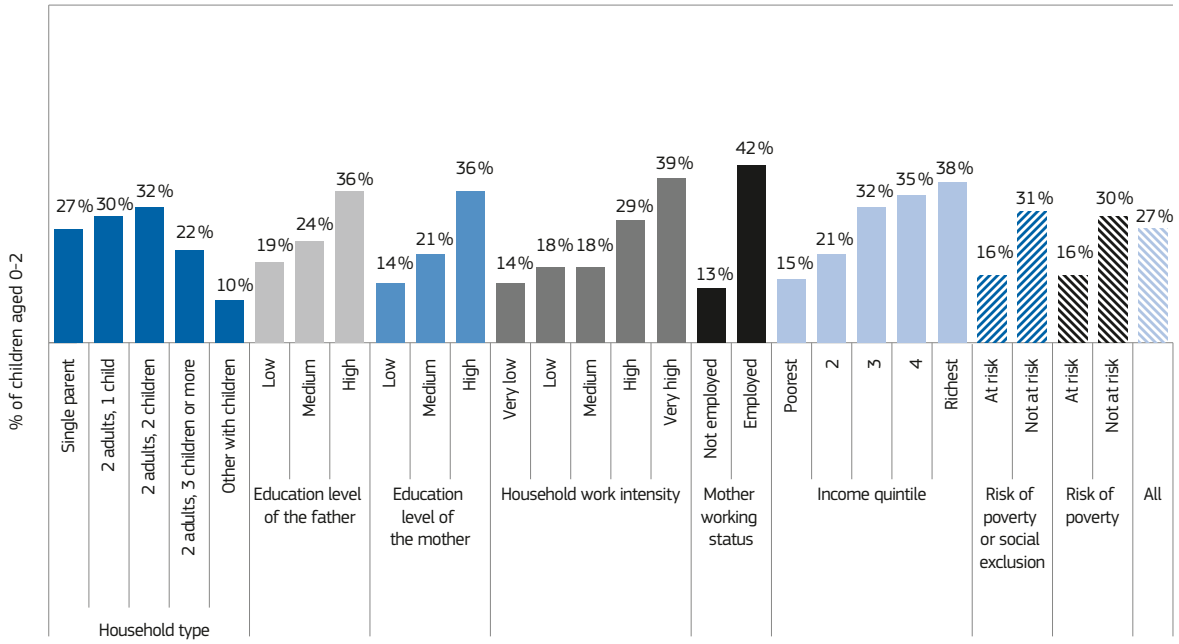
Source: European Commission (2013c).

Note: Data are not corrected for parental/socioeconomic background.

Chart 7: Uptake of ECEC is low among disadvantaged children in the EU

Use of formal childcare for children aged 0–2 across several breakdowns



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Source: Eurostat, EU-SILC 2012.

Research shows that high quality ECEC can improve a child's development, particularly for the most disadvantaged: it prevents early school leaving; improves academic achievement and increases educational attainment ([40]). This reduces risky behaviour later in life and supports participation in lifelong learning and social inclusion ([41]) (Chart 6). Therefore, accessible and affordable, good quality ECEC can significantly contribute towards helping mitigate inequalities.

In practice, however, children from disadvantaged backgrounds ([42]), defined in terms of the education level of their parents, income quintiles or risk of poverty, are far less likely to use such services (Chart 7).

Inequalities in childcare among social groups (described as social gradients) vary between Member States. For example, in Scandinavian countries, such as Denmark or Sweden, the use of childcare is high, and the differences between the disadvantaged and better-off are low (see Chart 8). In France, Belgium and the Netherlands, there is evidence of a stronger social gradient combined with high levels of use of childcare services. In other Member States, such as Ireland, a significant social gradient is combined with limited levels of childcare.

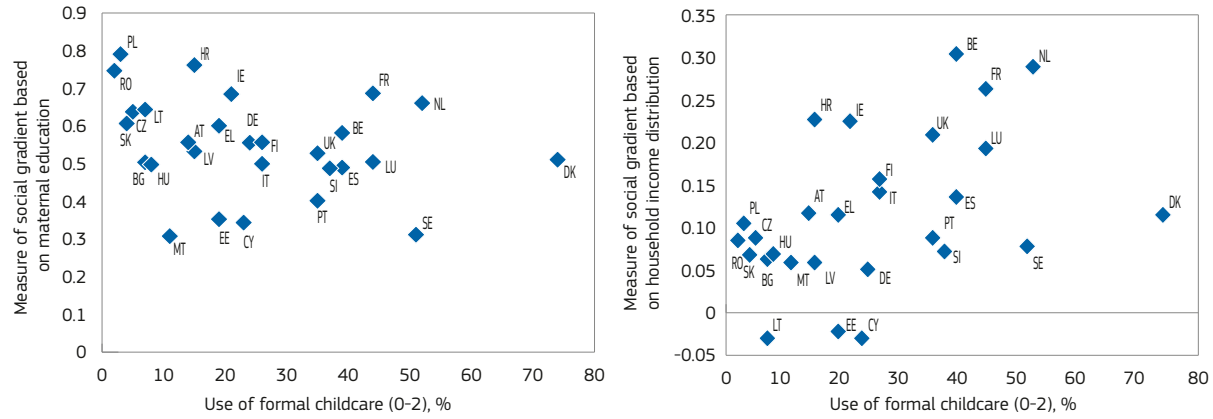
([40]) The FP7 research project 'CARE' addresses issues related to the quality, inclusiveness, and individual, social and economic benefits of early childhood education and care in Europe. The central goal of CARE is to develop an evidence-based and culture-sensitive European framework of developmental goals, quality assessment, curriculum approaches and policy measures for improving the quality and effectiveness of early childhood education and care. http://ecec-care.org/

([41]) See Box 1 for literature review. The term 'early childhood education and care' includes formal services for children between birth and compulsory school age focused on providing early — or pre-school — education and childcare for working parents (Moss, 2009 in European Commission (2013a)).

([42]) Migrant background is one important dimension of disadvantaged people. The analysis of this specific group goes beyond the scope of this chapter. Specific work on social gradients will deal with this.

Chart 8: Disadvantaged children have more access to childcare in the northern EU Member States

Use of childcare and social gradients in access to childcare across Member States (2011)



Source: Social Situation Monitor for DG EMPL, work in progress.

Note: The social gradient based on education is a modified concentration index based on maternal education levels and the social gradient based on income is a rank correlation based on income position.

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The main reasons for low use of childcare across the Member States vary over a long duration of parental leave ([43]); excessive cost of childcare; a disincentive tax-benefit system ([44]) (for lone parents or second earners); and the quality, accessibility (e.g. proximity, opening hours) and availability (waiting list, lack of services) of childcare (Table 2) ([45]).

Improving the use of childcare at the national level requires greater awareness of the different obstacles, which might differ across Member States. In some of the countries currently below the Barcelona target ([46]), such as Slovakia, Poland, Croatia or Estonia, the duration of maternity leave is among the highest in Europe. In Croatia, Romania, Latvia, Greece and the United Kingdom, a large share of those persons with care responsibility is inactive or involuntarily works part-time because of a lack of support services. In other Member States, such as Ireland, Slovakia or Malta, the high cost of childcare associated with inactivity traps for low earners are a major obstacle.

Difficulties in accessing quality childcare are reported in Greece, Romania, Slovakia, Poland, Slovenia, Italy and Spain — problems linked to a lack of physical access, distance, inadequate opening hours or eligibility criteria. The Eurofound Quality of Life Survey reports access problems due to distance or opening hours in Greece, France, Romania, Poland and the Czech Republic. Availability, because of waiting lists or lack of services, can also restrict the use of childcare. However, the extent of such difficulties also depends on national circumstances with the Netherlands and Hungary both reporting similar levels of difficulty in accessing childcare services, even though usage of childcare differs considerably between these countries.

([43]) Long parental leave can also be a compensatory measure due to lack of adequate infrastructure.

([44]) Removing or reducing distortionary income taxes and social security contributions also stimulates the labour market participation of low-qualified individuals and boosts incentives to invest in education and training for them (see, for instance, Booth and Coles 2007).

([45]) European Commission (2013a).

([46]) With Barcelona targets, the EU wanted to provide childcare by 2010 to at least 90 % of children between 3 years of age and the mandatory school age, and to at least 33 % of children under 3 years of age. They were set in 2002 at the Barcelona European Council. Reaching those targets should remove disincentives to female labour force participation. Presidency Conclusions, Barcelona European Council, 15&16 March 2002, http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/71025.pdf.

Table 2: **Use of childcare related to context indicators**

		Use of formal childcare (at least 1 hour a week) 0-2	Length of maternity leave (months)	Out-of-pocket childcare costs (lone parent, full-time care net cost, % of family net income)	Participation tax rate of taking up employment for a second earner - Moving into full-time employment with earnings = 50% of average earnings (AW)	Involuntary fixed-term or part-time % of women employed	Inactivity and part-time work due to lack of care services for children and other dependents % of persons 15-64 with care responsibilities	Availability (waiting list, lack of services)	Cost	Access (distance, opening hours)	Quality
	EU-28	**28**			**35.2**	**13.4**	**42.9**	**58**	**59**	**41**	**27**
Below the Barcelona target	CZ	3	43	17.8		10	18	61	45	51	28
	SK	5	44	25.1	23.7	7	14	61	71	47	38
	PL	6	49	8.7		18	38	61	66	51	38
	BG	8	14	7.7	21.6	4	21	49	55	33	20
	LT	8	41	9.0	36.1	5	45	53	55	29	26
	HU	8	42	5.9		9	37	45	63	39	36
	HR	12	20			7	81				
	AT	14	28	4.3	45.9	5	16	45	43	39	21
	RO	15	29			1	89	62	74	57	47
	MT	17	16	21.3	28.9	7	3	64	78	35	29
	EE	18	41	7.6	24.8	4	15	62	71	45	24
	EL	20		6.5	5.3	15	72	73	78	57	63
	IE	21	18	40.4	49.5	14	49	47	76	36	23
	IT	21	16			25	17	58	63	37	32
	LV	23	41	13.5	35.6	6	79	59	60	45	27
	DE	24	40	15.3		8	47	61	50	39	25
	CY	26	8			24	52	36	47	33	19
	UK	27	19	13.0	51.5	7	72	54	78	39	25
	FI	29	12	21.7		16	6	46	33	34	12
Above the Barcelona target	PT	35	13	4.0	15.7	22	47	53	63	42	36
	ES	36	40	9.0		31	63	53	67	44	30
	SI	38	15	12.3	30.1	10	55	70	74	46	35
	FR	40	40	7.5	25.9	16	22	72	60	50	25
	NL	46	16	5.7	36.6	10	7	46	65	19	14
	BE	48	12	8.2	43.1	10	71	60	42	35	18
	LU	48	16	10.7		9	14	60	37	35	17
	SE	52	37	5.0	23.7	18	9	28	11	26	18
	DK	67	16	7.8	89.1	11	11	37	43	32	20

Sources: Eurostat, EU-SILC 2012 (IE 2011); Fondazione Brodolini, 2013 (maternity and parental leave); Eurostat, EU-LFS 2012 (involuntary part-time and inactivity); OECD tax-benefit model (cost of childcare); Eurofound European Quality of life survey (self-declared obstacles).

Note: All data are for 2012, except for length of maternity leave, which is for 2013.

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3.1.2. Formal education

Completion of upper secondary education is considered to be the minimum skills requirement for actively participating in social and economic life ([47]). In 2013, 5.5 million people left school without finishing upper secondary education in the EU-28 with the share of early leavers being over 15% in Romania and Italy (Chart 9) ([48]).

The share exceeded 20% in Malta and Spain, although this has decreased over the last three years ([49]). The reduction in the number of early school leavers over the last few years can be partially explained by counter-cyclical education participation. Young people may prefer to stay in education given the limited job possibilities in recession or slow-growing economies.

In tertiary education, Italy, Romania, Croatia, Malta, Czech Republic and Slovakia remain far below the headline target, although all are improving (Chart 10) ([50]).

Educational mobility has, on average, improved across the EU, but having low qualified parents still has a negative impact on the educational opportunities of their children (Chart 11). The share of tertiary educated young people from low educated families is lowest in Austria, Italy, Poland and Slovakia, while it is the highest in Finland. Moreover, Slovakia

([47]) OECD (2012b).

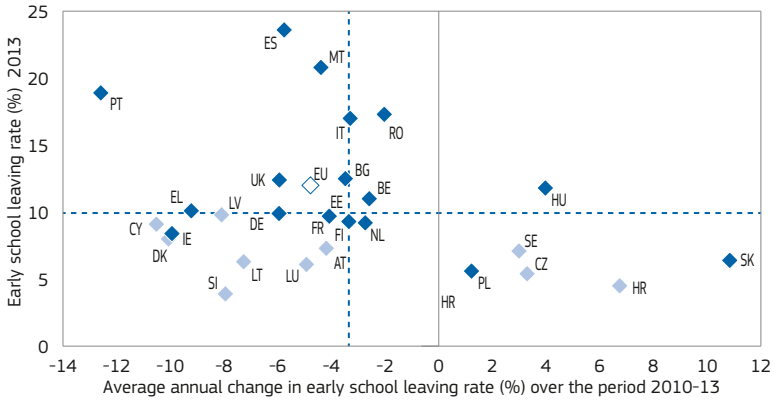
([48]) Early school leaving is one of the Europe 2020 headline targets and it aims to reduce the share of early school leavers to less than 10%.

([49]) The FP7 research project 'RESL.eu' (Reducing Early School Leaving in Europe) is collecting data on youngsters, families and schools in nine EU countries. It aims at identifying characteristics of youth at risk of ESL as well as protective factors (such as social support mechanisms, resiliency and agency of pupils, etc.) which may encourage potential ESL pupils to gain qualifications via alternative learning arenas. https://www.uantwerpen.be/en/projects/resl-eu/

([50]) The Europe 2020 headline target is that the share of 30–34 year olds with tertiary education attainment or equivalent should be at least 40%.

Chart 9: Early school leaving: current performance and recent changes

Early school leavers is the share of people between 18–24 years of age not in education and who have not completed upper secondary education, EU, 2010, 2013



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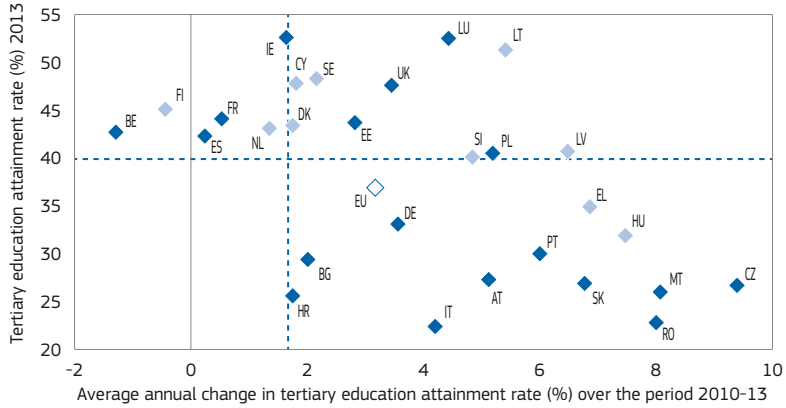
Source: European Commission (2014d).

Chart 10: Tertiary education: current performance and recent changes

Share of people between 30–34 years old having tertiary education EU, 2010, 2013



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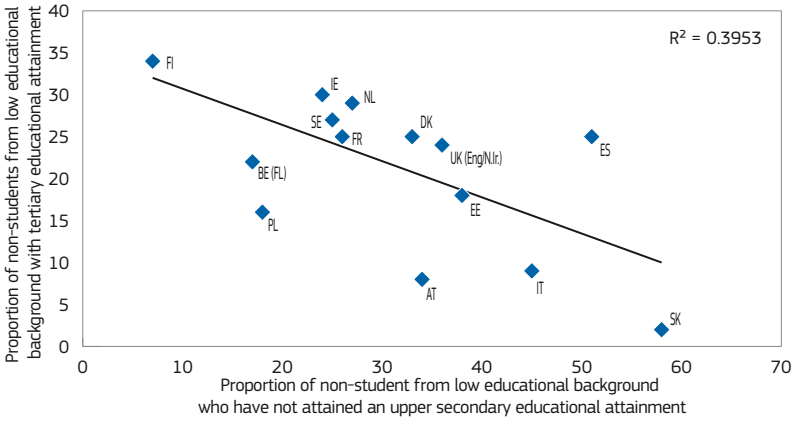
Source: European Commission (2014d).

Chart 11: Limited chances for tertiary education attainment for young people with low-educated parents in several Member States

Educational achievement among 25–34 year-old non-students with parents who have below upper secondary educational attainment, 2012



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Source of data: OECD (2014b).

and Italy, together with Spain, also have high shares of young people without upper secondary education coming from disadvantaged families ([51]).

Completing upper secondary or tertiary education is no guarantee, however, that young people from disadvantaged backgrounds ([52]) will attain similar basic skills compared to their better-off counterparts, as demonstrated by the PISA survey (Chart 12) ([53]). One third of the variation in mathematics proficiency across the OECD in PISA is explained by differences in the percentage of students who attended pre-primary education for more than one year, after accounting for per capita GDP ([54]). Some countries, such as Estonia, Finland, Ireland and the Netherlands, have been able to combine high levels of student performance with an equitable distribution of learning opportunities as measured by PISA ([55]). Too often, and in too many countries, however, schools reproduce existing patterns of socioeconomic advantage.

Possession of basic (cognitive) skills is important in terms of labour market achievement with regard to maintaining employability and achieving successful transitions between jobs ([56]). At the same time, non-cognitive skills, such as: motivation; sociability; the ability to work with others; and job-specific or technical skills; are also important for successful labour market participation ([57]).

More general effort is needed in order to improve school outcomes and the literacy of pupils in the EU Member States as demonstrated by the PISA survey (Table A.1 in Annex). The EU as a whole is far behind its benchmark in maths, although the picture is more encouraging

([51]) For more details, see section on Tackling inequalities in the Commission Education and Training Monitor 2014 (European Commission 2014d).

([52]) In the OECD's PISA study, a pupil's socioeconomic status is estimated by the index that is based on such indicators as parental education and occupation, and the number and type of home possessions related to education. These are considered proxies for wealth and the educational resources available at home.

([53]) The OECD PISA survey compares the outcomes of high school students internationally in mathematics, reading and science, as well as so called cognitive skills, and provides valuable information on how well prepared upper secondary students are for the workplace, career training or higher education.

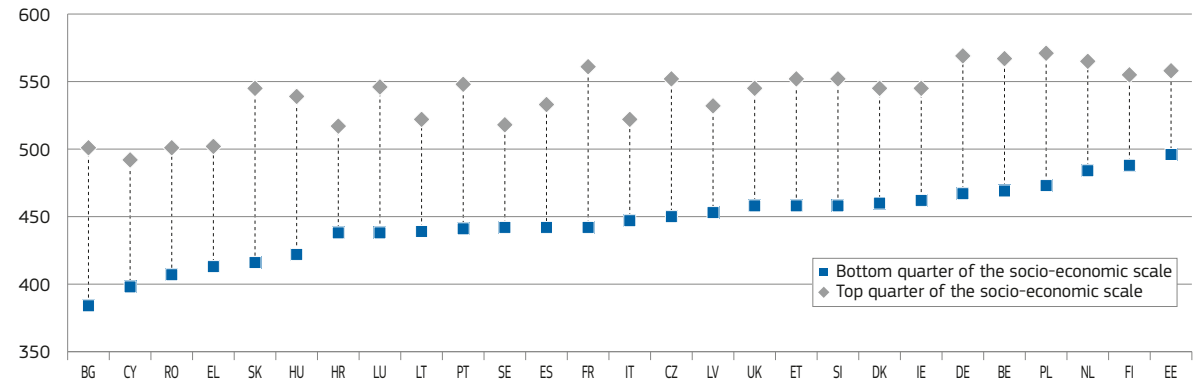
([54]) OECD (2013b).

([55]) Schleicher (2014).

([56]) Berton et al. (2014).

([57]) See Box 1.

Chart 12: Higher scores in skills proficiency for young people with higher socioeconomic status
Achievement in maths by socioeconomic status (PISA score points, 2012)



Source: European Commission (2013c).

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in science and reading. In comparative terms, overall EU performance is slightly better than the United States, but below that of Japan.

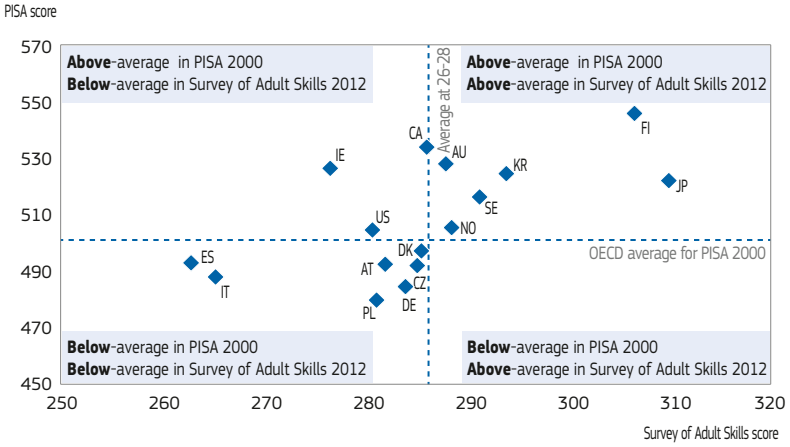
Despite good performance and a low share of early leavers (well below the EU average) (see Chart 9), there are a number of countries with an above EU average share of low achievers in all three fields (Croatia, Slovakia, Sweden) or at least in particular fields (Slovenia and Austria in reading, and Lithuania in reading and mathematics).

PISA 2012 results show that performance across all three areas of basic skills correlate with each other — Members States that show certain levels of basic skills in one area tend to perform similarly in other areas ([58]). Therefore, policies designed to tackle low achievement in one field often converge with policies in another.

In many countries, the proficiency achieved at a young age strongly correlates with the proficiency of the same cohort as adults, as demonstrated by PIAAC (Chart 13). Countries whose cohorts performed very well in PISA also had much better results in the Adult survey and vice versa.

Financial resources are important in improving the quality and equity of educational outcomes but, in high-income countries, their allocation is more important than their size ([59]). PISA results show that advantaged and disadvantaged schools tend to have similar physical infrastructure and educational resources to those in good performing countries, but those countries tend to prioritise higher salaries for teachers over other expenditure, such as supporting smaller classes ([60]). In low-income ([61]) countries, the scale of the resources is a more important determinant of students' performance.

Chart 13: Vicious cycle of low performance
Mean literacy proficiency in PISA (2000) and in the Survey of Adult Skills (2012)



Source: OECD (2013a).

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OECD suggests that improving the quality and equity of educational outcomes requires a combination of measures ([62]). This includes promoting high-quality teaching, especially for disadvantaged schools and students, by encouraging diversity and improving the employment conditions of teachers (working conditions, career and financial incentives to attract and retain teachers in disadvantaged schools, educating the teacher educators). It also considers that measures need to be taken in order to prevent increases in school's autonomy undermining equity, by avoiding socio-economic segregation, and investment in pre-school care and childhood, as well as improving the quality of schools via student and school assessments. Finally, measures are needed to create effective learning environments: by limiting grade repetition; reducing early tracking by not placing students on separate tracks at a very early age; continuously supporting students; and by setting high expectations, especially for disadvantaged students.

([58]) European Commission (2013c).

([59]) Oosterbeek et al. (2007), Schleicher (2014), OECD (2013b).

([60]) OECD (2013b).

([61]) Countries with cumulative expenditure per student below USD 50 000, like the Czech Republic, Hungary and the Slovak Republic. (Schleicher 2014).

([62]) Schleicher (2014).

3.2. Maintaining human capital

The dynamic character of human capital accumulation implies that the skills acquired at one stage form the basis from which further steps can be made throughout the life-cycle ([63]), with the possibility for further accumulation or depreciation at every stage.

Higher participation rates in education can have a positive effect on human capital formation, but they do not ensure that skills obtained during education are maintained and used throughout the working life. Traditional measures of human capital, as used in macroeconomic analyses, focus essentially on length and level of formal education, but a comprehensive analysis of human capital needs to move beyond this. Lifelong learning and training, in particular, play critical roles in maintaining human capital once formal education has been completed. ([64])

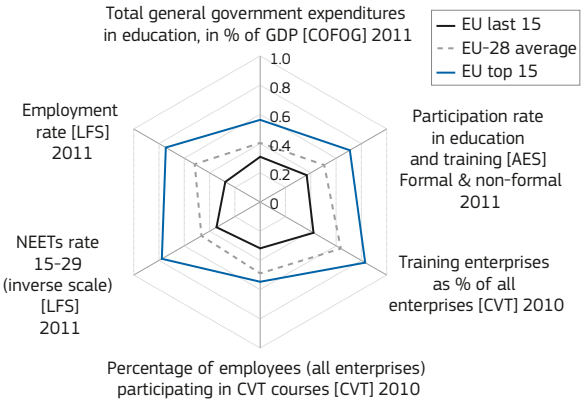
3.2.1. Lifelong learning and training: complementary roles of public and private sectors

The most competitive countries in the EU seem to be those which invest a higher share of GDP in education and which have high participation in formal and non-formal education and training (Chart 14) ([65]). In these countries, the private sector seems more likely to train employees, who then show a higher propensity to participate in continuous vocational training. Unsurprisingly, these countries also have significantly lower NEET rates and higher employment rates. The differences between the most competitive and least competitive countries can be observed. On the input side, the biggest gaps are in terms of participation rates and of the percentage of private sector enterprises investing in employee training. On the outcome side, NEET rates and employment rates differ greatly.

The role of the private sector in maintaining human capital, by investing in vocational training of employees, is particularly relevant not only from a public finance perspective, but also in terms of effectiveness of the investment, as enterprises can fine-tune and adapt training programmes to their specific needs.

In general, training provided by the public and private sectors can be seen as both necessary and complementary. Chart 15 shows that countries that spend more on education, as a share of GDP, are also those whose firms are more engaged in providing employee training. Moreover, this positive relationship has been rather stable over time, as shown by the trend line through 1999, 2005 and 2010 ([66]).

Chart 14: More competitive countries are those more able to maintain human capital



Source: Eurostat (COFOG, AES, CVTS, LFS), DG EMPL elaborations.

Notes: *Top EU countries include EU countries that were in 2014, according to the overall competitiveness ranking, among the top 15 competitive countries (out of 60) and the last 15 EU countries includes those ranking in places from 46–60. **TOP_EU countries: SE, DE, DK, LU, NL, IE. *** LAST_EU countries: IT, HU, SI, EL, RO, BG, HR. ****Overall ranking of the World Competitiveness Yearbook is based on four main factors: Economic Performance; Government Efficiency; Business Efficiency and Infrastructure. The scale 0 to 1 for the different indicators is calculated by normalising their values with a standard MAX/MIN normalisation formula.

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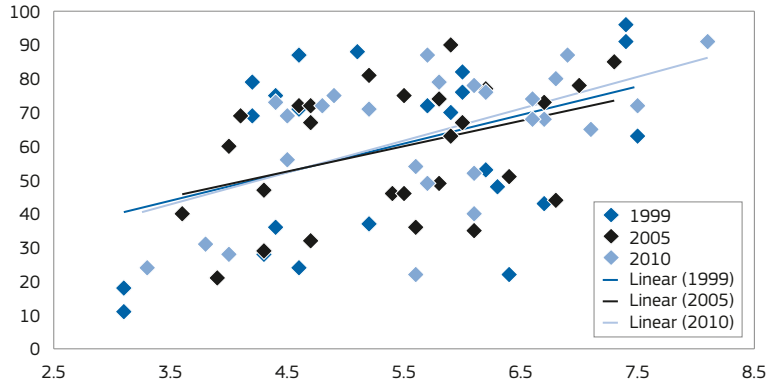
Chart 15: Public and private sector investments in human capital are complementary and mutually reinforcing

General government expenditure on education (X-axis), as a share of GDP, and share of enterprises providing training (Y-axis) (years 1999, 2005 and 2010)



Sources: COFOG and CVTS, DG EMPL elaborations.

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([63]) So called 'self-productivity' and 'complementarity' upon skills (Cunha et al. 2006).

([64]) Beblavy and Maselli (2014) argue that the number of low-skilled workers shouldn't be considered only as a stock, but also as a flow variable, as one can become low-skilled during working life. Kurekova et al (2013) point to structural and institutional barriers that can draw people into low-skillness such as technological change, growing service sector or educational expansion.

([65]) In assessing the importance of training, several measures have proved useful. They have materialised in different indicators that measure the efforts of public finances, private enterprises and individuals in forming and maintaining human capital. In particular, we consider: total general government expenditure on education, as a share of GDP; overall participation rate in education and training of the population; the percentage of employees taking part in continuous vocational training courses; the share of enterprises providing training for their employees; the rate of young people (aged 15–29) neither in employment nor in education and training (NEET rate); the employment rate in the country. By normalising these indicators, with a max-min method, in a 0–1 scale, we can compare them directly in Chart 14. In particular, we can compare them with the aggregates of Member States used previously according to their level of competitiveness as stated in the IMD World Competitiveness Yearbook 2014 (see Box 2).

([66]) See chapter 5 'Markets and systems of adult education and CVET: the governance challenge' in European Commission, 2013b.

The service sector has a higher share of companies providing training for their employees, compared to the industrial, manufacturing or agriculture sectors. Moreover, within the service sector, knowledge-intensive industries, like ICTs and financial services, are most likely to invest private resources in training ([67]).

The size of enterprises is also seen to be an important factor in determining their propensity to invest in training for their employees. In general, larger companies seem more likely to provide training in both the most competitive and the least competitive countries, confirming previous results ([68]).

From 2005 to 2010 we see an EU-wide increase in companies providing training, most notably in small firms (Chart 16). In the most competitive EU countries ([69]) the increase is lower than in the least competitive ones, due to the already high share of companies providing training in 2005. The gap between big and small companies in providing training is being reduced at a faster pace in the least competitive countries.

These trends are confirmed by the recent 3rd European Company Survey ([70]), which found that some 71% of companies in the EU provide paid time off for training for some employees at least, although small establishments are least likely to do this. Experiences vary considerably across countries, with Bulgaria, Greece, Croatia and Lithuania being those where this is rarest, as compared with Austria, Finland, Sweden and the Czech Republic. In general, where paid time off for training is provided, the training is mainly focused on enhancing employee skills in relation to their current job ([71]).

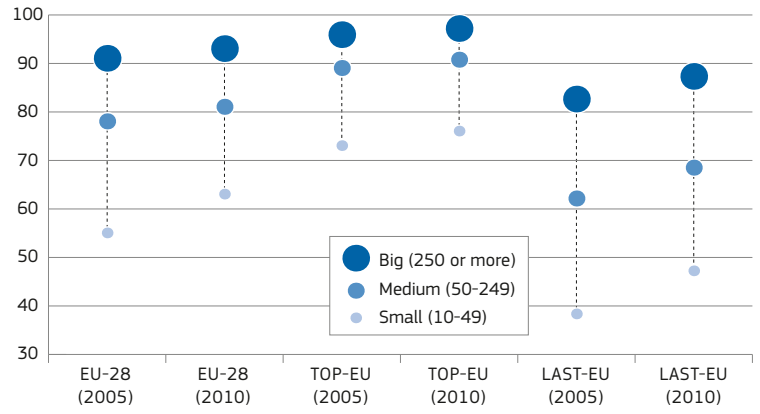
Certainly training is not the only way through which firms can help maintain and optimise the use of human capital. Workplace practices adopted by firms ([72]) are complementary to on-the-job training (see Box 1).

An analysis of the quality of human capital, through direct measurement of skills, can help shed some light on the relevance of training provided by enterprises to their employees. Looking at scores in numeracy, literacy and problem-solving can provide an overview of the quality of education and training.

We focus on PIAAC scores for employed people (both full-time and part-time) in the three dimensions of numeracy, literacy and problem-solving, and observe differences among EU countries. The share of employer-sponsored, job-related education and training (Eurostat, Adult Education Survey, 2011) correlates positively with the PIAAC scores across all three dimensions (Chart 17). This might suggest that the comparatively higher efforts done by the employers in providing training to the employees might contribute to these differences. Section 3.3.1. further investigates this stylised fact through an econometric analysis.

Chart 16: **Big differences between small and large enterprises in less competitive countries**

Enterprises providing training as % of all enterprises, by size class (2005 and 2010, EU-28, most and least competitive countries)



Sources: Eurostat, CVTS.

Notes: *Top EU countries include EU countries that were in 2014, according to the overall competitiveness ranking, among the top 15 competitive countries (out of 60) and the last 15 EU countries includes those ranking in places from 46–60. **TOP_EU countries: SE, DE, DK, LU, NL, IE. *** LAST_EU countries: IT, HU, SI, EL, RO, BG, HR. ****Overall ranking of the World Competitiveness Yearbook is based on four main factors: Economic Performance; Government Efficiency; Business Efficiency and Infrastructure.

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3.2.2. Active ageing and health

The demographic challenges posed by the combination of lower fertility rates, longer life expectancy, and a declining share of the working-age population creates pressures to mobilise all available human resources ([73]). Since the proportion of older inactive people per those in work is rising, the contribution that older people can make to the economy and society becomes even more relevant than in the past. Consequently, the stock of labour market skills becomes ever more dependent on the maintenance and updating of the existing workforce's skills ([74]), increasing the importance of policies to ensure a healthy life and promoting active ageing.

In this respect, age has a limited, but nevertheless significant, effect on the level of skill proficiency, as the analysis of microdata below shows. Older adults generally show lower proficiency in literacy, numeracy and problem solving than younger people, but data from the PIAAC survey also shows considerable variation in the skill proficiency of older people across countries. This suggests that differences in education and labour markets may influence adults' capabilities to develop and maintain skills as they age. Moreover, the general decline in cognitive skills can be mitigated, delayed or prevented by continuous vocational training, education and lifelong learning ([75]), highlighting their importance in active ageing policies.

In general, individuals with poor skills are less likely to engage in education and training on their own initiative, and tend to receive less employer-sponsored training. This applies particularly to older workers ([76]). Therefore, they need well targeted help to escape the low-skills/low-income trap.

([67]) Continuing Vocational Training Survey, Eurostat.

([68]) Badescu et al. (2011).

([69]) As ranked by the IMD World Competitiveness Yearbook 2014, International Institute for Management Development.

([70]) Eurofound (2013).

([71]) Ibidem, p.5.

([72]) For instance, job latitude and employee control and empowerment, performance incentives etc.

([73]) The next chapter (Chapter 3) will further develop the analysis of active ageing.

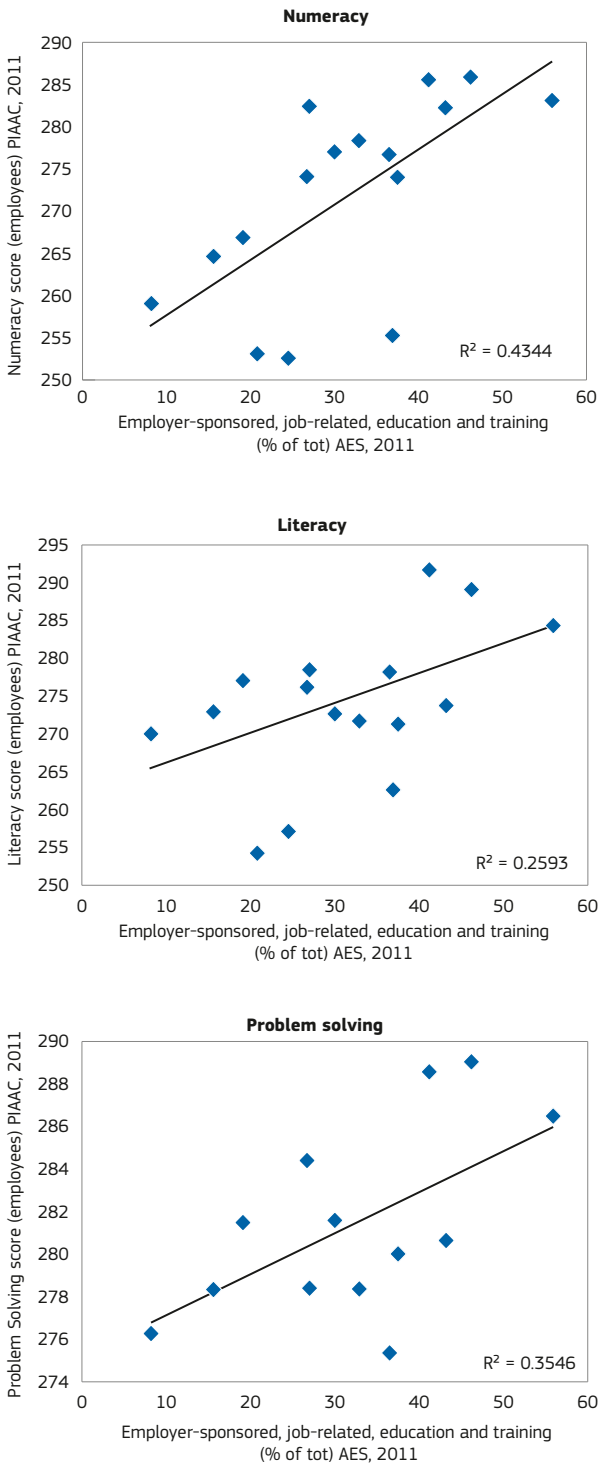
([74]) Desjardins and Warnke (2012).

([75]) Desjardins and Warnke (2012).

([76]) OECD (2013a).

Chart 17: More employer-sponsored training is associated with better skilled employees

Employer-sponsored education and training and skills proficiency of employees



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Sources: PIAAC and Adult Education Survey, DG EMPL elaborations.

Previous studies have shown an association between higher rates of and more equal participation in training in EU countries, suggesting that differences in national training systems are mainly due to [77] their respective capacity for training older, less educated and less skilled workers. This is linked to institutions affecting the system of incentives for engaging in adult learning and the resources available for including older workers in lifelong training.

A key factor for ensuring that human capital is preserved is health. A useful indicator of health as a productivity/economic factor is the Healthy Life Years (HLY) indicator [78] (also called disability-free life expectancy), which measures the number of years that a person of a certain age is likely to live without disability. Eurostat data show that the expected length of healthy life in the EU has been decreasing since 2010 for both females and males.

A prolonged decrease in the number of healthy life years would present an important risk to the provision of human capital and the sustainability of public expenditure. Investment in health care will consequently have to, on the one hand, preserve human capital (supporting active ageing and participation in the labour market) and, on the other, prevent higher dependency costs. The importance of health and safety at work to promote active and healthy ageing becomes evident [79].

The Europe 2020 strategy highlights the importance of addressing health inequalities as part of achieving the goal of inclusive growth and poverty reduction. The evaluation of the European Strategy 2007-2012 on health and safety at work [80], highlighted that several occupational and safety issues are age-related and demographic trends make the needs of older workers, in particular older females, a priority in the immediate future. Data also show that the health status of people varies significantly according to their educational level. This is particularly relevant to understanding the dual link between human capital and health; better educated people enjoy better health status, which can in turn be linked to their better economic conditions. Ensuring good

(77) Badescu et al. (2011).

(78) HLY is a functional health status measure that is increasingly used to complement the conventional life expectancy measures. The HLY measure was developed to reflect the fact that not all years of a person's life are typically lived in perfect health. Chronic disease, frailty, and disability tend to become more prevalent at older ages, so that a population with a higher life expectancy may not be healthier. Indeed, a major question with an aging population is whether increases in life expectancy will be associated with a greater or lesser proportion of the future population spending their years living with disability. If HLY is increasing more rapidly than life expectancy in a population, then not only are people living longer, they are also living a greater portion of their lives free of disability. Any loss in health will, nonetheless, have important second order effects. These will include an altered pattern of resource allocation within the health-care system, as well as wider ranging effects on consumption and production throughout the economy. It is important for policy-makers to be aware of the opportunity cost (i.e. the benefits forgone) of doing too little to prevent ill-health, resulting in the use of limited health resources for the diagnosis, treatment, and management of preventable illness and injuries. The HLY is a key indicator of health status of the European Core Health Indicators (ECHI). More information on the indicator is available at: http://ec.europa.eu/health/indicators/healthy_life_years/index_en.htm

(79) European Commission (2013f).

(80) European Commission (2013e).

health is thus an important precondition for maintaining the available human capital.

3.3. Using human capital

Research suggests that the availability of human capital does not generate benefits, notably economic ones, if it is left idle or under-utilised ([81]) with the quality of the national institutional and policy frameworks being important in this respect ([82]). Examples of poor human capital usage are reflected in evidence of outcomes such as high rates of unemployment and inactivity, especially of women, migrants and young people; high levels of (early) retirement; part-time work or skill-mismatch. On the other hand, institutions and policies such as: active labour market policies; financial incentives to work through tax and social welfare systems; retirement policy of increasing retirement age and extending working life, can all improve the utilisation of human capital and thereby indirectly support further investment in human capital.

Moreover, use of skills in and outside work is the best way to maintain and even increase them ([83]), as being employed generally corresponds to better skills (see Chart A.1 in Annex). Recent PIAAC data allow us to shed more light on the importance of using skills at work. The data not only show that the potential of highly skilled adults is not exploited to the same extent in all countries ([84]), but also stresses the role of a person's employment status on skill usage and maintenance ([85]).

Good utilisation of human capital covers a broad range of problems and policies, which cannot all be presented and analysed here. We decided to focus on the importance of work intensity on skills performance, on women and labour segmentation and skill mismatches, as potential key explanatory variables ([86]).

Skill proficiency is higher among those who are active on the labour market — a finding which may be part of a vicious circle: the inactive part of the workforce suffers from skill depreciation and has lower participation in education and training, further worsening their prospects to find a job. Such a result reveals that human capital capacity extends well beyond the 'stock' accumulated during formal education and develops through use at work.

3.3.1. Work intensity, the use of skills and skills performances

The phenomenon of skill usage and its impact on maintaining human capital can be investigated through a series of regression analyses using PIAAC micro-data. We build a new variable, which takes into account the full working history of individuals. 'Work intensity' can be proxied as the total number of years a person is paid to work, relative to his or her age ([87]). The so-defined 'work intensity' variable has been classified into quintiles ([88]). We include two variables reflecting the use at work of those skills which may be particularly relevant: the frequency of 'solving complex problems' (of any nature) and ICT experience ([89]). We then control for a number of core socio-demographic variables: education (highest educational attainment achieved), age, gender, and 'foreign born' — a dummy variable reflecting where the respondent was born.

The aim of the regression is to find evidence for the human capital depreciation phenomenon, such as the impact of skills and work intensity on PIAAC performance, i.e. the scores in literacy, numeracy, and problem-solving. Tables 3 to 5 show the results of the regressions ([90]) with the respective coefficients together with the standard error of estimation. The higher the coefficient relative to the standard error, the greater its statistical significance as indicated by the stars in the respective third column ([91]).

Results for the socio-demographic controls:

- Age has a clear, negative impact across all three disciplines. The older people are, the poorer they perform in literacy, numeracy and problem solving. Though cohort effects may play a role, this is an unsustainable situation in view of workforce ageing, which calls for stronger investment in their work-related qualifications and skills.
- Women score less favourably in all disciplines.
- As expected, higher educational attainment leads to better scores in all disciplines.
- Being foreign-born strongly reduces the chance of achieving high scores in all disciplines.

Of particular relevance for our analysis are the impact of work intensity and the use of skills. A number of results stand out.

- Not being exposed to ICT in one's working environment strongly reduces the scores in all three disciplines. The same is true for a low frequency of 'solving complex problems' at work.
- The longer someone has been working for pay, the higher their relative performance in numeracy, literacy and, to a lesser extent, problem solving.

([81]) Knowledge and skill are workers' capabilities for performing various tasks, and they can be used differently. Therefore Acemoglu and Autor (2011) argue for adding additional variables in the models to distinguish between skills (availability) and their use in order to better understand the labour market trends, and the impact of technology on employment and earnings. Also, within the companies, the value of its human capital depends on its potential to contribute to the competitive advantage of the firm. See Lepak and Snell (1999 in Baron (2011).

([82]) See review of human capital policies in the EU in Heckman and Jacobs (2009).

([83]) Reder (1994).

([84]) In CZ, PL, NL and Flanders (BE) highly skilled individuals who are out of the labour force represented more than 2% of the total adult population and in FI the share was close to 4% while the highest share of inactive highly skilled adults is in CZ, SK, IT, and PL (more than 20%).

([85]) Various studies had already found a link between national levels of educational attainment among EU Member States and the level of workforce training (Badescu et al., 2011).

([86]) European Commission publishes extensively about activation problems and policies. See e.g. European Commission (2014g, 2012c, 2012d, 2012e).

([87]) A more accurate definition of 'work intensity' would have been the number of years one has worked for pay, relative to the time elapsed since finishing formal education. However, as many people start working long before they finish formal education, we dropped that idea because so-defined work intensity would often have exceeded 100%. We have no information on the work history after finishing education.

([88]) Dividing the population into five equal classes with respect to people's 'work intensity':
Class 1: Work intensity (WI) > 60%;
class 2: 48.15% < WI ≤ 60%;
class 3: 33.33% < WI ≤ 48.15%;
class 4: 16.67% < WI ≤ 33.33%;
class 5: WI ≤ 16.67%.

([89]) The ICT experience variable is negatively expressed, i.e. equal to 2 if there is no experience, otherwise it is 1.

([90]) The number of valid cases per country involved may be too small (ranging from around 2.500 to around 6.000). The last column shows the international average for countries where the results are most reliable, due to a higher number of observations.

([91]) Third column: * and ** refer to the coefficient if it is (in absolute terms) greater than 1.96 and 2.576 times the standard error, resp. As the true coefficient then lies in the middle a confidential interval greater than 95% and 99%, resp., the estimated sign of the coefficient is significant at minimum 5% and 1%, resp.

Table 3: Linear regression — Literacy

	Age	S.E.	Sex	S.E.	Educa-tion	S.E.	Foreign born	S.E.	Work intensity	S.E.	Freq. of solving complex problems	S.E.	No ICT-experience	S.E.
Belgium (Flanders)	-0.79	0.12**	-4.35	1.35**	4.99	0.27**	-35.48	3.69**	0.75	1.15	1.64	0.6**	-20.06	2.04**
Czech Republic	-0.59	0.17**	-3.69	1.75*	4.16	0.34**	-7.29	5.91	0.01	1.67	0.98	0.8	-10.53	2.58**
Denmark	-1.01	0.07**	-1.54	1.1	4.03	0.18**	-37.43	2.46**	1.58	0.79*	2.97	0.58**	-15.87	1.88**
Finland	-1.04	0.1**	-0.38	1.67	4.16	0.26**	-41.49	5.35**	-1.12	0.87	3.12	0.67**	-15.83	2.63**
France	-0.59	0.08**	-1.48	1.16	4.99	0.2**	-25.01	2.24**	-0.11	0.74	1.98	0.46**	-15.82	1.6**
Ireland	-0.41	0.09**	-5.29	1.44**	4.83	0.31**	-13.21	2.11**	1.28	0.83	1.79	0.59**	-10.03	2.21**
Italy	-0.56	0.13**	2.62	2.1	3.98	0.33**	-23.46	4.11**	2.34	0.95*	1.66	0.79*	-18.55	2.5**
Japan	-0.8	0.08**	0.91	1.48	4.05	0.2**	-31.12	14.06*	1.65	0.77*	1.34	0.61*	-10.38	1.87**
Korea, Republic of	-1.06	0.07**	-2.87	1.39*	3.6	0.21**	-44.45	6.79**	1.49	0.63*	0.38	0.48	-10.13	1.82**
Netherlands	-0.94	0.08**	-3.02	1.32*	4.25	0.24**	-34.09	3.14**	-0.12	0.8	2.61	0.59**	-20.26	2.23**
Norway	-0.83	0.09**	-3.97	1.35**	4.35	0.19**	-37.05	2.58**	1.87	0.97	3.23	0.7**	-19.61	2.26**
Poland	-0.64	0.13**	0.28	1.86	4.36	0.28**	6.3	13.86	1.62	1.2	1.39	0.79	-12.35	2.29**
Russian Federation *	-0.25	0.19	2.54	2.03	2.35	0.51**	-3.16	8.54	3.42	1.81	1.26	0.99	-1.46	3.48
Slovak Republic	-0.86	0.12**	2.6	1.44	2.69	0.28**	-0.42	4.72	5.37	0.99**	3.32	0.58**	-6.46	1.86**
Spain	-0.64	0.08**	-8.09	1.63**	4.06	0.2**	-20.37	2.63**	-1.41	0.67*	1.33	0.56*	-14.99	1.87**
Sweden	-0.99	0.1**	-2.97	1.52	4.85	0.23**	-40.46	2.24**	2.54	1.09*	3.05	0.62**	-15.26	2.34**
UK (England/ N.Ireland)	-0.32	0.12**	-1.24	1.59	2.92	0.19**	-24	3.76**	2.06	1.19	2.74	0.72**	-20.96	2.45**
International average	-0.73	0.03**	-1.76	0.38**	4.03	0.07**	-24.25	1.54**	1.37	0.26**	2.05	0.16**	-14.03	0.55**

Sources: PIAAC, DG EMPL elaboration.

Notes: * Data for the Russian Federation do not cover the Moscow municipal area. ** Belgium refers only to Flanders. *** United Kingdom refers only to England and Northern Ireland.

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Table 4: Linear regression — Numeracy

	Age	S.E.	Sex	S.E.	Educa-tion	S.E.	Foreign born	S.E.	Work intensity	S.E.	Freq. of solving complex problems	S.E.	No ICT-experience	S.E.
Belgium (Flanders)	-0.66	0.13**	-15.89	1.71**	5.44	0.3**	-33.69	3.54**	1.36	1.17	2.23	0.66**	-21.55	2.07**
Czech Republic	-0.39	0.15**	-9.02	2.03**	5.04	0.4**	-10.9	6.07	-0.56	1.41	1.57	0.88	-13.76	2.77**
Denmark	-0.7	0.08**	-12.61	1.47**	4.49	0.22**	-35.73	2.8**	2.34	0.89**	3.16	0.66**	-16.08	2.09**
Finland	-0.85	0.1**	-14.43	1.62**	4.69	0.3**	-40.22	5.22**	-0.74	0.96	3.5	0.79**	-15.58	2.73**
France	-0.55	0.1**	-12.02	1.46**	6.41	0.23**	-29.94	2.99**	1.41	0.94	2.23	0.5**	-21.4	1.61**
Ireland	-0.39	0.1**	-16.07	1.5**	5.11	0.34**	-8.4	2.37**	2	1.01*	1.54	0.67*	-16.98	2.51**
Italy	-0.72	0.14**	-5.14	2.18*	4.26	0.35**	-14.63	4.57**	4.72	1.13**	2.49	0.88**	-23.23	2.83**
Japan	-0.4	0.08**	-6.68	1.79**	4.43	0.22**	-32.17	15.85*	2.09	0.96*	2.35	0.66**	-15.96	1.75**
Korea, Republic of	-1	0.08**	-5.73	1.41**	4.41	0.24**	-42.15	6.64**	1.94	0.69**	0.29	0.55	-10.55	2.1**
Netherlands	-0.72	0.08**	-14.33	1.34**	4.3	0.24**	-36.71	3.32**	0.03	0.85	2.73	0.67**	-20.39	2.6**
Norway	-0.75	0.1**	-15.08	1.42**	5.26	0.21**	-43.97	2.99**	3.59	1.04**	2.56	0.75**	-17.77	2.6**
Poland	-0.52	0.14**	-8.49	1.67**	4.34	0.31**	-34.59	15.97*	2.56	1.29*	1.74	0.74*	-14.01	2.25**
Russian Federation *	-0.23	0.2	0.6	2.36	2.55	0.58**	-10.56	4.45*	2.3	1.98	2.55	0.96**	-4.48	3.12
Slovak Republic	-0.85	0.14**	0.16	1.74	3.62	0.3**	-3.35	5.11	6.79	1.28**	3.81	0.69**	-10.24	1.94**
Spain	-0.7	0.09**	-15	1.7**	4.11	0.21**	-18.16	2.89**	0.13	0.76	1.89	0.63**	-19.02	1.78**
Sweden	-0.8	0.11**	-14.38	1.4**	5.61	0.22**	-43.26	2.5**	2.83	1.15*	2.83	0.75**	-13.49	2.39**
UK (England/ N.Ireland)	-0.3	0.12*	-11.65	1.79**	3.25	0.22**	-30.05	3.64**	2.5	1.33	3.44	0.79**	-23.43	2.61**
International average	-0.62	0.03**	-10.34	0.41**	4.55	0.07**	-27.56	1.63**	2.08	0.28**	2.41	0.18**	-16.35	0.58**

Sources: PIAAC, DG EMPL elaboration.

Notes: * Data for the Russian Federation do not cover the Moscow municipal area. ** Belgium refers only to Flanders. *** United Kingdom refers only to England and Northern Ireland.

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Table 5: **Linear regression — Problem solving**

	Age	S.E.	Sex	S.E.	Educa-tion	S.E.	Foreign born	S.E.	Work intensity	S.E.	Freq. of solving complex problems	S.E.	No ICT-experience	S.E.
Belgium (Flanders)	-1.28	0.14**	-8.19	1.67**	4.36	0.23**	-18.42	3.34**	-0.85	1.14	1.62	0.59**	-16.9	2.41**
Czech Republic	-0.9	0.21**	-5.15	2.37*	3.17	0.4**	-1.01	6.77	-2.73	2.05	4.58	0.91**	-20.82	3.45**
Denmark	-1.48	0.07**	-6.03	1.28**	3.61	0.22**	-21.63	2.74**	1.6	0.76*	2.8	0.62**	-15.98	2.26**
Finland	-1.47	0.1**	-6.23	1.35**	3.97	0.31**	-15.66	4.91**	-2.48	0.93**	3.01	0.66**	-12.16	2.09**
France	.	..	.	..	.	..	.	..	.	..	.	..	.	..
Ireland	-0.97	0.11**	-7.84	1.79**	4.35	0.34**	-0.03	2.14	0.57	0.97	1.41	0.7*	-10.12	2.1**
Italy	.	..	.	..	.	..	.	..	.	..	.	..	.	..
Japan	-1.58	0.14**	-6.07	1.99**	3.62	0.35**	4.2	15.55	3.51	1.26**	3.3	0.91**	-16.44	3.03**
Korea, Republic of	-1.61	0.1**	-4.93	1.5**	2.88	0.31**	-35.36	10.44**	0.95	0.81	1.41	0.64*	-5.87	2.1**
Netherlands	-1.12	0.08**	-5.45	1.42**	3.5	0.22**	-17.52	3.08**	-0.71	0.85	1.92	0.6**	-16.44	2.2**
Norway	-1.46	0.09**	-7.67	1.12**	3.84	0.22**	-22.51	2.86**	1.65	0.84*	2.36	0.68**	-15.35	2.1**
Poland	-1.33	0.21**	-12.14	2.53**	3.81	0.38**	-1.57	24.06	1.11	1.87	-0.56	1.04	-17.68	2.9**
Russian Federation *	-0.88	0.24**	1.07	3.65	1.37	0.76	-1.8	4.56	5.91	2.86*	2.71	1.29*	-11.98	4.92*
Slovak Republic	-0.98	0.16**	-1.99	1.9	2.49	0.39**	0.89	7.44	3.17	1.45*	1.22	0.78	-9.43	2.93**
Spain	.	..	.	..	.	..	.	..	.	..	.	..	.	..
Sweden	-1.44	0.11**	-5.34	1.48**	4.34	0.24**	-30.23	2.29**	0.77	1.01	3.03	0.71**	-11.98	2.42**
UK (England/ N.Ireland)	-1.02	0.09**	-7.91	1.67**	2.57	0.16**	-17.17	3.15**	1.73	0.88*	1.46	0.64*	-20.45	2.77**
International average	-1.25	0.04**	-5.99	0.52**	3.42	0.09**	-12.7	2.4**	1.01	0.37**	2.16	0.21**	-14.4	0.75**

Sources: PIAAC, DG EMPL elaboration.

Notes: * Data for the Russian Federation do not cover the Moscow municipal area. ** Belgium refers only to Flanders. *** United Kingdom refers only to England and Northern Ireland.

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- The statistical significance for 'working intensity' is considerable, but less so than skill-use as measured in the questionnaire ([92]).

These results confirm a link between people's work history and usage of their skills with enhancing skills proficiency. At any level of educational attainment, the possibility of using skills at work is associated with a higher performance measurement of those skills ([93]). This, in turn, has strong implications for future labour market prospects of individuals. Successful workforce activation is therefore key, also from the point of view of skills maintenance.

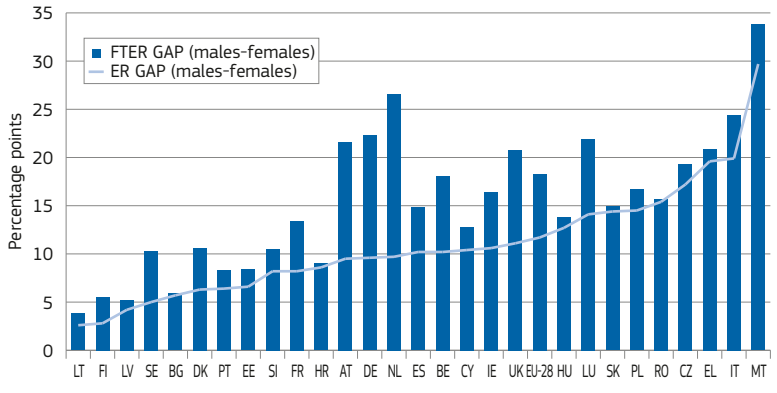
3.3.2. Utilising the potential of women in the labour market

One in four persons of working age in the EU is inactive, and about 15 % of them have a tertiary education. This represents a significant cost in terms of potential human capital that is unused.

When it comes to a better utilisation of existing resources, female participation becomes a concern. Although the female employment rate has been increasing in the EU, women are still less likely to work than men with big variations across the EU (Chart 18). In 2013, the EU-28 employment rate for women aged 20–64 was more than

Chart 18: **Men continue to be stronger integrated in the labour market than women**

Gaps between male and female full-time equivalent employment rates (FTER) and employment rate (ER) in 2013, women and men aged 20–64, 2013, Member States



Sources: Eurostat, DG EMPL, own calculations.

Note: FTER — full-time equivalents calculated with regard to the working time of a full-time, full-year employee.

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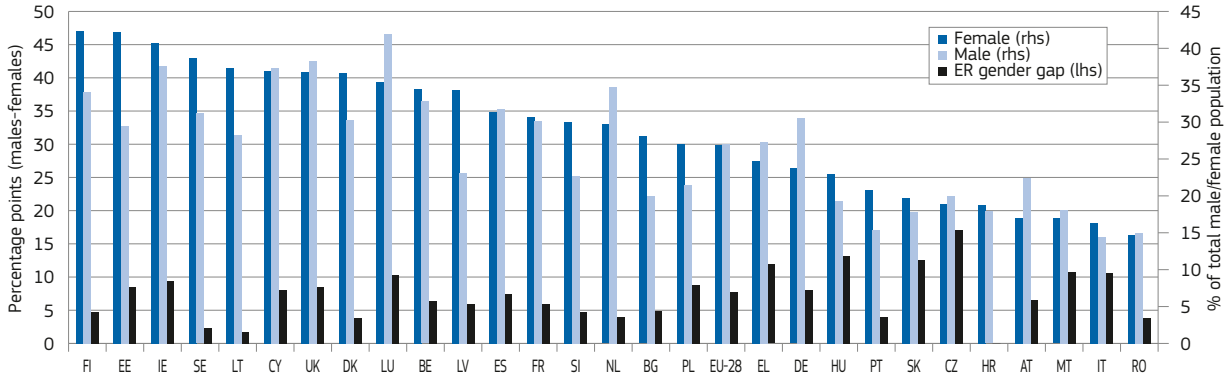
([92]) One reason could be measurement problems since skill-use variables are strongly connected with work-intensity so that multi-collinearity problems emerge. Probably related to that problem (and the reduced number of valid observations), the country-specific coefficients vary and are not all positive. Apart from that, country differences also reflect different sectoral specialisations within each country, with more knowledge-intensive sectors determining a higher 'pay-off' of work to skills. All in all, the evidence of a positive impact of work history on skills proficiency across all countries is still convincing.

([93]) The fact that our variable considers the whole work history of the individuals, while the test of skills proficiency are taken at one point in time (2011 in this case), should allow for a prudent inference of causal relations, from being at work to having better skills.

Chart 19: High educated women — more in population, less in employment

Employment rate gender gap in percentage points (male — female); share of female/male with high educational attainment (% of respective population), 2013, 25–64 years



Sources: Eurostat, DG EMPL, own calculations.

Notes: *Countries are ranked according to the decreasing share of women with high educational attainment. ** High educational attainments means short-cycle tertiary, bachelor or equivalent, master or equivalent and doctoral or equivalent (levels 5–8).

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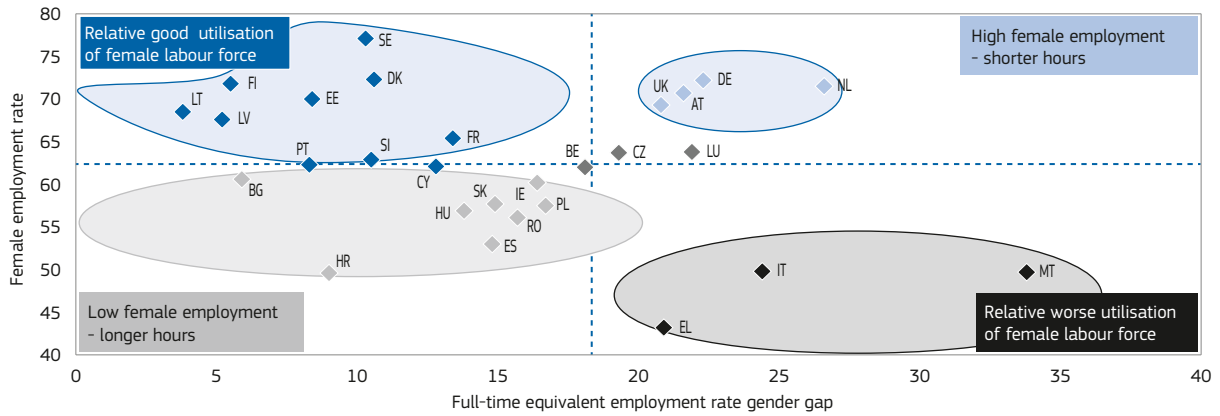
Chart 20: Some policy mixes are better for women's labour market integration

FTER gap (percentage points) and female employment rate (%) in the EU Member States in 2013



Sources: Eurostat, DG EMPL, own calculations.

Note: FTER — full-time equivalents calculated with regard to the working time of a full-time, full-year employee.

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12 percentage points lower than that of men (62.5% vs 74.2%) — yet this is a significant improvement on the 17 percentage points gap in 2002 (58.1% vs 75.4%) ([94]).

Not only are women less likely to work than men, those who do are, on average, likely to work fewer hours than men. When employment is measured in full-time equivalents, the largest gaps are in Member States where the female employment rate is relatively high (e.g. Austria, Belgium, The Netherlands, Ireland, Germany and the United Kingdom) (Chart 18). In other words, part of higher female employment rates is a result of greater participation in part-time work and, to that extent, reflects less, not more, exposure to work-related skill usage and strong under-employment.

The gender employment gap is strongly linked to **family and care activities**, with prime age women being most likely to work fewer hours or be inactive due to family and care-related activities, and this is only changing slowly ([95]).

Indeed, the stock of female human capital is not used effectively. As for men, for women too the likelihood of working increases with higher educational attainment, but the employment rate gender gap remains significant even at the highest levels of educational attainment (Chart 19). In all but four countries (Luxembourg, Germany, Austria and the Netherlands), a greater share of women have higher educational attainment than men, with the biggest differences occurring in Estonia and Latvia (more than 15 pps). Despite this, the employment rate of men exceeded that of women in all Member States, with the exception of Croatia, where the rates were the same. The Commission's analyses ([96]) reveal that a country's relative performance in terms of gender-gap tends to be similar across all educational levels: e.g. low gender gaps exist in Bulgaria, Lithuania, Latvia, Hungary and Slovakia and high gaps occur in Germany, Belgium, Ireland, the United Kingdom and the Netherlands.

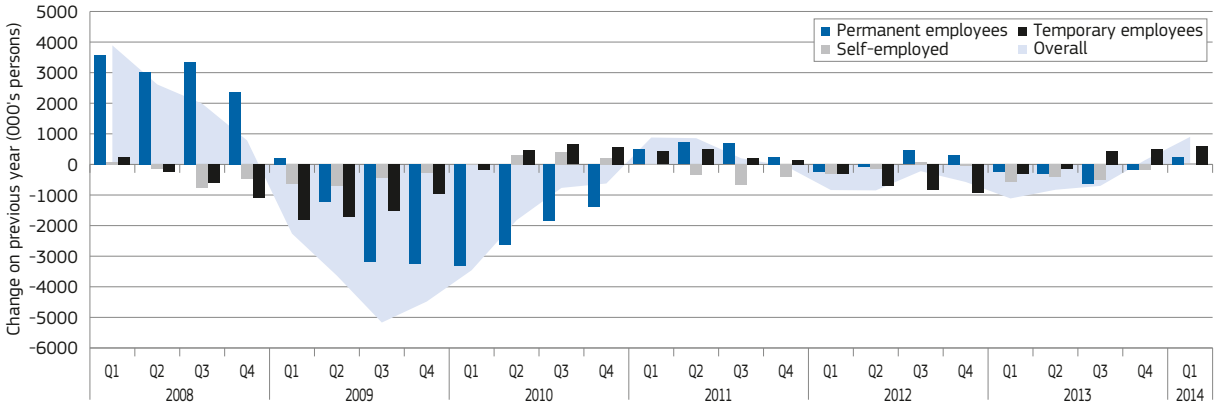
The analysis in the 2013 Economic and Social Developments in Europe review showed some distinct patterns among Member States regarding the gender gap in total hours worked. Only a few Member States, mainly Nordic and Baltic countries, have so far succeeded in implementing a policy mix that combines high female employment rates with a low gender gap in total hours worked (Chart 20).

([94]) Over the last two decades, the employment rate of women in the EU-15 increased by more than ten percentage points, from 52.8% in 1995 to 63.7% in 2013. [lfsa_ergan].

([95]) European Commission (2014f).

([96]) European Commission (2014f).

Chart 21: **Temporary contracts are the main typology of new jobs created in the last quarters**
Employees in permanent and temporary work in the EU-28, self-employment and total employment (15–64)



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Sources: Eurostat, LFS [lfsq_egaps,lfsq_etgaed] Data non-seasonally adjusted.

The policy mix notably includes: availability of flexible working arrangements and long part-time positions for parents; incentives to share unpaid work within the couple; and available, affordable, quality childcare. Some countries, such as Germany and the United Kingdom, have a high share of working women but with relatively short hours. Others, such as Spain or Ireland, have a lower female labour market participation rate although those women who do work tend to work longer hours.

OECD analysis reveals that closing the gender gap reveals some great potential in terms of economic growth through activating existing labour resources ([97]). In countries such as Ireland and Luxembourg, which have low female activity, a convergence in activity rates could increase the total labour force by more than 20%. Moreover, an increase in the working time of women would obviously increase still further the convergence in labour force intensity. The convergence in intensity contributes more to the increase in the total size of the labour force in countries with a high share of women working part-time.

Furthermore, the OECD estimates that halving the gender labour-force participation gap could bring a 6.2% gain in GDP across 21 EU members of the OECD by 2030, plus a further 6.2% gain for full convergence. The largest gains from full convergence are projected in countries like Italy and Greece with large existing gender gaps (around 20%) while the growth potential is limited in countries like Finland or Sweden (less than 5%).

([97]) Thevenon et al. (2012).

3.3.3. Labour market segmentation and skill mismatches

Strong labour market segmentation (high incidence of atypical work) and the persistence of skill mismatches on the labour market, together with a rising share of long-term unemployment, point to the increasingly structural nature of the EU's labour market problems and are a threat to future welfare. They create a persistent exclusion of 'outsiders' and force many people into work that does not match their skills. The resulting depreciation of skills will inhibit growth for a long period of time, while at the same time skills needs are changing, with an increasing need for highly-skilled workers. In light of the human capital shortages to be expected, the policy focus must lie on structural labour market reforms.

In recent years, changes in labour market conditions and policy changes, like deregulation of non-standard work forms ([98]), have contributed to the increase in non-standard forms of contracts and a rise in part-time work and the use of temporary contracts. For example, a tendency to make more extensive use of temporary contract was already evident before the crisis, particularly in some countries. However, temporary contracts have become the main form of new jobs created in recent quarters (Chart 21) ([99]).

([98]) Eichhorst, 2013.

([99]) An employee is considered as having a temporary job if employer and employee agree that its end is determined by objective conditions, such as a specific date, the completion of an assignment, or the return of an employee who is temporarily replaced. Typical cases include: people in seasonal employment; people engaged by an agency or employment exchange and hired to a third party to perform a specific task (unless there is a written work contract of unlimited duration); people with specific training contracts (Eurostat).

While the share of temporary contracts in total employment is higher for women, more recently the increase has been faster for men.

Growing levels of atypical employment, such as part-time work, casual work or work on temporary contracts reflects strong labour market segmentation and is therefore considered to be one of the main drivers of increasing inequality, even in the pre-crisis period, despite employment growth ([100]). Recent studies have also demonstrated that the increase in non-standard work contracts has had a negative influence on total productivity as a result of an underinvestment in human capital ([101]).

In the vast majority of countries, workers on temporary contracts are found ([102]) to make less intensive use of their information-processing skills and some generic skills (e.g. task direction, influencing and self-organising), than those in permanent employment — suggesting that the tasks carried out by workers hired under different contractual arrangements vary substantially. Such a usage gap can potentially reduce future opportunities for temporary workers and have a negative impact on labour productivity of young workers if they are on temporary contracts for long periods. Moreover, employers invest less in training of temporary workers.

Therefore, tapping into existing labour resources requires the promotion of regular instead of atypical employment, helping transition to permanent jobs and

([100]) OECD (2014a).

([101]) Franceschi and Mariani (2014); and ISFOL (2014).

([102]) Quintini (2014).

reducing the share of involuntary forms of at non-standard work contracts.

However, the spread of fixed-term contracts can be seen to have encouraged firms to adopt a short-term approach to the management of human resources, which overestimates the short-term benefits of a reduction in labour costs due to short-term flexible or temporary contracts, and to discount the long-term collective costs associated with reduced human capital formation and the loss of innovative capacity ([103]).

Atypical contracts often coincide with people having to accept jobs below their level of education or not matching their skills. Skill mismatch — a difference between the skills and qualifications that are available and those which are needed in the labour market ([104]) — especially if it is persistent, implies real short- and long-term economic and social losses for individuals, employers and society. Individuals working in jobs below their qualifications may earn less, be more prone to change jobs and in the long-run will be more likely to lose skills by not using them ([105]) and become less satisfied with their jobs.

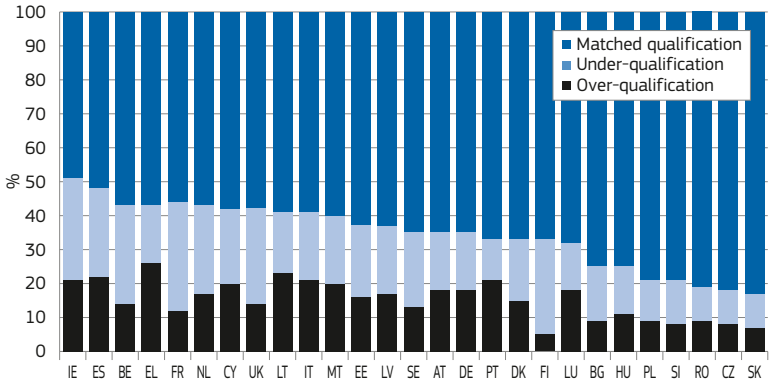
Those with insufficient skills are less efficient and productive in their work. In the long-run employers are faced with higher recruitment and turnover costs, as well as lower productivity and reduced competitiveness. For society as a whole, skill mismatch reduces matching efficiency and increases unemployment ([106]). In the long run it leads to under-investment in training, low-skills-bad-jobs-low-wage equilibrium, and undermines long-run growth and social inclusion ([107]). Some skill mismatch is inevitable in a dynamic economy, where skill requirements change as jobs are changing, where labour market information is imperfect and where education and training systems need time to respond to new knowledge and skill demands ([108]). However, in some EU Member States almost half of the labour force is seen to be mismatched, which is a huge waste of human potential (Chart 22), with vertical mismatch especially high in Mediterranean countries (e.g. Greece, Spain).

As the ageing society will require a strong acceleration of productivity growth due to the forthcoming workforce decline, this waste of resources belongs to the most serious recent socioeconomic developments and will inevitably result in lower growth potential unless policy takes decisive action.

Earlier Commission research has shown that countries with high levels of over-qualification appear to share some common characteristics ([109]). Already now (before the demographic shift) they tend to be less wealthy and have a lower share of services in GDP. They also have low levels of public investment in education and training and low expenditure in labour market programmes, which might reduce their quality and ability to respond to changing labour market needs. There are few jobs available for highly educated graduates and many business executives in these countries consider that their educational systems are not meeting their business needs; enterprises provide less company training and pay less attention to human resource management and recruitment. Highly mismatched countries tend to have more rigid labour markets and higher labour market segmentation ([110]).

Some skill mismatch is likely to continue in the future given that, according to forecasts by Cedefop, the demand for the highly educated is expected to fall short of supply, while the opposite is forecast for the low qualified, in 2015 ([111]). Raising awareness of the need to anticipate and address potential mismatches in different sectors and occupations is an important investment into future growth, but a reduction in skill mismatch requires

Chart 22: Qualification mismatch is very high in some Member States
Average incidence of vertical mismatch (2001–11) in EU-27 countries, % of employees (aged 25–64)



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Source: European Commission (2012a).

Notes: Over-qualified (or under-qualified) workers are those whose highest level of qualification attained is greater than (or lower than) the qualification requirement of their occupation. The modal qualification in each occupational group at the two-digit level is used to measure qualification requirements. The appropriate EU-LFS weighting variable (COEFF) is used in the calculation of the modal qualification.

([103]) ISFOL (2014).

([104]) Skill mismatch can be quantitative and qualitative. The first one shows differences between aggregate labour supply and demand. Qualitative mismatch shows differences between individuals' skills and job requirements at micro level, where individuals can have higher qualifications and skills than required (over-qualified or over-skilled) or lower (under-qualified or under-skilled). For a more detailed presentation of various forms of skill mismatch, see European Commission (2012a) and Flisi et al. (2014).

([105]) See evidence by results on Adults skills survey (OECD 2013a) and Pellizzari and Fichen (2013).

([106]) European Commission (2013d).

([107]) For more details on the economic and welfare cost of skill mismatch, see European Commission (2012a).

([108]) Even if there is today a skill match, this can change in the future, due to technological changes and changing job requirements, skill depreciation and obsolescence if there is no further training (European Commission, 2012a).

([109]) Those characteristics are based on observing vertical mismatch for 2001–09. The high over-qualification cluster includes Greece, Italy, Portugal, Cyprus, Lithuania, Ireland and Spain, while the medium over-qualification cluster includes Austria, Belgium, Denmark, Estonia, France, Luxembourg, Latvia, the Netherlands, Sweden and the UK. See European Commission (2012a).

([110]) See European Commission (2012a).

([111]) Cedefop, Skills forecasts, Online data and results (April 2014) and Flisi et al. (2014). Eurostat has recently published a new population projection Europop 2013 that significantly changes current labour supply estimates, especially at the national level. Cedefop is currently working on the evaluation of possible impacts of the new population projections on the skills forecasting results and will produce a new forecast in early 2015.

policy intervention ([112]) across various policy domains, including: education and training; employment and social security; mobility and migration; and industrial and regional development ([113]).

Education and training systems could be more responsive to labour market needs, equipping graduates with good basic skills, promoting a variety of routes for qualifications (e.g. VET), and providing early career guidance to help students make more informed choices. They could also encourage adult and lifelong learning, with companies playing a bigger part by providing more work-based training.

Employment and social policies can improve mobility and more efficient matching by passing social security rules that allow easy transfer of social security rights. Active labour market policies can help job-seekers, notably the low-skilled, obtain relevant skills and shorten unemployment spells, although activation should not be led by a 'work-first' approach ([114]). Good quality labour market intermediaries, such as public employment services (PES), which support good matches and provide necessary guidance and job-counselling, play a very important role ([115]).

Industrial and regional development policies can reduce skill mismatch, mainly by influencing the labour demand side. Stimulating innovation and the creation of high-level jobs helps utilise the potential of Europe's high-qualified workforce. This is also achieved by supporting firms that rely on high-skill, high-productivity product strategies and exploiting synergies between skills and high-productivity firms by facilitating the growth of industrial clusters.

Research findings tend to emphasise the role of employers in reducing skill mismatch ([116]) by offering attractive working conditions, including performance pay, complex job tasks and learning opportunities. However, it is unrealistic to expect all employees, notably new ones, to have all the required skills for the available jobs. Employers can overcome this by becoming more involved in education and training systems, notably by providing quality apprenticeships. Another way to improve the match is to improve companies' human resource and recruitment policies to attract and select talent, and to facilitate internal labour mobility ([117]).

Employers and workers have a joint interest in investing in skills. Their representatives (employers' organisations and trade unions) often combine their (sector-specific) knowledge of the labour market to identify skill gaps and develop joint solutions. They may jointly develop training curricula or organise paritarian funds (e.g. financed through social security contributions) to provide training. In doing so, they overcome problems of collective action and positive spill-overs associated with skill investment.

4. Policies and their impact: Evidence from the Labour Market Model

This section uses DG EMPL's Labour Market Model (LMM) to demonstrate how different policies can help in forming, maintaining and using human capital ([118]). We show how investment in education helps in *forming* human capital. When it comes to *maintaining* human capital, investment in training is an efficient tool — particularly when it is embedded into a more comprehensive strategy which also uses educational investment to strengthen overall labour productivity, and hence growth. Finally, we may improve the *usage* of human capital by helping firms to lower labour costs in the most vulnerable segment of the labour market. But again, policies are most effective when they are part of a policy package that also includes policies supporting growth in addition to investment in human capital.

Given the precarious labour market situation for young people in Europe, simulation of policy measures in this section concentrates on young cohorts (aged below 24).

4.1. Forming HC: Investment in education — the case of Germany

The decisive role of formal education in human capital formation has been confirmed by many studies. Previous simulations using DG EMPL's Labour Market Model show that young people graduating from higher educational have better labour market outcomes leading to higher economic growth ([119]). These exercises show the impact of opting for higher education although, since higher education comes at a cost, it involves personal choices. From an individual's perspective, there is not only the cost, which can be particularly high in some countries, but also the question of foregone earnings and the possibility of missing out on career opportunities during the period of study. For the great majority, however, these costs are typically weighed against the long-term gains from higher education in terms of enhanced job opportunities, higher earnings, better recognition and better working conditions.

DG EMPL's model can take on board the endogeneity of education ([120]), which assumes that, before starting their careers, people decide on which educational path to follow, namely low, medium or high education ([121]), given

([112]) Intervention is needed due to various market failures preventing efficient reduction of mismatch by labour market adjustments alone, such as the lagged nature of skill supply relative to demand; positive spillovers ('externalities') in human capital outcomes; disincentives to investment in training by enterprises and recruitment deficiencies; missing insurance markets for skill investment and intergenerational transmission of education and training. (European Commission, 2012a).

([113]) Berkhout et al. (2012); European Commission (2012a), World Economic Forum (2014).

([114]) According to the World Economic Forum (2014), activation strategies should move away from the 'work-first' to a 'learn-first' approach and take into account the long-term consequences of training and placement decision on individuals' employability and adaptability.

([115]) European Commission (2012a, 2013d); World Economic Forum (2014); Berkhout et al. (2012).

([116]) World Economic Forum (2014), Cappelli (2014), CEDEFOP (2012b).

([117]) World Economic Forum (2014), Berkhout et al. (2012).

([118]) LMM is a general equilibrium model covering 14 EU countries and is used to show the impact of labour market policy measures on important internals such as employment, unemployment, wages, but also GDP and productivity. It has a particular focus on the labour market, and includes a detailed picture of the institutional surroundings in the different countries. LMM distinguishes eight age groups and three skill-levels (in the sense of educational levels). It also considers the impact of firm-training on individual labour productivity. For more detail, see Berger et al. (2009:2), p. 9. For a short explanation of LMM, consult European Commission (2010).

([119]) European Commission (2014e), Chapter 1, Section 6.1 for Germany; Employment and Social Developments in Europe 2013; Peschner and Fotakis (2013), Section 4.2.1 on the example of France.

([120]) Berger et al. (2009:1), pp. 27–28.

([121]) According to the International Standard Classification of Education 1997: ISCED 0-2 (low), ISCED 3-4 (medium), ISCED 5-6 (high). See http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/educ_esms_an5.htm

their respective costs ([122]) and benefits ([123]). On this basis it is assumed, in the traditional economic jargon, that they pursue further education so long as the marginal costs are lower than the marginal gains of higher education.

This endogenous educational choice is 'switched on' in this section — contrary to the analyses mentioned earlier ([124]). This means that an incentive is needed to attract more people to engage in higher education ([125]). It is assumed that the government spends 0.1 % of GDP on subsidies to young people aged between 20 and 24 years if they take up tertiary education ([126]). The measure is financed by lump-sum taxes levied on all households and they are assumed to 'have no incentive effects other than shifting income from the private to the public sector' ([127]). The results are similar in all 14 countries covered by the model, but we use Germany as a basic example.

The Europe 2020 target aims at having 40 % of people aged between 30 and 34 years with tertiary education in 2020, while Germany had set itself the national objective of increasing to 42 % the share of people aged between 30 and 34 years who successfully achieve tertiary *or equivalent* educational attainments by 2020 ([128]) — reflecting the relevance of good quality vocational (apprenticeship) education in Germany in providing skills relevant for the labour market.

In 2013, the share of tertiary educated people in Germany was only around 33 % — below the EU average of 37 %, according to the Labour Force Survey ([129]) ([130]). The 2014 Country Specific Recommendation ([131]) urges Germany to spend more on education and make efforts 'at all levels of government to meet the target for total public and private expenditure on education and research of 10 % of GDP by 2015, and even more ambitious follow-up targets should be aimed for in order to catch up with the most innovative economies'.

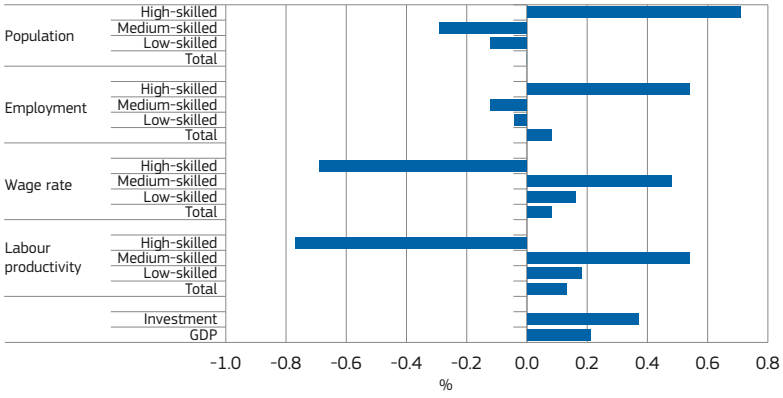
Chart 23 shows the long-term, steady-state results of the simulation. The subsidy increases the net-yield resulting from taking up high education. Those concerned adjust to the new situation as more of them take the step from medium to high education. On this basis, the share of population with tertiary degrees would increase by 0.7 % compared to the baseline scenario — this is mainly at the expense of medium-educated (-0.3 %) and some low-educated people (-0.1 %).

As a result of the changing skills mix, total employment is expected to increase by 0.1 %, but the composition changes strongly towards the highly educated. This has important implications for the countries' long-term growth perspective since physical investment is strongly complementary to the average skill level ([132]), and higher investment and better skills improve workers' productivity.

Hence, the changing skills composition would be expected to trigger investment and labour productivity, which in turn pulls up GDP by more than 0.2 %. That is, a long-term multiplier of more than two, which would bring an economic expansion more than twice as strong as the initial cost of the measure — which is a very typical finding for skill-/education-related policy measures ([133]).

Chart 23: Positive impacts of subsidising young people to take up higher education in Germany

Simulation with DG EMPL's Labour Market Model: giving a subsidy to young adults to take up tertiary education (0.1 % of GDP)



Source: Own calculations based on DG EMPL's Labour Market Model.

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4.2. Maintaining HC: Investment in training — the case of Slovakia

Informal training plays a major role in the acquisition of the new skills needed to achieve higher labour productivity growth and to limit human capital depreciation over time ([134]).

In Slovakia training intensity is low and 'despite government efforts to reform vocational education and training and subsidise jobs for young people, the youth unemployment rate remains among the highest in the EU' according to the 2014 Country Specific Recommendation

([122]) Educational cost is also assumed to be a function of individual 'abilities' of which agents are assumed to have a correct esteem.

([123]) It is also assumed that agents have a perfect esteem on their individual abilities.

([124]) For a similar exercise based on an older version of LMM, see Berger et al. (2009:2), pp. 50–56.

([125]) The model assumes that the provision of higher education is oriented towards labour market needs and that the additional graduates are expected to be hired at least at the same rate as existing graduates.

([126]) Currently, this corresponds to some EUR 2.7 bn per year and thus constitutes a medium-sized package. Today, this amount would be arithmetically sufficient to grant to each student of a German university support of around EUR 1 100 per year.

([127]) Berger et al. (2009:2), p. 9.

([128]) Unlike the general EU2020 target, Germany includes 'tertiary *and equivalent*' education, i.e., ISCED levels 4–6 (instead of 5–6) into its own education-related objective for 2020. ISCED level 4 includes post-secondary education.

([129]) Germany had already exceeded national set targets in 2010 with a share of 43.5 % (Federal Ministry of Economic Affairs and Energy (2014), p. 31.

([130]) http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database (table t2020_41).

([131]) European Commission (2014a), p. 4.

([132]) Capital intensity will be higher the stronger skills are distributed towards higher skills: high skills attract investment and vice versa. See Berger et al. (2009:1), p. 33.

([133]) The strong negative impact on labour productivity of the highly educated is due to the expansion of high-educated employment.

([134]) For example: Berger et al. (2009:1), section 9.5.2; Heckman et al. (1998), HC accumulation function on p. 3. For empirical evidence, see the micro-data analysis in section 2.3.1, based on the 'PIAAC' survey on adult skills.

to Slovakia ([135]). Therefore, the effectiveness of firm-sponsored training to support young people is the focus of this section.

We first simulate the effects of a Slovak government subsidy to firms that induces them to offer firm-sponsored training to workers. The magnitude of the subsidy is 0.1 % of GDP, and is assumed to be financed by lump-sum taxes levied on all households. In order to show the impact on different age groups, we first assume that the subsidy focusses on all workers. In a subsequent simulation, we drop that assumption and focus the subsidy on young workers only. Finally, in an attempt to find the 'optimal policy mix', we combine the training subsidy with a scholarship programme to encourage a higher take up of higher education.

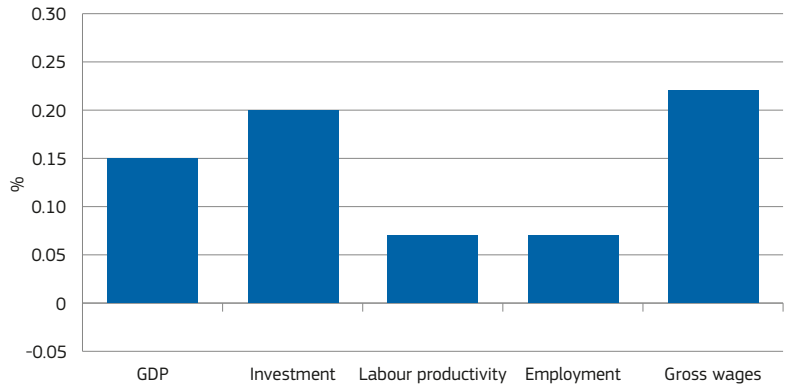
Chart 24 shows the long-term results on the Slovak economy. In effect, the subsidy induces more firms to spend on training, as a result of which more workers take up training and become more productive which, in turn, increases demand for workers across all educational levels ([136]).

Chart 25 shows that employment increases are strongest for highly educated workers, since higher educated people in Slovakia have a higher propensity to undergo training. As capital is more complementary to higher educated workers, the changing educational mix would encourage further physical investment. As a result, GDP is 0.15 % higher than in the baseline scenario. The educational structure of the workforce plays a major role in explaining this result.

Since young people in Slovakia are disproportionally affected by unemployment, which is at a level of around 34 %,we consider the impact of the government devoting the same amount of money (0.1 % of GDP) to subsidise firm-sponsored training only for *young* workers below 25 years of age.

Chart 26 shows the resulting long-term simulation results. The employment effect is a little stronger than in the previous scenario because a given amount of subsidy constitutes a relatively big incentive to hire young workers since

Chart 24: Impacts of subsidising companies' training in Slovakia
Simulation with DG EMPL's Labour Market Model: subsidise firm-sponsored training in Slovakia (0.1 % of GDP) — all age groups targeted



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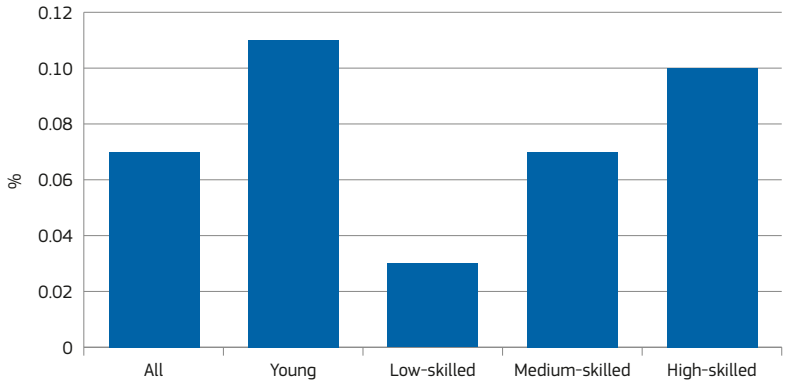
Source: Own calculations based on DG EMPL's Labour Market Model.

Chart 25: Employment impacts of subsidising companies' training in Slovakia
Simulation with DG EMPL's Labour Market Model: subsidise firm-sponsored training in Slovakia (0.1 % of GDP) — all age groups targeted — employment effect



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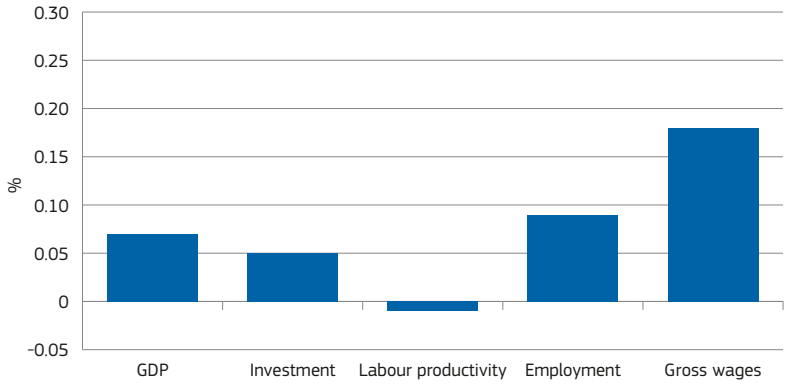
Source: Own calculations based on DG EMPL's Labour Market Model.

Chart 26: Impacts of subsidising companies' training only for young people in Slovakia
Simulation with DG EMPL's Labour Market Model: subsidise firm-sponsored training in Slovakia (0.1 % of GDP) — young age groups targeted (aged 15–24 years)



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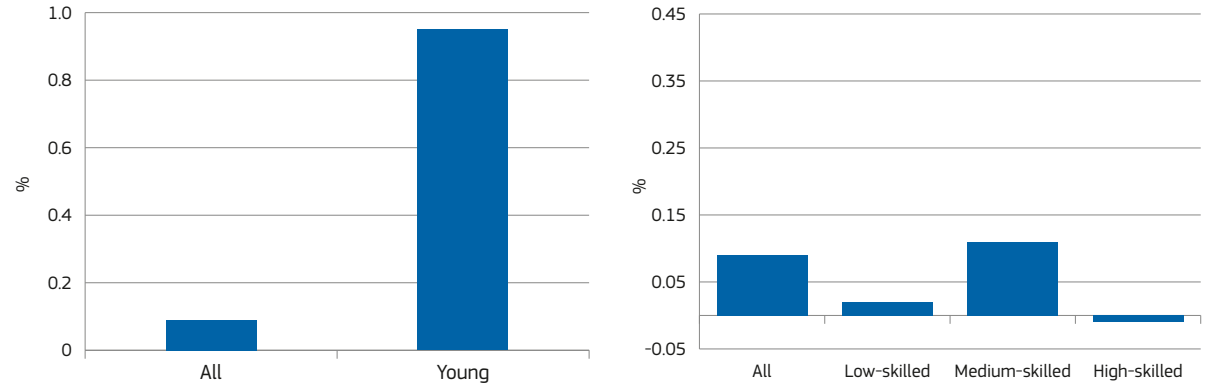
Source: Own calculations based on DG EMPL's Labour Market Model.

([135]) European Commission (2014b), p. 5.

([136]) Similar long-term outcomes were obtained in a previous simulation for France (Peschner and Fotakis 2013).

Chart 27: Employment impacts of subsidising companies' training only for young people in Slovakia

Simulation with DG EMPL's Labour Market Model: subsidise firm-sponsored training in Slovakia (0.1% of GDP) — young age groups targeted (aged 15–24 years) — employment effect



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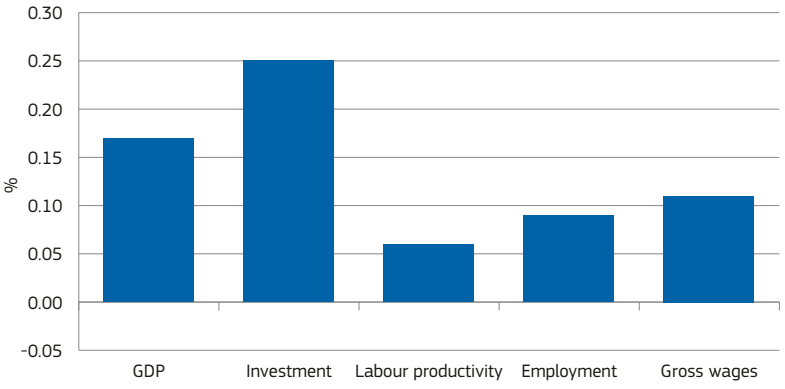
Source: Own calculations based on DG EMPL's Labour Market Model.

Chart 28: Impacts of policy mix support to young people in Slovakia

Simulation with DG EMPL's Labour Market Model: Policy Mix of firm subsidy for the training of young workers (15–24 years), combined with tertiary education scholarships for tertiary education (20–24 years), Slovakia. Magnitude: 0.05% of GDP each



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Source: Own calculations based on DG EMPL's Labour Market Model.

their earnings are low. Firms offer higher wages to those young workers as a result of their increased individual productivity and as a result of the (wage) bargaining over the subsidy ([137]). Higher wages lead to youngsters staying in (low- and medium-skilled) employment rather than investing in higher education with a result that, in the long term, there will actually be more medium- and low-educated people in employment and fewer highly educated people than before the measure — as shown in Chart 27.

This changing educational mix would be expected to reduce total labour productivity, even if individual labour productivity of young people improves due to the training, since investment growth will be subdued as a result of the capital-skills-complementarity described earlier.

As a result, we see stronger employment gains than in the non-targeted scenario, which might be seen as good news by Slovak policy-makers in so far as the young people's labour market situation is seen as critical, even though this comes at the cost of relatively moderate economic expansion and decreasing total labour productivity. Knowing how important higher education is for stronger investment and higher productivity, Slovak policy-makers might, therefore, consider combining the positive employment-impact of a training subsidy aimed at young people with a subsidy that encourages high education — the idea being to continue to focus on young generations, while avoiding negative side-effects resulting from the lower educational mix in the training-only scenario.

Lastly, we assume that the 0.1% of GDP is spilt into two equal parts. The first part is invested in the firm-subsidy that targets young people's training as in the previous scenario, with the second part used to fund tertiary education scholarships for people aged between 20 and 24 years. As assumed previously, funding will be through lump-sum taxes on all households.

Employment gains are similar to both training-only scenarios above. Contrary to the training-only-policy targeted towards young people, the strong incentive to take up tertiary education would be expected to result in the strongest employment gains for *high*-educated people, as shown in Chart 29.

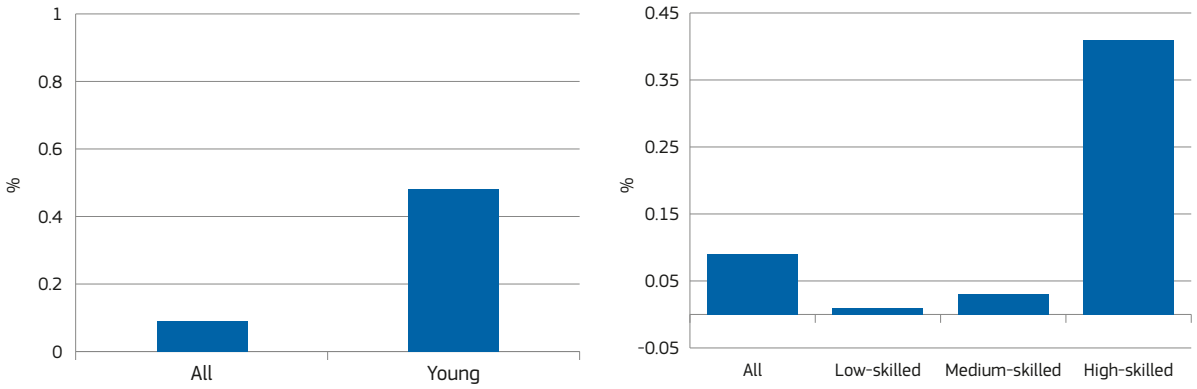
The additional supply of highly educated people reduces their gross wages ([138]), resulting in a less pronounced increase in average wages than in the training-only scenarios above. However, as the workforce's educational mix moves upwards, the policy mix avoids a decline in total labour productivity and would result in strong shifts in investment, following the complementarity between capital formation and skills. The GDP increase is much stronger than in the training-only scenario focused on the young and is even a bit stronger than in the non-specialised training-only scenario.

([137]) The subsidy increases the rent of a firm-worker-pair and the two parties split this additional rent among them via higher gross wages, see also the wage bargaining equation in the model documentation. See Berger et al., (2009), Part II, p. 39.

([138]) Again, this is also due to the wage-bargaining-effect. As the subsidy is lower than in the training-only case, so is the additional worker-firm rent to be spread over the two parties through wage bargaining. See previous footnote.

Chart 29: Employment impacts of policy mix support to young people in Slovakia

Simulation with DG EMPL's Labour Market Model: Policy Mix of firm subsidy for the training of young workers (15–24 years), combined with tertiary education scholarships for tertiary education (20–24 years), Slovakia. Magnitude: 0.05% of GDP each — employment effect



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Source: Own calculations based on DG EMPL's Labour Market Model.

4.3. Using HC: Labour demand incentives to youth employment — the case of Italy

As hysteresis is seen to be particularly harmful for those who become unemployed early on in their working lives, there are arguments in favour of including measures that strongly encourage employers to hire young people.

Previous analyses ([139]) revealed that labour-cost oriented policies have a strong potential to generate pronounced employment gains, particularly among vulnerable groups of workers, such as low-skilled, young or low-income workers. However, these policies come at a cost in so far as they provide demand and supply-side incentives for stronger low-skilled employment at the expense of higher skill groups, which could lead to lower investment and lower economic growth in the long run.

Italy is a country where young people face severe labour market problems as their unemployment rate reaches 40%. In the 2014 Country Specific Recommendations, Italy is urged to take further steps 'in line with the objectives of a youth guarantee'. Policy that addresses the low youth labour market participation appears to be 'limited' ([140]).

Chart 30 reproduces the long-term result of a 0.1%-of-GDP subsidy to lower young workers' labour cost by lowering employers' social contributions for the case of Italy ([141]). In contrast to the training subsidy simulated for Slovakia above, we assume that the measure is financed by an increase in the VAT rate. This is in order to reflect more popular strategies of shifting the tax-burden away from labour towards consumption. That is, we assume tax-reform away from labour towards VAT.

As the subsidy is restricted to young workers, employment gains concentrate almost exclusively on the 15 to 24 years age group. Compared to the situation where the wage-cost subsidy is not restricted to a specific age group, the overall employment impact is substantial because the given subsidy has a stronger relative impact where wages are low, as is the case for young workers. As the initial stimulus is clearly demand-driven (decreasing labour costs), the strong employment effect is in fact the endogenous result of higher labour market participation (and lower unemployment) within the group of young people. This is because young workers' wages shift pronouncedly, following stronger demand.

The measure's side effects are revealed by Charts 30 and 31. Concentrating labour cost subsidies to young people will change the educational composition towards the low-skilled — an effect already seen in the previous section on the training subsidy. As higher wages make employment more attractive to young people, more of them decide not to invest in higher education but take up employment — remaining medium- or low-educated. The changing educational composition would drag down investment (and hence GDP), following the capital-skills-complementarity.

To avoid this side-effect on the skills-composition, the Italian government may decide to split the subsidy in two parts, similarly to the training-example for Slovakia: with half of the 0.1% of GDP devoted to lowering labour costs — the other half being spent on support for tertiary education, all funded through higher VAT. In fact, Italy's share of young people aged 30 to 34 years holding tertiary degrees is the lowest in the EU: only 22.4% — way below the EU average (some 38%) and the country-specific target for the year 2020 (26%). Hence, further efforts to increase education attainment seem necessary, despite recent progress.

The long-term effects of such a policy-mix are displayed in Chart 32. Total employment shifts quite significantly, by 0.12%, compared to the reference scenario — the increase being twice as strong as in the case of only reducing labour costs. On the other hand, looking at young workers, their employment gains are less pronounced than in the scenario where all resources are devoted to reducing labour costs. This result appears logical, only half of the 0.1% of GDP is now devoted to reducing young workers' labour costs, whereas total employment takes advantage of a changing educational mix when young people are subsidised into tertiary education (where they are assumed not to be employed).

The education-subsidy is a strong incentive to take up tertiary education, so the number of highly skilled workers increases markedly, whereas medium-skilled employment declines. In so far as there is currently a shortage of skilled labour relative to supply, and a surplus of unskilled labour relative to supply, this would boost total labour productivity (despite strong employment gains), as the additional complementary physical investment triggers faster GDP growth.

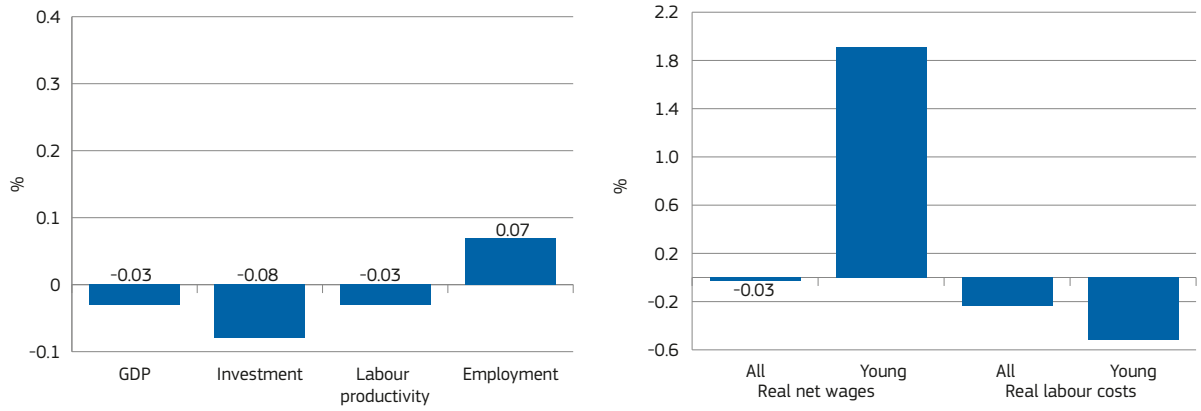
([139]) European Commission (2012b), section 4 and European Commission (2012a).

([140]) European Commission (2014c), paragraph 13.

([141]) European Commission (2012b), especially p. 277–279.

Chart 30: Balancing between short- and long-term benefits and costs of lower social security contributions for young people in Italy

Simulation with DG EMPL's Labour Market Model: lowering employers' social contributions for young workers (15–24 years), Italy. Funding: VAT increases. Magnitude: 0.1% of GDP



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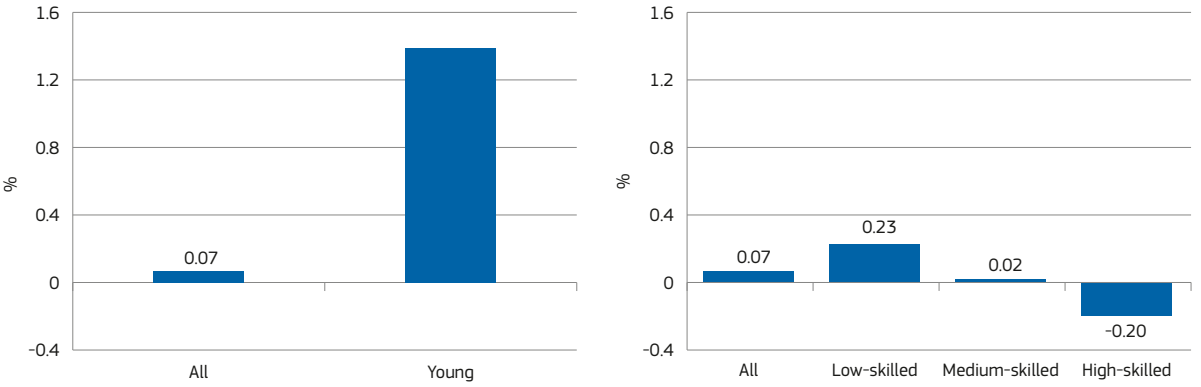
Source: Own calculations based on DG EMPL's Labour Market Model.

Chart 31: Lowering social security contributions for young people in Italy increases employment of the low-skilled at the expense of the highly skilled

Simulation with DG EMPL's Labour Market Model: lowering employers' social contributions for young workers (15–24 years), Italy. Funding: VAT increases. Magnitude: 0.1% of GDP — employment effects



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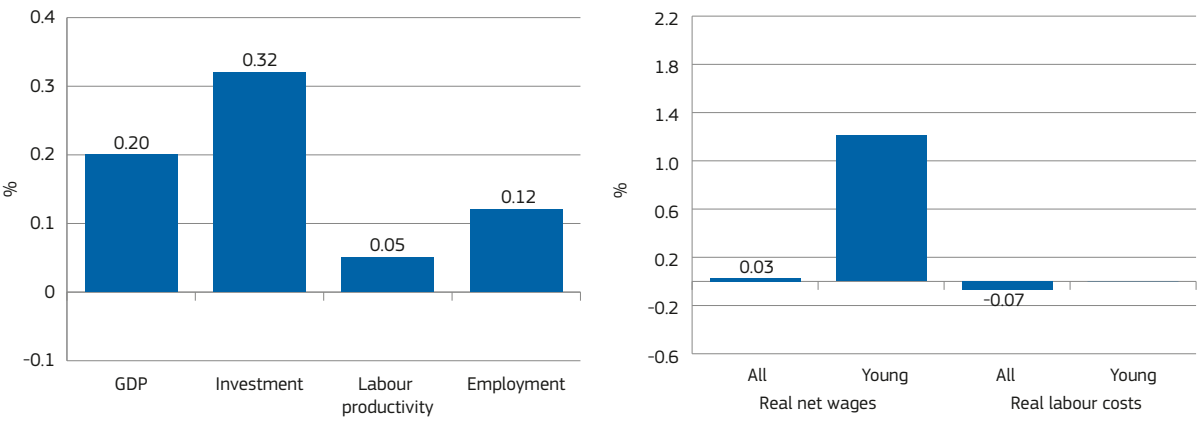
Source: Own calculations based on DG EMPL's Labour Market Model.

Chart 32: Impacts of policy mix support to young people in Italy

Simulation with DG EMPL's Labour Market Model: lowering employers' social contributions for young workers (15–24 years), combined with tertiary education scholarships for tertiary education (20–24 years), Italy. Magnitude: 0.05% of GDP each



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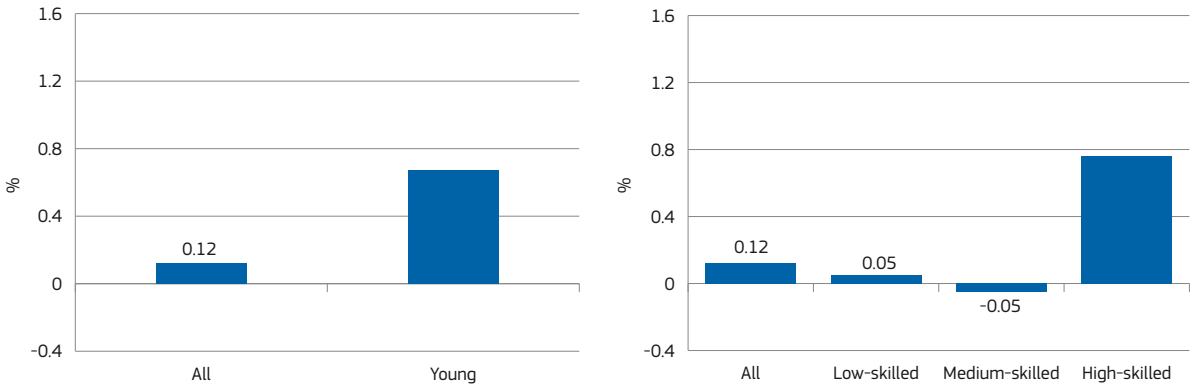
Source: Own calculations based on DG EMPL's Labour Market Model.

Chart 33: Employment impacts of policy mix support to young people in Italy

Simulation with DG EMPL's Labour Market Model: lowering employers' social contributions for young workers (15–24 years), combined with tertiary education scholarships for tertiary education (20–24 years), Italy. Magnitude: 0.05% of GDP each — employment effects



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Source: Own calculations based on DG EMPL's Labour Market Model.

5. Conclusions

Demographic trends and globalisation are considered among the major challenges that threaten a job-rich and inclusive growth in the EU over the long run. In the absence of the demographic dividend from which the EU has benefited in the past, ensuring positive prospects for economic growth and social welfare in Europe requires increased productivity and a better utilisation of labour capacity.

Investment in human capital is crucial to supporting productivity gains and ensuring that future growth is both job-rich and inclusive. Effective human capital investment must be understood not only in terms of forming skills through the education and training of individuals, but also as the creation of the policy and institutional frameworks that can help individuals maintain and use their skills.

This chapter has illustrated the importance of various elements of a supportive policy and institutional mix for the formation of human capital, including accessible and affordable good quality early childhood care and education, which reduces generational transmission of social-inequalities.

Similarly, at the other end of the initial formation spectrum, the importance of higher education is rapidly increasing. Various reports suggest that demand for better educated people will continue to be strong in future decades, particularly for expanding businesses ([142]). The analysis, including macro-model simulation, adds to the evidence that the supply of a highly-educated workforce represents a necessary condition for achieving higher productivity and stronger economic growth. Hence recent progress in Member States towards the Europe 2020 objective of increasing the share of tertiary educated people aged 30 to 34 years to 40% is encouraging.

At the same time, and especially given the current demographic situation and projections, the EU cannot afford to rely solely on the supply of highly skilled people newly entering labour markets. As the whole society and its workforce continues ageing and the relative contribution of older people to the economy and society increases, policy makers must pay more attention to mobilising and optimising existing human resources. Maintaining human capital is mainly dependent on provision of lifelong learning and continuous vocational training, together with investment in health and other policies to support longer working lives. This chapter particularly highlights the complementary roles of the public and private sectors and shows how the maintenance of human capital is decisive in avoiding skill depreciation.

Finally, the chapter argues that stronger supply of highly skilled workers, combined with a focus on human capital maintenance through training and health policies, will not suffice to ensure future sustainable and inclusive growth. Labour market inactivity, weak labour market attachment, skill mismatch and underutilisation of women's employment potential all represent a waste of resources in the form of unused human capital, which needs to be mitigated by appropriate public policies. In particular, the changing skills profile of our economies must be supported by comprehensive skills-strategies to fully realise its potential.

Integrated policy approaches targeted at all three aspects of human capital development — skills formation, maintenance and use — are crucial for strengthening EU competitiveness and for sustaining its social welfare model. But the relationship runs both ways, as this chapter repeatedly demonstrates. Functioning welfare systems and, in particular, well-designed social investments, are paramount if Europe is to continue to benefit from its main competitive advantage in the international markets — highly skilled and productive human capital.

([142]) For example: CEDEFOP (2012).

Annex

Table A.1: Share of low achievers among young people too high in several Members States and has even increased in some

Share of low achievers in reading, maths and science among 15 year olds (PISA), benchmark less than 15%, 2012, change 2009–12 in percentage points, EU and EU Member States

	2012 Reading	Evolution 2009-12 (% points)	2012 Maths	Evolution 2009-12 (% points)	2012 Science	Evolution 2009-12 (% points)
EU	**17.8**	**-1.9**	**22.1**	**-0.2**	**16.6**	**-1.2**
Belgium	16.1	-1.5	19.0	-0.2	17.7	-0.4
Bulgaria	39.4	-1.6	43.8	-3.3	36.9	-1.9
Czech Republic	16.9	-6.2	21.0	-1.3	13.8	-3.5
Denmark	14.6	-0.6	16.8	-0.3	16.7	0.1
Germany	14.5	-4.0	17.7	-0.9	12.2	-2.6
Estonia	9.1	-4.2	10.5	-2.1	5.0	-3.3
Ireland	9.6	-7.6	16.9	-3.9	11.1	-4.1
Greece	22.6	1.3	35.7	5.4	25.5	0.2
Spain	18.3	-1.3	23.6	-0.1	15.7	-2.5
France	18.9	-0.9	22.4	-0.1	18.7	-0.6
Croatia	18.7	-3.7	29.9	-3.3	17.3	-1.2
Italy	19.5	-1.5	24.7	-0.2	18.7	-1.9
Cyprus	32.8	:	42.0	:	38.0	:
Latvia	17.0	-0.6	19.9	-2.7	12.4	-2.3
Lithuania	21.2	-3.2	26.0	-0.3	16.1	-0.9
Luxembourg	22.2	-3.8	24.3	0.4	22.2	-1.5
Hungary	19.7	2.1	28.1	5.8	18.0	3.9
Malta	:	:	:	:	:	:
Netherlands	14.0	-0.3	14.8	1.4	13.1	-0.1
Austria	19.5	-8.0	18.7	-4.5	15.8	-5.2
Poland	10.6	-4.4	14.4	-6.1	9.0	-4.1
Portugal	18.8	1.2	24.9	1.2	19.0	2.5
Romania	37.3	-3.1	40.8	-6.2	37.3	-4.1
Slovenia	21.1	-0.1	20.1	-0.2	12.9	-1.9
Slovakia	28.2	6.0	27.5	6.5	26.9	7.6
Finland	11.3	3.2	12.3	4.5	7.7	1.7
Sweden	22.7	5.3	27.1	6.0	22.2	3.1
UK	16.6	-1.8	21.8	1.6	15.0	0.0
Japan	9.8	-3.8	11.1	-1.4	8.5	0.0
USA	16.6	-1.0	25.8	2.5	18.1	-2.2

Source: EC Press release, http://europa.eu/rapid/press-release_IP-13-1198_en.htm.

Note: [1] The PISA 2012 scores are divided into six proficiency levels ranging from the lowest, level 1, to the highest, level 6. Low achievement is defined as performance below level 2: reading (score <407.47), mathematics (score <420.07) and science (score<409.54).

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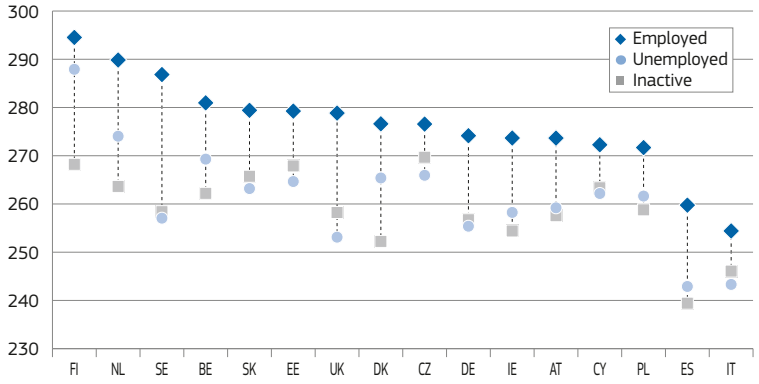
Chart A.1: Being employed generally corresponds to better skills

Average literacy scores by labour status



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Source: PIAAC, DG EMPL elaboration.

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