2017 PROGRESS REPORT
on the Federal Government’s Skilled Labour Concept
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The German economy is thriving. The labour market is also in excellent shape. Unemployment is at its lowest ever since reunification, and employment subject to compulsory social security contributions is at a record high. Some regions are already at full employment.

However, these positive results also mean that a smart and proactive approach to securing the skills base will continue to be crucial for the future development of the economy. Businesses and organisations are already struggling to find skilled staff in certain regions and industries, and with specific skill sets. Demographic change is a contributing factor. More than anything, however, the increasing pace of digitalisation poses new challenges for businesses and workers alike. If we want to stay competitive, we must work together to ensure that the labour market of the future has the skilled workers we urgently need to secure Germany’s position as an excellent location for business and investment. This has been clearly demonstrated in the consultation process on ‘Work 4.0’ launched by the Federal Ministry of Labour and Social Affairs, whose results are now documented in a White Paper.

The radical changes technological progress brings to our working world are already being felt. The demands facing skilled workers will also change as a result. The digital transformation will definitely not destroy jobs on a massive scale, as is sometimes claimed. While some tasks will disappear, new ones will be created. It is therefore safe to say that Germany will continue to need well-trained skilled professionals across all skill levels in the future. However, there will be a significant change in the skills being sought. One key outcome of the Work 4.0 consultation process is the importance of skills matching if we are to avoid skilled labour shortages.
Germany’s economic future depends on how well we manage to secure and expand the skills base, which is why this issue remains a central focus of labour market policy. As early as 2011, the Federal Government adopted a comprehensive Skilled Labour Concept containing five priority areas – dubbed ‘skilled labour paths’ – to stabilise the long-term supply of skilled labour. Skills development and initial and continuing training are key elements in this respect. In addition, we also need to concentrate on labour activation and securing employment, approaches to strike a better balance between work and family commitments, good educational opportunities for everyone from the outset, and integration and the immigration of skilled workers.

This progress report takes stock of what we have achieved so far. It shows that we have made good headway on all five of the skilled labour paths. By way of example, I would like to highlight the increase in the employment rate of 55–64-year-olds whose skills and wealth of experience are especially important in our aging society. The steady growth in the female employment rate – also of particular significance with a view to securing the skills base – is another noteworthy development. Female employment in Germany is now at a high level by international standards.

All this progress must not, however, detract from the fact that much remains to be done: valuable female talent, in particular, is still under-utilised in the German labour market. Too many young people still leave school without a qualification. Furthermore, lifelong learning must become the norm for all of us, and continuing education measures must be more attractive, more tailored to market needs and more in step with current developments. And despite early success in the integration of asylum seekers into the labour market, our work is far from done.

I invite you to read this progress report, both to discover the milestones we have already reached and to learn where we need to step up our efforts. One conclusion I can draw is that, in addition to expanding the skills based, policymakers and the business community must also work together to ensure that workers can keep pace with the digital transformation. We must act in unison so that the workers of today and the future are guaranteed to have the skills they need in a rapidly changing working world.

Andrea Nahles
Federal Minister of Labour and Social Affairs
1. Introduction

The labour market and the world of work are undergoing a radical transformation, shaped in particular by digitalisation, automation, flexibilisation and decentralisation. Added to this are factors such as the ever more apparent demographic change, the many and varied expectations and needs of younger generations, and higher levels of immigration. These trends are developing at a different pace, with some trends intensifying while others are compensatory. Although it is impossible to fully predict how these trends will evolve, one factor that remains constant in the midst of all this change is the importance of well-trained workers for the German labour market. Therefore, securing the supply of skilled labour remains a priority of German labour market policy.

For the Federal Government, the process of securing the supply of skilled labour is a comprehensive, long-term task. In June 2011, the Federal Government adopted the Skilled Labour Concept as the basis for its many different measures and initiatives. This concept follows the principle that all domestic labour potential must be tapped as effectively as possible and that Germany must remain an attractive place to work, also for international skilled professionals, in order to secure the skills base. Five skilled labour paths were defined to this end. By activating workers and securing employment, by striking a good balance between family and career commitments, by offering educational opportunities for everyone from the outset, by encouraging skills development through initial and continuing training, and by promoting integration and the immigration of skilled workers, the aim is to secure and expand the skills base available in Germany.

The German labour market has changed dramatically since the adoption of the Skilled Labour Concept. Therefore, the time is ripe for a comprehensive appraisal of the situation. The dynamic pace of digital structural change and the trend, brought about by demographic developments, towards a ‘jobseeker’s market’ with regional and sector-specific characteristics make it necessary to review the direction skilled labour policy has taken. The Federal Government also committed to such a review with its Skilled Labour Concept. This progress report therefore provides a comprehensive account of the goals of the Skilled Labour Concept that have been achieved, and explains the challenges that persist in the fields defined thus far, despite all the interministerial measures that have been implemented. To this end, the developments of the five skilled labour paths are presented in detail, placed in the context of the economic framework and assessed.
With a view to the challenges of securing the supply of skilled labour in the future, the report also assesses the Skilled Labour Concept as a whole.

Overall, progress has been made on almost all the skilled labour paths since the Skilled Labour Concept was launched in 2011. This positive trend also continued in the recent past, with the vast majority of indicators improving further in the two years since the publication of the last progress report. The improvements in gainful employment, the area of education and the immigration of high-skilled workers have been particularly striking.

The strength of the German labour market and the stable macroeconomic climate, in particular, are reflected in a consistently high demand for labour. The effect is a steady increase in employment rates in recent years, coupled with a continuous drop in unemployment, allowing Germany to exceed all the central targets for employment in the Europe 2020 Strategy.

With regard to education, the surge in the rates of entry to higher education is particularly significant with a view to securing the future skills base. Since the publication of the last progress report in 2014, the entry rates to higher education have stabilised at around 55%, reaching a high level also by international standards.

There have also been serious changes in the area of immigration. This is attributable in part to the influx of more than 1.1 million refugees in 2015. In addition, Germany’s strong labour market attracts many workers exercising the right of free movement of workers within the European Union. On the whole, therefore, immigration is already helping to relax the skilled labour situation in Germany.

Even though progress has been made along the five skilled labour paths, the challenges that still remain must not be overlooked. Despite all the success of the Skilled Labour Concept over the past six years, these challenges persist in the area of female labour force participation, in education in general and in the continuing training of low-skilled workers, as well as in the shortages in the labour market, the structures of which remain unchanged. While we need to keep up our efforts in these areas, in light of a rapidly changing job market we also need to explore new avenues to effectively secure the future supply of skilled labour.

In future, it will not be enough to focus exclusively on the mobilisation and activation of those who have been unable, or insufficiently able, to take part in working life thus far. The immigration of skilled professionals will also be unable to sufficiently offset the skills shortage. While this does not mean that additional potential for skilled labour cannot be unlocked here, a highly quantitative approach to securing the skills base does not go far enough to cover future demand for skilled labour.
Rather, given that the digital transformation and demographic change will dynamically alter labour supply and demand, we need to place a stronger focus on qualitative aspects so that businesses will continue to find the skilled professionals they need in the future.

This is because technological progress will change the tasks to be performed, and therefore the professional requirements, of almost one job in every three. This development will unfold in an aging society that is characterised by immigration and a growing diversity in preferences regarding working life. Therefore, if this transformation is to succeed, the priority is to stay laser-focused on both labour supply and labour demand and ensure both sides are even better aligned in the future, as this is the only way to overcome regional and sector-specific shortages and reduce or prevent a skills’ mismatch. A major qualitative challenge will be to continuously adapt the skills and abilities of workers to changing demand. While this applies to all segments of the labour market in the medium term, in the immediate future it applies, in particular, to the successful integration of asylum seekers in Germany into the labour market.
2. Economic framework and skilled labour shortages

The demand for labour and individual shortages of skilled workers are essentially determined by macroeconomic trends. At the same time, demographic developments – and in the short term specifically the rate and structure of annual net migration – affect the general availability of labour. This chapter provides an insight into how economic and demographic conditions have changed since the Skilled Labour Concept was adopted by the Federal Government in 2011.¹

2.1 Economic and labour market developments

The Federal Government’s Skilled Labour Concept was developed in a period of strong economic growth. On the back of high growth rates, real GDP (gross domestic product) in 2011 was higher than before the global financial and economic crisis of 2009. In the two years that followed, however, the upturn slowed appreciably. Economic activity in Germany in 2012 and 2013 was marked by a continuously challenging global economic climate.

The economic situation brightened again after 2013, and as result of the economic recovery GDP rose by 1.6% in real terms during 2014. This solid economic growth continued in 2015 and 2016, with real GDP increasing by 1.7% and 1.9%, respectively. In its latest spring projection, the Federal Government is expecting GDP growth of 1.5% for 2017 and 1.6% for 2018.

This development was and is accompanied by a very healthy labour market. Since the Skilled Labour Concept was adopted in 2011, the number of people in employment has increased year by year, with 43.6 million people gainfully employed in 2016. This translates to a solid increase of 2 million employed persons compared with 2011. At the same time, the prime-age population (aged 20–64) in Germany only increased by roughly 1 million. This illustrates that the growth in employment since the adoption of the Skilled Labour Concept has been accompanied by a substantial increase in the rate of employment. This positive employment trend is still ongoing, with the Federal Government expecting the number of people in gainful employment to pass the 44 million mark in 2017, setting a new record in post-reunification Germany. A separate

¹ An overview of the development of the underlying indicators for the economic framework is provided in the Annex.
analysis of workers in jobs with compulsory social insurance coverage also paints a positive picture: the number of workers in this segment stood at 31.4 million in 2016 – an increase of 2.7 million compared with June 2011.

Alongside this dynamic growth in employment, Germany has also witnessed a steady improvement in the integration of unemployed persons into the labour market since the introduction of the Skilled Labour Concept. The number of individuals registered as unemployed on an annual average fell by roughly 10%, or 286,000 persons, between 2011 and 2016. While the drop in unemployment was far more pronounced in eastern Germany (−25%) than in western Germany (−2%) during this period, at 8.5% the rate of unemployment in eastern Germany was still far higher than that of western Germany (5.6%) in 2016. In addition, core unemployment can still be observed. At 993,000 the number of long-term unemployed in 2016 was down by around 75,000, or 7%, on the figure for 2011. Long-term benefit receipt, health issues, low skill levels and advanced age are particular barriers to the integration of the long-term unemployed into the labour market. Overall, however, it is important to point out that the rate of unemployed persons moving from basic income support to employment subject to compulsory social insurance contributions is higher now than in 2011.  

The continued strength of the German labour market is also reflected in the consistently high demand for labour. For example, the number of job vacancies in the labour market rose from 918,000 in Q4, 2011 to 1,055,000 in Q4, 2016. Employers in some industries and regions are finding it increasingly difficult to successfully fill vacancies in their companies. This can be seen in the drop in the number of registered unemployed persons per registered job vacancy, and in the increase in the average time a position remains vacant over the years. While we are not yet facing a nationwide shortage of skilled workers, the labour market is much tighter than in the preceding five years (Figure 1).

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2 German Council of Economic Experts 2016/17.
3 The ‘labour shortage indicators’ are still above the reference criteria in Germany on average. A shortage occurs when the ratio of unemployed persons to jobs drops below 2:1 in the case of skilled staff and specialists, and 4:1 in the case of experts, and the time needed to fill a vacancy in an occupational group is 40% above the average and the rate of unemployment in the specific occupation is less than 3%.
Aside from changes in the number of gainfully active people, a comprehensive understanding of the situation in the labour market also calls for a closer look at the change in hours worked, as this reflects the correlation between employment and economic trends. The framework for adapting working hours to temporary fluctuations in capacity utilisation – both in terms of collective bargaining agreements and in-company measures – is well developed at this stage. Apart from short-time, businesses also increasingly tend to use working-time accounts to counterbalance weak phases in the economy without the need for staff cutbacks. In addition to Germany’s better initial economic situation and a more favourable structural framework, this working-time flexibility was one of the main reasons why the impact of the great recession of 2009 on the labour market was decidedly less harsh and not as long-lasting in Germany than in other countries.

This flexibility in terms of the hours worked is clearly visible in the different phases of the economic cycle. For example, the total number of hours worked and the average annual working time decreased in the relatively slow period of economic activity during 2012 and 2013, while the number of people in employment increased by roughly 700,000 at the same time. In the period of strong economic growth that followed in 2014 and 2015, the increase in employment was accompanied by an increase in the hours worked. If we consider the entire period since the adoption of the Skilled Labour Concept, it can be said that the average annual working time per worker in Germany remained more or less stable while the number of hours worked increased each year. One limiting factor here is that the growth in employment is partly based on the

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**Fig. 1: Development in the labour shortage indicators ‘unemployed persons per job’ and ‘time to fill a vacancy’**

Across all occupations, total (excluding assistants), Germany, November to October in each case

![Graph showing the development in the labour shortage indicators ‘unemployed persons per job’ and ‘time to fill a vacancy’ across all occupations, total (excluding assistants), Germany, November to October in each case.](image-url)
increased labour market participation of women, a high percentage of whom – by international standards – still only work on a part-time basis.4

2.2 Demographic developments

The impact of demographic change can be increasingly felt in Germany. Following a temporary dip, the population of roughly 82 million is again at practically the same level as it was 20 years ago. Today, however, there are far more older people in the population make-up. By the end of the 2020s, almost one-fifth of the working-age population will be aged between 60 and 66 (inclusive). In the 2040s, more than one person in ten in Germany will be over 80 years old. In 2015, only roughly 6% of the population fell into this category.5 Further to this, the life expectancy of children born today is 11.5 years longer than in 1960. At the same time, the number of years people are in good health is also increasing. One of the reasons for the aging population is the low birth rate since the end of the baby-boom era.

Women born in 1968 have the least number of children, with 1.49 children on average. Projections show, however, that women born in the 1970s tend to have a somewhat higher fertility rate, with women born in 1973 giving birth to 1.56 children, for example.6 Nevertheless, this means that each generation of parents is followed by a far smaller generation of children, which is why there has also been a decline in the number of women of childbearing age for some years now.7

The consequences of this have been visible in the labour market since the mid-1990s, with the gradual entry of the baby-bust generation. So far, the impact of the falling birth rate on the labour supply could be largely offset by higher labour force participation rates, particularly in the case of women and older workers.8 In future, however, it will not be possible to offset the numbers to the same extent, as much of the potential has already been leveraged and people born in the high-fertility years will be gradually retiring by the mid-2030s. The first baby-boomers will already be reaching statutory retirement age in the next few years. While we are currently not experiencing a nationwide shortage of skilled labour, shortages in the recruitment of skilled workers will become more pronounced in individual sectors and regions in the years ahead in light of these developments.

Increased national and international mobility is another factor in demographic change. The difference between the number of immigrants and the number of emigrants is known as the net migration. On the whole, the measures set out in the Skilled Labour Concept have been accompanied by a consistently positive level of net migration. While net migration

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4 OECD 2017.
7 Federal Ministry of Family Affairs, Senior Citizens, Women and Youth 2015.
8 Despite the increased participation of women in the labour force, there is still a pronounced ‘working-time gap’ between men and women. An average working week for women is on average 8.9 hours shorter than the hours worked per week by men.
stood at roughly 130,000 persons in 2010, it had more than doubled to around 280,000 persons in 2011. It continued to increase each year in the years that followed and exceeded the 500,000 mark in 2014 (Figure 2).

The year 2015 was a landmark year in Germany’s immigration history, with record net migration of more than 1.1 million people reported, a substantial percentage of whom were asylum seekers. Rather than accessing the labour market directly, these individuals will only gradually enter the labour market after a period of integration, provided that they have good prospects of remaining in Germany. The majority of these individuals are young, with more than half of the asylum seekers arriving in Germany in 2015 well below the age of 25. This will have the knock-on effect of increasing the working-age population, in particular. Integrating these individuals into the education system and the labour market will be one of the central challenges Germany will face in the coming years (see Chapter 5.4).

Fig 2: Net migration in Germany
1991–2015

Source: Federal Statistical Office.
Germany’s robust labour market also attracts many people who exercise the right to the free movement of workers in the European Union, with the ongoing economic problems in many EU member states acting as a push factor in this regard. The eastern enlargement of the EU, in particular, has resulted in increased immigration from other member states within the framework of the free movement of workers. Citizens of Estonia, Latvia, Lithuania, Poland, Slovakia, Slovenia, the Czech Republic and Hungary were granted unrestricted rights to free movement on 1 May 2011. Any restrictions on access to the German labour market were lifted on 1 January 2014 for workers from Romania and Bulgaria, and on 1 July 2015 for workers from Croatia. Since then, annual net migration in relation to EU member states has also increased significantly. In 2014, for example, total net migration of 312,000 was more than three times that recorded for 2010, when it stood at roughly 99,000. This figure rose again by a further 30,000 persons in 2015.9

In the context of demographic change, the migration surplus in recent years was enough to absorb the decline in the working-age population caused by the natural development of the population. For example, in 2015 the segment of the population aged between 20 and 64 increased by 449,000. The increase in gainfully active persons was just roughly 12% below this, at 395,000.

Overall, however, forecasts of demographic trends are fraught with uncertainty. The volatility of the migration balances in the past are testament to this fact. Nevertheless, it is becoming clear that the population will continue to age at a significant pace even if immigration is at a high level. Therefore, even with a high level of immigration Germany still needs to secure the skills base by unlocking domestic potential more effectively.

### 2.3 Situation regarding skilled workers

The skills’ bottleneck analysis conducted by the Federal Employment Agency allows us to assess the current situation regarding skilled workers in Germany. It reveals that Germany is still not facing a nationwide shortage of skilled labour, based on statistics from the Federal Employment Agency such as reported vacancies and registered unemployed. In addition to the application of three main criteria – namely the time a position remains vacant, the ratio of unemployed persons to jobs and the unemployment rate in specific occupations – to identify occupational groups, a validation is also performed which factors in the situation on the training market and the age structure of workers, among other aspects. Regional shortages are also examined separately in the analysis. While these data do represent the labour market to a large extent, they do not present the full picture. For example, only every second job opening is reported to the Federal Employment Agency. Despite this limitation, no source of data is available with more timely and nuanced information on the situation in the labour market other than the statistics.
of the Federal Employment Agency. These are generated monthly from the agency’s process data.

The stable labour market and the strong demand for skilled labour are also reflected in the skills’ bottleneck analysis. For example, compared to the same period in the preceding year, the average time a vacancy remains open has increased by 10 days to 100 days across all occupations (excluding assistant-level positions).\(^\text{10}\)

Furthermore, not much has changed in the past few years with regard to the occupations with labour shortages identified by the Federal Employment Agency. In light of the demographic change and digital transformation, the healthcare and nursing professions, as well as technical occupations, continue to be the main areas in which university-educated skilled workers and skilled workers with vocational training are in short supply.\(^\text{11}\) However, in some cases there are also clear regional differences within these occupational groups, as the example for mechatronics and medical doctors in Figure 3 below demonstrates.

**Fig. 3: Skills’ bottleneck analysis in mechatronics and medicine**

2.4 Labour market forecasts

While the skills’ bottleneck analyses conducted by the Federal Employment Agency refer to the current situation in the labour market, labour market forecasts try to make valid predictions on how labour supply and demand will develop in the future. Medium- and long-term labour market forecasts have changed considerably in recent times, particularly as a result of the high immigration of refugees. The latest labour market forecast conducted on behalf of the Federal Ministry of Labour and Social Affairs, therefore, gives particular consideration to the sharp increase in immigration since 2013, in addition to current trends in supply and demand in the labour market. It also assumes that the immigration of refugees will ease off by 2020. However, as the skills structure of the immigrants differs from that of the resident population, Germany faces a long-term challenge of integration. The forecast also assumes a steady pace of digitalisation of the economy and society and the continuation of the structural change – already taking place – towards knowledge-intensive, cultural and social services. Based on these assumptions, the supply of labour will increase to 45.5 million by 2020, also particularly because those born in the high-fertility years are currently still of working age (known as a demographic interim high). Following this, however, demographic change will take hold again and cause the working population to decrease by 1.5 million. Despite inward migration, around 700,000 fewer workers will be available in the labour market in 2030 than in 2014 (Figure 4).
Presuming that asylum seekers with long-term prospects of staying in Germany are successfully integrated into employment, annual economic growth according to the labour market forecast on behalf of the Federal Ministry of Labour and Social Affairs will be around one quarter of a percentage point higher by 2030 than in the absence of this immigration. In the event of large-scale immigration, the number of persons in employment will increase by 1.2 million but the overall rate of unemployment in the economy will also rise by 0.8 percentage points. However, the actual scale of the macroeconomic effects of the immigration of refugees hinges significantly on how quickly and how well these individuals are integrated into the labour market. Initial progress has recently been made in this respect. In the last twelve months, the employment of persons from the main non-European countries of origin of asylum seekers has increased by around 64,000 persons, with the majority of these in employment subject to compulsory social security contributions (+47,000). During the same period, however, the number of unemployed persons from the main non-European countries of origin of asylum seekers increased by around 43,000 (see also Chapter 5.4). According to the OECD, it takes around 20 years for asylum seekers to achieve employment rates similar to those of the local population. However, it must be said that female asylum seekers are far less likely to enter gainful employment than their male counterparts.

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Fig. 4: Labour supply and demand in millions


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12 Federal Employment Agency 2017d.
14 Federal Employment Agency 2017d.
15 Dumont et al. 2016.
16 Eisnecker et al. 2016.
In recent years, the German labour market has also been characterised by a steady restructuring of labour supply and employment, towards higher-skilled jobs, on the one hand, and service sector occupations, on the other. This trend is set to continue through to 2030. Accordingly, the forecast is that the number of experts (with at least four years of tertiary education) will continue to rise while the number of specialists (with a bachelor, master craftsman or technician qualification) will stagnate. Coupled with this, the number of skilled workers (with commercial, industrial or other training) available in the labour market is expected to decline, as will the number of assistants (with a maximum of one year of training).

These shifts are the counterpart to technological and structural change, which would be inconceivable in the German labour market without the continued improvement of the skill levels of the labour force. The introduction of new technological and organisational concepts is just as dependent on the availability of better-skilled workers as the development of the majority of knowledge-intensive service markets. This is why the Federal Government has maintained its quality-oriented strategy in the face of international competition. Labour supply has followed this trend, with a sharp increase in the number of university graduates. This development will most likely also continue in the future (Figure 5).

![Fig. 5: Change in labour force numbers by vocational qualification level](image-url)

With regard to the projected skills gap, this is not expected to narrow in the future. On the contrary, according to the labour market forecast of the Federal Ministry of Labour and Social Affairs, the imbalances both for persons with tertiary education and for persons without vocational training will be 5–7% higher in 2020 than in 2014, for example, at least if the labour supply does not adapt sufficiently to expected skill-specific change. In addition, the first generation of refugee migrants, which include a larger number of low-skilled workers, will also increase the imbalance. Both these factors point to the need for comprehensive and systematic continuing training (Chapter 5). This is because the number of young people in Germany who complete initial vocational training will not be enough to meet the increasing skills requirements. For the adaptation to succeed, the continuing vocational education and training (CVET) of adults must be stepped up. What is more, the immigration of asylum seekers downgrades the skills structure of the labour supply and therefore calls for the development of special training and education services to serve this target group. It must be noted, however, that these imbalances will diminish considerably in the coming years, as it can be presumed that labour supply and demand will respond to the existing shortages (Figure 6).

**Fig 6. Potential future skills gap by qualification level**

Labour shortage indicator II (baseline scenario), persons employed in thousands

3. The changing world of work

Technology has always been an engine of change and social progress. Nevertheless, today’s working world seems to be changing at a rate never before experienced as the digital transformation picks up speed. The convergence of diverse technologies that are evolving and spreading at a rapid pace sets in motion considerable processes of change in the labour market. This, in turn, presents new challenges for the Federal Government’s approach to securing the supply of skilled labour.

Because the scale of the resulting changes is so extensive and the implications so far-reaching, and to some extent disruptive, many areas will need to adapt. While initial barriers to digitalisation are disappearing thanks to powerful new technologies with an increasingly lower price tag, value added chains, organisation processes and fields of work are changing at an increasingly dynamic pace. Information and communication technologies are already considered a prerequisite for decentralised, skills-oriented and less hierarchical forms of work organisation. Today, over 80% of German workers use digital information or communication technologies in their jobs.

The global information space the Internet has created not only transcends conventional boundaries between organisations, businesses, industries and national economies, but also the barriers between work and private life, and production and consumption. As a result, the labour market and the world of work are increasingly shaped by flexibilisation, decentralisation and automation.

Digitalisation is just one factor in this transformation. Globalisation is another key driver of change. After all, while global trade itself is not a new phenomenon, the worldwide movement of goods, services, capital and people has greatly accelerated since the mid-20th century – most recently also owing to the rapid growth of the Internet. In this context, the German economy has always been closely engaged in global trade and global value added.

The degree of openness of the German economy has grown steadily and, at 70%, is roughly twice as high as in 1992. German businesses serve global demand and restructure their work processes and business organisation accordingly.

18 Federal Ministry of Labour and Social Affairs 2016a.
19 Federal Statistical Office 2017e.
In Germany, this development is taking place in a country with an aging workforce and a potential labour pool characterised by immigration. Not least, however, new prospects, expectations and needs of young generations are also changing the face of our future working world. This continued cultural change will also have an important bearing on the acceptance and popularity – or not – of new developments and innovations.

### 3.1 Automation and employment

Economic and industrial history has demonstrated that technological change can cause considerable upheaval in the labour market and the economy as a whole. In the past, however, jobs that were lost were consistently offset by the emergence of new industries and occupations. This caused the labour market to change on a scale and in ways previously unimaginable for the most part. Currently, the degree of digitalisation in individual industries and sectors in Germany is still very heterogeneous. While the ICT and media sector largely went digital and transformed in several waves over the past two decades, this process has yet to get off the ground in many areas of the manufacturing industry. And although half of organisations in Germany have already embraced the latest in modern technology, one-third have not yet concerned themselves of its use. This is particularly true for Germany’s SMEs, but less so for large corporations and microenterprises. A business’s ability to be competitive in the future, however, will depend closely on how well it manages the digital transformation.

Accelerated by the fast pace of technological progress, the automation of work has increasingly become a central talking point in recent years, especially as advances in artificial intelligence will also make the automation of knowledge work an increasing possibility in the future, in addition to the traditional automation of mechanical work.
One origin of the more recent debate was the 2013 study by Frey and Osborne, which found that 47% of jobs currently in the United States are potentially automatable in the next 10–20 years as digitalisation continues. However, Frey and Osborne’s analysis focused on occupations. This is a very rough matrix. If, on the other hand, the assumption is that individual tasks within occupations will be automated, and not actual occupations themselves, the likelihood that jobs will be automated is far lower. The reason is that even occupations that are considered highly automatable contain individual tasks that cannot, or cannot yet, be substituted by computer capital. Therefore, if we consider individual tasks instead of entire occupations, around 12–15% of existing jobs in Germany would be potentially automatable. An added factor, however, is the major structural change within occupations. For Germany, the share of jobs in which computerisation will result in significant changes to tasks is estimated at around 30% (Figure 7).

Fig. 7: Share of occupations with high potential for automation or potential for significant change in tasks

Source: OECD.

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Motivated by influential studies, such as that by Frey and Osborne cited above, public debate is often centred on the threat to jobs posed by modern technologies. The upshot is that other important factors that also affect future employment trends are neglected. For even tasks and occupations with a high potential for automation will not necessarily be replaced by a machine or computer in the future. Any substitution of human labour by machines will always also depend on the adaptability of occupational profiles and workers, wage and investment costs, and ethical and legal obstacles.\textsuperscript{27} For example, model calculations of the long-term forecast for the German labour market through to 2030 conducted for the Federal Ministry of Labour and Social Affairs demonstrate that even accelerated digitalisation can have positive effects on growth, productivity and employment if it is rolled out to society and the economy in the right way.\textsuperscript{28} This will require investment in training and continuing education, however, to continuously adapt workers’ skills to changing requirements (see also Chapter 5.3).

According to current studies, almost every occupation today comprises some tasks that are already automatable.\textsuperscript{29} This applies to occupations of both low earners and high earners and to occupations of workers with both a low level and a high level of training and education. The much-quoted theory of skill-biased technological change attempts to explain the skill-specific employment trends to be observed as a result of technological change. The extension of this theory, known as the task approach,\textsuperscript{30} assumes a decline in employment in the medium-skilled segment as this is where many routine tasks are concentrated, i.e. tasks that can be performed relatively easily by computers or digital technologies. By contrast, the level of employment is expected to increase, or at least stabilise, in the area of both high-skilled and low-skilled tasks as these have a higher concentration of manual and complex, cognitive non-routine tasks.\textsuperscript{31}

In forecasting skill-specific trends in employment, the latest labour market forecast for the Federal Ministry of Labour and Social Affairs not only looks at automation potential but also equally considers the adaptability of workers and businesses. In the baseline scenario, the forecast works on the assumption of a steady pace of digitalisation and a continuation of the structural change towards knowledge-intensive services, which is already in effect today.

The alternative scenario, in contrast, depicts the developments anticipated if digitalisation advances at an accelerated pace. While the demand for skilled workers with medium-level vocational qualifications stagnates or declines in both scenarios, accelerated digitalisation nevertheless has a positive effect on the demand for workers with technical college training (Fachschule), as a higher demand for such workers is assumed in this scenario than in the baseline scenario. On the whole, however, the demand

\textsuperscript{27} Bonin et al. 2015.
\textsuperscript{28} Vogler-Ludwig et al. 2016.
\textsuperscript{29} Chui et al. 2015, Dengier/Matthes 2015, Bonin et al. 2015.
\textsuperscript{30} Autor et al. 2003, Matthes et al. 2014.
\textsuperscript{31} Bonin et al. 2015, Arntz et al. 2016, Frey/Berger 2015.
for medium-skilled workers will decrease as a result of digitalisation. This decline will be far less pronounced in Germany, however, compared with other countries.\textsuperscript{32} This clearly illustrates that employment gains or losses for the economy as a whole in the face of increased digitalisation depend, inter alia, on the adaptability of the labour market and education institutions, businesses’ competitiveness and their ability to innovate and – with regard to new task and job requirements – not least on the ability of workers to adapt. At the EU level, for example, it was found that each job created in the high-tech sector can generate up to five new jobs in the local service sector.\textsuperscript{33}

Many labour market studies are agreed that low-skill, routine tasks are particularly vulnerable to automation.\textsuperscript{34} Consequently, low-skilled workers will be affected primarily. It must be emphasised, however, that this depends heavily on the occupational segment in question.\textsuperscript{35} Overall, in the period through to 2030 labour demand is expected to shift even more in favour of tertiary education graduates and away from workers without vocational training. Assuming an accelerated pace of digitalisation, the number of persons in employment with a tertiary education would be expected to increase by around 2.5 million by 2030, while the demand for workers without a vocational qualification would drop by roughly 2 million (Figure 8).

\footnotesize
\textsuperscript{32} OECD 2017a.
\textsuperscript{33} Goos et al. 2015.
\textsuperscript{34} Dengler/Matthes 2015, Vogler-Ludwig et al. 2016, Arntz et al. 2016.
\textsuperscript{35} Dengler/Matthes 2015, Vogler-Ludwig et al. 2016.
High earners also work in jobs that entail a significant share of tasks that are automatable. For example, more than 20% of the tasks performed by top-level managers in the United States are tasks that could already be automated today. This includes tasks such as report and data analysis, the creation of operating procedures and the examination of status reports. In contrast, only a small percentage of the tasks performed by a nurse, for example, could be automated.

Furthermore, the potential automation of jobs not only affects different sectors to a varying degree, but also different regions associated with these jobs. For example, the share of workers in Germany in an occupation with high potential for substitution ranges from 8% in Berlin to over 20% in Saarland. The share of workers whose tasks have a high substitution potential tends to be higher the greater the importance of the manufacturing industry in a particular federal state. However, this does not apply across the board because, in addition to the economic structure, other factors – such as the composition of workers by occupation and professional qualification level in a specific state – have a bearing on the percentage of jobs with high substitution potential in a region (Figure 9).
3.2 Digitalisation and cultural change

Not only does digitalisation have implications for the supply of jobs, it also affects people’s private and professional lives. The consequences for workers are two-sided and are, therefore, the source of controversial debate in the business sector, among policymakers and the public. The risks and opportunities presented in this context cannot be painted with a broad brush. Rather, as with the automation of jobs, they also depend on the specific circumstances in individual occupations, industries and regions. The true impact of digitalisation will ultimately depend on its technical organisation as well as on its individual utilisation and incorporation into businesses, collective agreements and the law.

The development and expansion of broadband, network technologies and mobile terminals increase worker flexibility in terms of work scheduling and their place of work first and foremost. The ability to work from home can make it easier for certain groups to access the labour market. For example, it can help people with limited mobility owing to a disability. Older workers, who are becoming increasingly important in the labour market as a result of demographic change, and workers who need to reconcile professional commitments and childcare or the care of a relative can also benefit from flexible work arrangements.
For example, the option of teleworking from home at least some of the time is used by mothers and fathers as a way of returning to work more quickly, or with more hours, following the birth of a child.\textsuperscript{38}

This technological development coincides with sociocultural change, which in turn triggers a change in employees’ preferences regarding their own work. Increasing numbers of women are gainfully active. More and more women and men want to share family and job responsibilities more equally. In over two-thirds of all two-parent households with underage children, both partners work, although women often only work part-time.\textsuperscript{39} ‘Men full-time – women part-time’ is by far the most typical division of paid work among two-parent families nowadays. While the most common model in the past, the single-earner household has become decidedly less attractive (Figure 10).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{GainfulEmployment.png}
\caption{Breakdown of gainful employment in two-parent families with at least one underage child}
\end{figure}

\textsuperscript{38} Federal Ministry for Family Affairs, Senior Citizens, Women and Youth 2016.
\textsuperscript{39} Two-parent households: persons aged 20–64, at least one person in gainful employment and at least one underage child.
Time is a scarce commodity for the busy generation of parents aged 30–55 juggling professional commitments, child-rearing and personal interests. This time-squeeze is likely to intensify in the future in our aging society if more and more workers face the added responsibility of caring for an infirm family member. When it comes to what they want from a job, therefore, greater time sovereignty is an important factor for many workers, in addition to traditional preferences such as job security and pay.

Developments in information and communication technology make it easier for employers to cater to staff needs for flexible working arrangements in terms of work time and place of work. This can particularly help businesses in rural areas to become more attractive employers. As a representative survey of workers and businesses in Germany reveals, around one-third of all businesses (with at least 50 workers subject to compulsory social security contributions) give their staff the option of working from home. However, demand would appear to exceed the current supply. While only 6% of working parents with underage children work from home with the help of digital technology, one parent in four would be open to doing so. From the worker’s point of view, the main benefits of teleworking from home include the reduced commute and a better work/life balance. For example, around 40% of fathers use the time saved to help their partners return to work. Businesses also see the benefits of home office arrangements, with two-thirds of businesses confirming an increase in staff productivity as a result.

With teleworking – which modern communication technologies enable – also comes the ability to reach a worker by mobile or e-mail during his/her spare time, however. According to a study by the Federal Ministry of Labour and Social Affairs, this ‘worker reachability’ increased between 2013 and 2015. As illustrated in the 2016 Report on Working Hours in Germany by the German Federal Institute for Occupational Safety and Health, the expectation that employees should be reachable in their spare time not only applies to workers in managerial positions. Workers in more elementary jobs, particularly in the services sector, are often expected to be reachable during their time off, and are frequently contacted.

While the trend towards flexibility in working time and location, which is being reinforced by digitalisation, offers opportunities for more self-determined working arrangements, new solutions for work/life balance, and a shift away from the culture of ‘face time’, homeworking, trust-based work times and increasing employer and customer expectations regarding staff reachability can also cause a gradual blurring of the

40 Bauer et al. 2012.
41 Federal Ministry of Labour and Social Affairs 2015a.
42 Federal Ministry for Family Affairs, Senior Citizens, Women and Youth 2016.
43 This applies in particular to employees who work from home (full- or part-time) during regular working hours and less to workers who do job-related tasks from home during their free time.
44 Federal Ministry for Family Affairs, Senior Citizens, Women and Youth 2016.
45 Research Alliance of the Federal Ministry of Labour and Social Affairs 2015a.
46 German Federal Institute for Occupational Safety and Health 2016.
lines between work and leisure time and the workplace and home. Workers can perceive this in two ways: as an encroachment on their private life and as interference in their professional life. The use of flexibility options can also lead to intensification of work and overtime, as people who work from home tend to do more overtime. This ‘removal of the boundaries of work’ can therefore also cause stress, and presents new challenges in terms of health and safety at work.

Further to this, digitalisation can give rise to unequal working conditions and cause polarisation between different groups of workers. The expectations and needs of staff with regard to working time and work location can vary greatly. On the one hand, there are groups of workers who consider flexibility in work scheduling and the place of work as an opportunity for a more self-determined working life and would therefore prefer more personalised arrangements. On the other hand, there are also large numbers of workers who are in favour of clearly defined, set working times and do not want to bring their work home with them.

In addition, there are also groups of workers for whom flexible work arrangements are not feasible at all, or only to a very limited extent. While, by their own account, 31% of white-collar workers work from home at least on occasion, at 2% this is rarely the case among blue-collar workers. In addition, academics and workers in managerial roles tend to telework from home on a comparatively regular basis. According to business corporations, managerial staff in large companies with more than 500 workers and in the services sector, in particular, receive the opportunity to work from home far more frequently than other groups of workers, and are also given the digital infrastructure to do so more often. Consequently, while they can benefit to a greater extent from autonomy with regard to work times and place, they are also vulnerable to specific stress factors.

Digitalisation not only offers businesses and workers greater flexibility in terms of working times and the place of work. With the increasing uptake of new technologies and assistance systems that can reduce physical strain in the workplace and help workers with complex cognitive tasks, digitalisation also presents opportunities to promote and maintain employees’ ability to work. This could particularly benefit workers with physically demanding jobs and older workers. Further advancements in assistive technologies to compensate for certain physical and sensory impairments could also improve the inclusion of people with disabilities in the working world. This would require the constant

47 Compared with workers who never work from home, employees who perform job-related tasks from home during their free time find that their family life is affected more by their professional life. In contrast, employees who telework from home at least some of the time as part of their regular working hours consider their work life to be somewhat more compromised by their private life than those who never work from home. Employees who receive business calls or e-mails several times weekly or daily during their spare time consider their family life to be affected by work on a comparatively frequent basis (Federal Ministry of Labour and Social Affairs 2015a).
48 Research Alliance of the Federal Ministry of Labour and Social Affairs 2015a.
49 Federal Ministry of Labour and Social Affairs/Nextpractice 2016b.
50 Research Alliance of the Federal Ministry of Labour and Social Affairs 2015a.
51 Research Alliance of the Federal Ministry of Labour and Social Affairs 2015b.
refinement and inter-mutual compatibility of various assistive systems. With a view to cognitive tasks, smart tutoring systems could potentially enable a much higher level of learning in the working process by adapting tasks to workers’ individual capabilities.\textsuperscript{52}

At the same time, technological innovations, such as in the context of human-machine interactions, also harbour risks in terms of security, health and employability. This concerns the balancing act between upskilling and deskilling, for example. The specific design of human-machine interaction can ‘enrich’ activities for workers by making them more complex and introducing a greater level of responsibility, with the machine providing assistance in dealing with the new range of tasks. However, it can also lead to formerly more complex activities being simplified and completely standardised so that they only require a low level of expertise and experience. The challenge is therefore to ensure that systems based on artificial intelligence do not devalue skilled workers’ necessary knowledge and experience. The issue of worker data is also an area faced with conflicting interests: on the one hand, the data can be used to optimise workflows and boost business efficiency by optimally adapting tasks to workers’ abilities and ergonomics. At the same time, however, this also paves the way for comprehensive permanent monitoring, which is incompatible with privacy rights. The central challenge will therefore be to maintain the high level of employee data protection in Germany while also exploiting the opportunities presented by technological progress for shaping the working world and securing the future skills base.\textsuperscript{53}
4. Securing skilled labour supply since 2011: goal achievement on five paths

The Federal Government’s Skilled Labour Concept was implemented roughly six years ago. The labour market in Germany has changed radically since then (Chapter 3). The time is therefore ripe to take stock of the situation. In particular, the dynamic pace of digital structural change explained earlier and the trend towards a ‘jobseeker’s market’ with regional and sector-specific characteristics, brought about by demographic developments, make it necessary to fully examine the direction skilled labour policy has taken. To this end, this section will first briefly describe the Skilled Labour Concept. It will then go on to present the quantitative and qualitative targets set out in the concept and outline how they have developed over the past six years. A comprehensive assessment of the progress made is then provided at the end.

4.1 The Federal Government’s strategy for securing skilled labour supply

To begin with, securing the supply of skilled labour is essentially the responsibility of business enterprises and the social partners. They promote the next generation of skilled workers and leverage the potential of the existing skilled labour pool. The Federal Government creates the appropriate framework for this, develops instruments and offers specific support through state measures.\(^{54}\)

With the Skilled Labour Concept, the Federal Government’s measures and projects were systematised in five paths for securing skilled labour supply for the first time in 2011. Following the principle that all workforce potential must be tapped as effectively as possible to secure the labour supply, the aim was to secure and expand the skills base in Germany by (1) activation and securing employment, (2) ensuring a good work/family balance, (3) providing educational opportunities for all from the outset, (4) promoting skills development through initial and continuing training and education and (5) encouraging integration and the immigration of skilled workers (Figure 11).

For each of these five ‘paths for securing skilled labour supply’, the Federal Government defined goals, described potential and assigned a weighting to the activities of the individual ministries. Coupled with the activities of the business community, the social partners, the \(\text{Länder} and
municipalities, the accompanying measures introduced by the Federal Government have begun to bear fruit in recent years.

Fig. 11: The five paths for securing skilled labour supply

<table>
<thead>
<tr>
<th>Increasing labour force participation in Germany</th>
<th>Improving the skills level of the (working) population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activation and securing employment</td>
<td>Educational opportunities for all from the outset</td>
</tr>
<tr>
<td>Better work/family balance</td>
<td>Qualifications: initial and continuing education and training</td>
</tr>
<tr>
<td>Integration and immigration of skilled workers</td>
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</tbody>
</table>

Skilled workers are essential for a society to develop and progress. They safeguard economic growth and social prosperity in our country. This applies to skilled workers at all skill levels – from technical staff to engineers, software developers to craftsmen, and medical doctors to nurses. For some regions and sectors, however, there were already signs the market for well-trained workers was tight the year the Skilled Labour Concept was adopted. This trend has continued ever since. The demand for skilled workers remains consistently high, and some sectors and regions are already experiencing a shortage. Therefore, efforts have been, and will remain, focused on bringing about a general increase in labour force participation. More people have found it possible – and also necessary – to bring their skills to the labour market, and will continue to do so. Securing the skills base, therefore, can also increasingly be regarded as an opportunity, as the five paths for securing skilled labour supply have placed a stronger focus on the potential of those who have been unable, or insufficiently able, to participate in the working world up to now. This applies, in particular, to the potential of women, older workers and people from a migrant background, but also to the long-term unemployed and people with disabilities. Skills development plays a central role in this context. Consequently, efforts to secure the skills base are directed at every target group in the labour market: from the training of young people and higher education enrolment rates to the participation of older persons in continuing vocational education and training.
4.2 Progress on the five paths for securing skilled labour supply

To secure the skills base in the medium and long term, labour potential must be systematically promoted and mobilised. To this end, concrete indicators were assigned to the five paths for securing skilled labour supply (Figure 12), making it possible to visualise developments in the core areas of skilled labour policy and closely monitor the specified targets over time. On this basis the Government undertook to conduct a regular review of the concept, the strategy and the measures for the secure supply of skilled labour and to make adjustments if necessary. The progress made on the individual paths for skilled labour supply has been documented in the previous periodic reports on the Skilled Labour Concept and placed in the context of the economic framework to secure the skills base. Furthermore, the central measures and programmes that the various government ministries have introduced or adapted in response to the individual paths for securing skilled labour supply have also been presented. With this report, the Federal Government now wishes to take stock and provide a comprehensive assessment of the Skilled Labour Concept. The developments of the five paths for securing skilled labour supply since the adoption of the Skilled Labour Concept will be presented in the following section for this purpose.\(^{55}\)

\(^{55}\) An overview of the development of the individual indicators is provided in table form in the Annex.
### Overarching objectives:
- Regular provision of findings to guide action
- Common understanding of the problem among all stakeholders responsible for securing the skills base

### Skilled labour path 1: activation and securing employment
- Increase the employment rate of 55–64-year-olds to 60% (national Europe 2020 goal)
- 20% reduction in the number of long-term unemployed (national Europe 2020 goal)
- Increase the employment rate of women aged 20–64 to 73% (national Europe 2020 goal)

### Skilled labour path 2: better work/family balance
- Increase the number or working hours of working mothers
- Reduce the number of single mothers receiving benefits under Book II of the Social Code
- Increase the share of women in executive positions

### Skilled labour path 3: educational opportunities for all from the outset
- Advance educational needs and participation needs in childhood and early childhood education
- Halve the rate of school-leavers without a qualification from 2008 by 2015 (Qualification Initiative of the Federal Government and the Länder)
- Reduce the proportion of early school-leavers (18–24-year-olds without an upper secondary school qualification) to under 10% (national Europe 2020 goal)

### Skilled labour path 4: qualifications: initial and continuing education/training
- Halve the proportion of young adults aged 20–29 without a vocational qualification from 17% to 8.5% by 2015 (Qualification Initiative of the Federal Government and the Länder)
- Increase the number of higher education graduates and enable people with a vocational qualification to obtain a higher academic qualification
- Increase the percentage of 30–34-year-olds with a tertiary or equivalent education (ISCED 4, 5 A/B and 6) to 42% (national Europe 2020 goal)
- Increase participation in CVET from the current rate of 43% of workers to 50% by 2015 (Qualification Initiative of the Federal Government and the Länder)
- Increase the proportion of women in STEM study programmes and occupations

### Skilled labour path 5: integration and immigration of skilled workers
- Better occupational integration of (unemployed) migrants
- Faster and more transparent processes for determining the equivalence of professional qualifications obtained abroad
- Adapt labour migration so that it is geared to the labour market, while taking aspects of integration policy into consideration
Path 1 for securing skilled labour supply: Activation and securing employment

The first path for securing skilled labour supply of the Skilled Labour Concept focuses on increasing labour force participation. In particular, the aim is to activate and integrate those groups of individuals whose participation in the labour market has been below-average up to now. Aside from the integration of women and older persons, this also includes the better integration of the long-term unemployed and people with disabilities.

Fig. 13: Employment rates

Overall, employment rates in Germany have increased substantially in the past ten years (Figure 13). This positive trend has also continued since the adoption of the Skilled Labour Concept. In 2016, the employment rate of 20–64-year-olds rose to 78.7% and therefore exceeded the national target of 77% which Germany had committed to in the Europe 2020 Strategy. In this context, the growth in the rates of employment is largely driven by positive developments in employment subject to compulsory social security contributions. For example, 31.4 million people held a job with compulsory social security coverage in June 2016, an increase of roughly 1.8 million on 2013. The most recent increase in employment subject to compulsory social security contributions is split almost equally between full-time and part-time jobs.
In an aging society, particular attention is also focused on the labour market situation of older persons. This is also reflected in the 60% target for the employment rate of older people that is set as an indicator in the national Europe 2020 goals. Growth in the labour force participation of older people remained strong in the past two years, with a higher employment rate recorded for the group of 55–64-years-olds overall (to 68.6% in 2016) and for the two subgroups of 55–59-year-olds and 60–64-year-olds (to 79.4% and 56%, respectively, in 2016). Furthermore, the higher labour force participation of older workers is coupled with an increase across all groups in the rate of workers in employment subject to compulsory social security contributions.

The promotion of the gainful employment of women is a central element of the Skilled Labour Concept. The share of women aged 20–64 who are in work continues to grow. The employment rate has risen from 71.1% in 2011 and 72.3% in 2013 to stand at 74.5% in 2016 – a high level, also by international standards. Germany has therefore recently exceeded its national target of a female employment rate of 73%, which it had committed to under the Europe 2020 Strategy.

In addition, the differences in the employment rates of men and women have narrowed slightly compared with 2013, but the gender gap still stands at 8.3 percentage points. Added to this are the persistently large differences in the weekly working times of men and women, a development attributable primarily to the fact that the increase in the gainful employment of women is still largely concentrated in the area of part-time work. Consequently, there has been a greater percentage increase in the number of part-time working arrangements than in the number of full-time positions in recent years. This is an indicator of challenges which still need to be addressed with regard to the reconciliation of work and family commitments. This area is analysed in more detail in the second path for securing skilled labour supply.

Lastly, the integration of long-term unemployed persons into the labour market has improved steadily since the adoption of the Skilled Labour Concept. In accordance with the national Europe 2020 goal formulated in the Skilled Labour Concept, long-term unemployment is considered according to the ILO definition in this context. While there were roughly 1.1 million people in long-term unemployment in 2011, and still around

56 According to the definition of the International Labour Organization (ILO), unemployment covers all persons aged between 15 and 74 who actively sought work in the four weeks prior to the survey and were not in paid employment. While people who work less than 15 hours a week can still be in the claimant count according to the national definition of the Federal Employment Agency, they are considered to be in gainful employment according to the ILO method. At the same time, there are other groups of persons, such as those participating in schemes, who are not considered to be in the claimant count but who can be unemployed. In sum, the number of unemployed persons according to the ILO definition (2016: 1.77 million) is far lower than the claimant count from the Federal Employment Agency based on the national definition of unemployment (2016: 2.69 million).
1 million in 2012, this figure dropped to 723,000 in 2016 (Figure 14). Germany has therefore clearly met its national Europe 2020 goal of a 20% reduction in the number of long-term unemployed persons compared with figures for 2008, the baseline year.

Fig. 14 Long-term unemployed

The employment situation of people with severe disabilities has improved steadily in recent years. The number of people with a severe disability or with an equal status in employment subject to compulsory social security payments reached a record high in 2015, standing at 1,198,000 in total; of these, roughly 1,030,000 were employed by employers with at least 20 positions and required by law to hire a certain percentage of workers with disabilities. This translates to an increase of 44% on 2002, the year the current scaled compensation levy was introduced. Data on the number of people with severe disabilities working for employers that do not fall under the requirement to employ persons with disabilities are only gathered every five years. In 2015, numbers stood at around 168,000 compared with roughly 138,000 in 2010. Further to this, in 2016 the number of unemployed people with severe disabilities on a yearly average fell more sharply (−4.6%) than the general rate of unemployment (−3.7%).

57 In the statistics from the Federal Employment Agency (notification procedure statistics, unemployment statistics and promotion statistics), people with a severe disability also include people with a degree of disability of less than 50 who are given equal status to a person with a severe disability (Federal Employment Agency 2015).
Despite the positive trend in employment figures, there is still room for improvement when it comes to the labour force participation of people with disabilities. Severely disabled unemployed persons have more difficulty finding employment than unemployed persons who do not have a severe disability. While they become unemployed less often, comparatively speaking, the average duration of unemployment is noticeably longer because of the slow pace of change in unemployment among people with severe disabilities.58

Path 2 for securing skilled labour supply: Better work/family balance

Measures to secure the skills base that are specifically aimed at women – and particularly mothers – in Germany, offer relatively high potential for mobilisation. This can be explained by the fact that mothers in Germany are generally well educated, but – on account of family responsibilities – they are still less active in the labour market, and when in gainful employment they tend to work far more frequently in part-time positions than fathers. Various measures introduced by the Federal Government are, therefore, geared towards improving the framework for parents to share work and family commitments in a spirit of partnership. For, in addition to a general increase in the female employment rate, it would appear that increasing the weekly working hours of women, in particular, could have an enormous impact on securing the supply of skilled labour in Germany.59

The dynamic development in maternal employment has continued since the adoption of the Skilled Labour Concept in 2011, with the strongest growth recorded in the gainful employment of mothers with small children. For example, in 2015 43% of mothers whose youngest child was aged between one and under two and 58% of mothers whose youngest child was aged between two and under three were already in gainful employment. Furthermore, the number of weekly hours worked by working mothers has also increased, with the biggest increase in the areas of three-quarter-time and full-time. Marginal employment decreased during the same period (Figure 15).

58 Federal Employment Agency 2017c.
59 Federal Ministry of Labour and Social Affairs 2015b.
Alongside work time-related measures and financial support from the Federal Government to assist parents in reconciling work and family commitments, the continuous improvement in the childcare infrastructure is one of the key drivers of the higher female employment rates (Figure 16). For example, it is found that mothers who avail of childcare services for their under-three-year-olds are 35% more likely to pursue gainful employment. They also work around twelve hours more per week than mothers who do not use such services. The results are similar for mothers who use childcare services for children aged between three and under six, and for school-going children. Given the higher maternal employment rate, investment in the expansion of child day-care facilities not only helps to reduce the shortage of skilled labour but can also have a positive impact on public finances through refinancing effects.

Fathers assuming an increasing share of family responsibilities is also a key factor in the return of mothers to the workforce.

Source: Federal Statistical Office 2017d.
Today, almost one child in three attends a child day-care facility or is looked after by a childminder. The childcare enrolment rate in 2016 was therefore 7.5 percentage points higher than in 2011. While already at a very high level, the childcare enrolment rate among children aged between three and under six has risen again and, standing at 93.6% in 2016, had almost reached the level of full childcare provision. Recent progress in the provision of all-day school services has been particularly remarkable. While 31% of pupils at schools of general education attended all-day schools in 2011, this share had increased to 39.3% by 2015. The share of primary school children attending all-day schools increased at a similar pace, going from 26.4% to 34.5%.

With regard to single parents, continuous progress has also been made since the adoption of the Skilled Labour Concept. In 2011, roughly 616,000 employable single parents still relied on basic income support benefits under Book II of the Social Code to get by. By 2016, the number of benefit recipients had been brought down to around 593,000. That said, around one-third of single parents continue to be economically inactive. Furthermore, women continue to account for the overwhelming majority of benefit recipients (stable proportion of women of approx. 94% since 2012).
An assessment of the progress made in improving the positions held by women at work also delivers mixed results. For example, the share of women in executive positions was still at only 29% in 2015, the same level it was at before the Skilled Labour Concept was adopted. In contrast, there has been a marked improvement in the percentage of women on the supervisory boards of publicly listed and co-determined companies, up from around 10% in 2011 to 28.1% today.62

**Path 3 for securing skilled labour supply: Educational opportunities for all from the outset**

Fair educational opportunities are among the most important investments we can make in our future. A primary focus of the Skilled Labour Concept was, and remains, to ensure that every child and every young person in Germany – male and female – receives the best possible educational opportunities, regardless of their cultural or social background, and irrespective of their parents’ means. A good school-leaving certificate is key to making a successful transition to vocational training or to pursuing higher education. Therefore, a priority of the Skilled Labour Concept is to reduce the number of early school-leavers in Germany. As agreed by the Federal Government and the Länder in the ‘Qualification Initiative for Germany’ in 2008, the aim was to halve the number of people leaving school without a qualification by 2015.

While clear progress has been made towards this goal, improvement has slowed in recent times. According to studies by the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder, the rate of people leaving school without a school qualification in relation to the typical population in this age group has dropped from 7.5% to 5.9% since 2008. However, the share has remained relatively constant since 2012. In addition, very little progress has been made in reducing the share of foreign nationals among the young people leaving school without a qualification. While an interim reduction of one percentage point was achieved, the rate has been rising again since 2013 and, at 11.8% in 2015, was back to the level it was at in 2011.
Following initial success, progress towards the goal of reducing the rate of early school-leavers, i.e. the number of 18–24-year-olds without a secondary-level school-leaving qualification, has also recently stalled. While the rate did temporarily drop to 9.5%, it had crept up to 10.1% by 2015. This means that Germany has more or less managed to stay within its national Europe 2020 goal of 10% (Figure 17).

To guarantee the early education and development of children and to make it more attractive for parents to avail of child day-care services, the quality of childcare services on offer is an important factor. This quality would normally be reflected in corresponding indicators for early childhood development. Up to now, however, little data has been available in Germany that would serve as a suitable basis for regular reporting. Therefore, the ratio of carers to children is used to gauge the quality of care for the under-threes. While the trend indicates a steady improvement in this ratio since the adoption of the Skilled Labour Concept, the differences between eastern and western Germany have remained virtually unchanged. In 2016, one preschool teacher in eastern Germany had to care for 5.7 children on average, in contrast to one preschool teacher to every 3.4 children on average in western Germany.

Fig. 17: School failure rates

Path 4 for securing skilled labour supply: Qualifications: initial and continuing training/education

Both vocational training and university education are direct paths to secure the next generation of skilled workers in Germany. To assess the progress made towards securing skilled labour on the skilled labour path ‘qualifications: initial and continuing training/education’, a range of indicators were selected and the Federal Government set itself clear quantitative targets for each indicator.

With regard to tertiary education, all targets have been met. The share of university entrants, in particular, has increased dramatically. At 55.5%, the current entry rate to higher education is a solid 10 percentage points higher than in 2010 before the adoption of the Skilled Labour Concept, and roughly 20 percentage points higher than in 2006 (Figure 18). Therefore, the 40% target set in 2008 under the Qualification Initiative for Germany is expected to be clearly exceeded for the foreseeable future.

Fig. 18: Entry rates to higher education

Source: Federal Statistical Office.

63 The 2016 entry rate to higher education is a provisional figure.
The share of a cohort that pursues higher education has increased substantially. The college dropout rate has been more or less constant for quite some time, with the exception of courses involving a state examination. For example, at just below 30% the dropout rate among students in bachelor programmes is relatively stable. Nevertheless, reducing the tertiary-level dropout rate remains a challenge for higher education institutions and education policy.

The growing tendency to study among younger cohorts also results in a gradual increase in the proportion of 30–34-year-olds with a tertiary education in Germany. According to the data, in 2015 roughly one person in three aged between 30 and 34 had a third-level education. This contrasts with 30.6% in 2011 and just 25.8% in 2006.\textsuperscript{64} Due to the sharp increase in the entry rates to higher education in recent years, the share of the population aged 30–34 with a third-level education will also increase disproportionately in the next ten years if dropout rates remain constant. By then, the national Europe 2020 goal of increasing the share to 42% will also most likely be reached, albeit with some delay. However, Germany has not yet managed to bring about a marked increase in the share of women studying STEM disciplines, which has remained stubbornly at 30%, on average, for quite some time. That said, there has been some success in a break away from typical gender biases in the choice of study programmes, with a higher proportion of women now opting to study an engineering, mathematics or science discipline than when the Skilled Labour Concept was adopted in 2011.\textsuperscript{65} As a result, the average percentage of women in all STEM subjects is likely to also increase in the future.

While growth in the third-level education of individuals with vocational qualifications has been rather slow, progress in the participation of adults in continuing education and training (CET) measures was far more pronounced. According to the results of the Adult Education Survey, every second person aged 18–64 took part in CET in 2016. The Federal Government’s target of 50% was therefore met. The participation of older persons in CET measures has also improved continuously. Nevertheless, the overall tendency of this group to take part in CET is still lower than that of younger cohorts. With 44% of 55–64-year-olds taking part in continuing education and training in 2016, the CET participation rate among older workers was 10 percentage points higher than in the year the Skilled Labour Concept was adopted (Figure 19).

\textsuperscript{64} The indicator for this in the Third Progress Report on the Skilled Labour Concept was still based on the International Standard Classification of Education (ISCED) in the version from 1989. This was replaced by a more recent version – ISCED 2011 – in 2011, which is also used here.

\textsuperscript{65} Federal Statistical Office 2016c.
With regard to the percentage of young adults without a formal vocational qualification, progress is less positive, and the goal of halving the rate to 8.5% by 2015 – as set down in the Qualification Initiative of the Federal Government and the Länder – was not reached. However, the proportion of unskilled persons in the 20–29 age bracket has declined continuously since the adoption of the Skilled Labour Concept.

**Path 5 for securing skilled labour supply: Integration and immigration of skilled workers**

When the Skilled Labour Concept was adopted in 2011, this coincided with the lifting of any restrictions on the free movement of workers from the EU member states of Poland, Hungary, Czech Republic, Slovakia, Slovenia, Estonia, Latvia and Lithuania that same year. Since then, the employment of foreign nationals in jobs subject to compulsory social security payments has increased considerably. In June 2016, for example, around 550,000 people working in jobs subject to compulsory social security payments came from one of the eight EU member states mentioned above. This contrasts with just 195,000 persons in June 2011. At roughly 1.8 million people in June 2016, foreign workers from the 28 members states of the EU accounted for roughly 6% of all workers with compulsory social security coverage in Germany. Between 2013 and 2016 alone, the number of EU foreign nationals working in Germany in a job subject to compulsory social security payments rose by around 50%, or 582,000 persons. By comparison, the employment of third-country nationals grew at a slower pace: between 2013 and 2016 the employment of this group of persons in jobs with social security coverage increased by 18% to roughly 1.4 million persons.
This translates to a growth of 205,000 in the number of third-country foreign nationals employed in Germany in jobs subject to compulsory social security contributions (Figure 20).

**Fig. 20: Foreign-national workers in jobs subject to compulsory social security payments**

By origin, in thousands

While immigration to Germany is primarily within the framework of the free movement of workers within the EU, in recent years there has also been a steady increase in the immigration of skilled workers and highly qualified professionals from non-EU countries. Within this context, the EU Blue Card, in particular, has become an increasingly important channel for highly skilled workers to obtain a work permit. Some 7,000 EU Blue Cards were issued in 2015 for standard occupations and around 7,500 for occupations in which there are labour shortages. This equates to an increase of roughly 30% on figures for 2013 (Figure 21).
Recently around 5,200 non-EU graduates of German institutes of higher education took advantage of the possibility to obtain a residence permit to search for employment on completion of their course of studies. The highest figure recorded so far for this type of residence permit was in 2015. However, this only amounted to 638 more residence permits than in 2013, and just 307 more than in 2011.

In contrast, far more progress has been made with regard to the recognition of professional qualifications obtained abroad. With roughly 20,000 proceedings for the recognition of professional qualifications recorded in 2015, numbers have almost doubled since 2012 – the year the Federal Government’s Professional Qualifications Recognition Act first entered into force. Three-quarters of all foreign occupational qualifications submitted for recognition in 2015 were approved as fully equivalent and, at 2.6%, the rejection rate was lower than in previous years. According to the information provided by the statistical offices of the Länder, over 8,300 proceedings were held in total for the recognition of professions regulated at Land level. A strong increase is also reported in the number of applications to the Central Office for Foreign Education for the appraisal of foreign higher education qualifications which do not lead to a regulated occupation, with applications rising from 5,233 in 2012 to 16,500 in 2016.

Fig. 21: Use of various channels to immigration
Cases per year

<table>
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<tr>
<th>Year</th>
<th>EU Blue Card for standard professions</th>
<th>Jobseekers after graduation from higher education</th>
<th>EU Blue Card for occupations with a shortage of skilled labour</th>
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</thead>
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<td>0</td>
</tr>
<tr>
<td>2015</td>
<td>8,000</td>
<td>6,000</td>
<td>4,000</td>
</tr>
</tbody>
</table>

Source: Central Register of Foreigners.
4.3 The Federal Government’s Skilled Labour Concept: taking stock

Since the adoption of the Federal Government’s Skilled Labour Concept in 2011, significant progress has been made on the five paths for securing skilled labour supply defined in the concept. This is clearly illustrated by the general overview of the quantitative indicators used in previous progress reports to assess the successes and failures. In the recent past, this positive trend has continued with a further improvement recorded in the vast majority of indicators in the two years since the last progress report. Gainful employment, education and the immigration of high-skilled professionals were areas where improvements were particularly striking.

The most important developments within the context of the Skilled Labour Concept

The strength of the German labour market and the stable macroeconomic climate are reflected in the consistently high demand for labour. Employment rates have increased steadily in recent years as a result of increased participation in the labour market, while unemployment has continued to drop. Germany has therefore managed to exceed all the central Europe 2020 goals in the area of employment.

In this context, the target employment rate of 77% was exceeded for the first time as early as 2013. Following recent improvements, Germany is now around 2 percentage points above target. The target of increasing the rate of older workers to 60% was also already achieved in 2012. Following the additional progress made in the last two years, this target is now exceeded by over 8 percentage points. Lastly, the target employment rate of women of 73% was also reached in 2014, and has continued to increase ever since.

The national Europe 2020 target of reducing the number of long-term unemployed by 20% compared with 2008 figures had already been well exceeded as early as 2013. Since then, long-term unemployment in Germany has declined appreciably, with the result that less than half as many people were affected by long-term unemployment in 2016 than in 2008, the baseline year.

With regard to education, the surge in the rates of entry to higher education witnessed at the start of this decade is particularly significant with a view to securing the future skills base. Since the publication of the last progress report in 2014, the rates of entry to higher education have stabilised at around 55%, reaching a high level also by international standards. The national target of a 40% higher education entry rate has, therefore, been exceeded by a significant margin. Given that college dropout rates have remained largely unchanged at the same time, the share of 30–35-year-olds with a tertiary education will also increase significantly over the medium term, putting the national Europe 2020 goal of 42% for this indicator clearly within reach.
Germany set itself the goal of increasing the participation of 18–64-year-olds in continuing training and education to 50% and managed to achieve this for the first time in 2014. In this respect, the progress made in the continuing training of older workers is remarkable. The positive effect of the steady increase in the labour market participation of this population segment can be felt here, with more than four in every ten workers over 55 investing in maintaining their skills and employability.

The area of immigration has experienced dramatic changes since the adoption of the Skilled Labour Concept: while net migration stood at around 280,000 people in 2011, it shot up to roughly 430,000 persons in 2013 and even exceeded the one million mark in 2015 as a result of the large influx of asylum seekers to Germany. However, many of those seeking asylum in this country do not yet have the necessary skills and knowledge to gain a foothold on the German labour market. This is particularly true of female asylum seekers. The labour market integration of asylum seekers with good prospects of remaining in Germany will be one of the central challenges for the secure supply of skilled labour in the near future. However, to gauge the immediate improvement in the skills base as a result of immigration, an analysis of the inward migration of workers from other EU states provides more relevant data for the moment: in 2011, the number of non-German EU nationals who moved to Germany in 2011 exceeded the number of people who emigrated from Germany to EU states in the same year by around 216,000. This figure, known as the net migration, increased significantly to around 341,000 persons in 2015.

The ratio of more highly qualified persons is relatively high among the migrants from other EU countries. In fact, they tend to be even better qualified than the average German population and are characterised by high employment rates. However, there are indications that quite a few are working below their qualification level, which was obtained abroad. The existing potential must be unlocked more efficiently here in the future. Nonetheless, the sharp increase in immigration from other EU member states is already helping to relax the situation as regards skilled labour, and ensures that the working-age population in Germany declines at a slower pace, contrary to the natural changes resulting from the trends in the birth rate in the past.

It must be noted, however, that future trends in immigration are very difficult to predict with any degree of confidence. As experience from the recent past shows, the migration flows within Europe are highly volatile, and the situation can turn quickly if the economic climate in the migrants’ countries of origin changes or the economic upswing in Germany loses momentum.

Furthermore, the potential for immigration from other EU countries will decline over the medium term. As the effect of demographic change
also begins to be felt in these countries, the number of young adults – who account for the majority of international migration flows – will also drop significantly.

If net immigration from EU countries remains at the level most recently observed until 2030, it could still absorb two-thirds of the decline in the domestic working-age population expected by then.\(^{67}\) Provided that the trend towards higher employment rates, particularly of women and older workers, also continues, the decline in the number of workers in the coming 15 years could be far lower than anticipated in previous forecasts regarding the development of the labour supply.

The Skilled Labour Concept considered in the light of new and remaining challenges

Even though progress has been made along the five paths for securing skilled labour supply, the challenges of securing a sustainable supply of skilled workers that still remain must not be overlooked. Despite all the success of the Skilled Labour Concept over the past six years, these challenges persist primarily in the area of female labour force participation, in the continuing training of low-skilled workers, the labour market integration of people from a migrant background, school education, as well as in the shortages in the labour market, the structures of which remain unchanged. While we need to keep up our joint efforts in these areas, in light of a rapidly changing job market we also need to explore new avenues to effectively secure the future supply of skilled labour.

Currently, around three-quarters of all women are in gainful employment, but frequently work on a part-time basis for family reasons.\(^{68}\) In addition to improving both the quality and quantity of child day-care services, greater attention must still be paid to the issue and societal task of ensuring better conditions for combining family and professional commitments on a fairer, more partnership-driven basis. Further to this, we need to focus more on the particular challenges facing single parents, and on equal labour market participation overall, as much potential women have to offer is still going to waste. For example, Germany has still not managed to appreciably increase the share of women in executive positions in the last few years.

\(^{67}\) Bonin/Rinne 2016.
\(^{68}\) Rengers 2015.
This is currently also true of the percentage of women among students in STEM study programmes. A positive trend can be expected here in the coming years, however, as a higher proportion of young women are now pursuing a degree in engineering, mathematics or science than in the year the Skilled Labour Concept was adopted.\(^6\) This is relevant, as STEM professions, in particular, play a crucially important role in Germany’s economic strength and capacity to innovate.

In the field of education, the strong expansion in tertiary education stands in contrast to the relatively fragile progress made in preventing lower-achieving pupils from dropping out of school and training programmes. Too many pupils still leave the school system without a qualification, and the rate of unskilled young adults is still too high. Further progress is essential here, particularly with regard to the dual system of training and education. This is because businesses in a number of sectors are finding it increasingly difficult to fill training places due to the shrinking numbers of pupils per school year and the steep rise in higher education entry rates. Strengthening Germany’s successful model of dual education and training over the medium term, therefore, remains a central task for a secure supply of skilled labour.

Lastly, it must be noted that despite all the success made on the paths for securing skilled labour supply defined in the Skilled Labour Concept in 2011, the shortages seen on the German labour market in 2016 have not abated. According to the latest analysis of labour shortages by the Federal Employment Agency, the healthcare and nursing professions, as well as technical occupations, continue to be the main areas in which both university-educated skilled workers and skilled workers with vocational training are in short supply. To qualify this statement, however, it must be added that the full effect of the measures taken by the Federal Government, such as those to increase the appeal of occupations experiencing labour shortages in terms of training and working conditions, will only be felt in the coming years. While Germany is currently not experiencing an acute nationwide shortage of skilled labour, there is the danger that the ongoing demographic change and digital transformation of the working world could cement the structures of these shortages.

Efforts already undertaken to expand the skills base must be continued. However, it will no longer be enough to focus primarily on mobilising and activating those who have not been able, or sufficiently able, to participate in working life so far. The immigration of skilled workers will also be unable to offset the imbalance sufficiently.

\(^6\) Federal Statistical Office 2016c.
While this does not mean that additional potential for skilled labour cannot be unlocked here, a highly quantitative approach to securing the skills base does not go far enough to cover future demand for skilled labour.

Rather, given that the digital transformation and demographic change will dynamically alter labour supply and demand, we need to place a stronger focus on qualitative aspects so that businesses will continue to find the skilled professionals they need in the future. This is because technological progress will change the tasks to be performed, and therefore the professional requirements, of almost one job in every three. This development will unfold in an aging society that is characterised by immigration and a growing diversity in preferences regarding working life. Therefore, if this transformation is to succeed, the priority is to stay laser-focused on both labour supply and labour demand, and ensure both sides are even better aligned in the future (Chapter 5.2), as this is the only way to overcome regional and sector-specific shortages. Another qualitative challenge will be to continuously adapt the skills and abilities of workers to changing demand (Chapter 5.3). While this applies to all segments of the labour market in the medium term, in the immediate future it applies, in particular, to the successful integration of the many asylum seekers in Germany into the labour market (Chapter 5.4).
5. Challenges of securing the future supply of skilled labour

Every current forecast on the future of work stresses the fact that the digital transformation will make the labour market more dynamic. Contrary to the frequently voiced fears that digitalisation will put huge numbers of jobs at risk, the model calculations of the latest labour market forecast on behalf of the Federal Ministry of Labour and Social Affairs demonstrate that accelerated digitalisation can even help generate economic growth and employment.

Several long-term forecasts on the development of the labour market have already been produced for the Federal Ministry of Labour and Social Affairs. The current forecast for the period to 2030 calculates and assesses scenarios in order to explore to what extent the digital transformation can be shaped. In terms of methodology, the study compares a ‘baseline scenario’, which assumes a slow but steady pace of digitalisation without particular priorities being set, with the alternative scenario of ‘accelerated digitalisation’ in which policymakers and the business community take on a pioneering technological role and systematically align education and infrastructure policies with the digital transformation.

In this context, it is crucial that the forecasts not only quantify the potential risks of digital technology, but also consider the positive effects of demand deriving from product innovation as well as cost and price reductions. Under these assumptions, employment gains of around a quarter of a million people can be expected. Real gross domestic product (GDP) in 2030 could then be 4% higher than in scenarios without accelerated digitalisation, and unemployment could fall by a further 20%. Per capita income would also be 4% higher. In addition, the number of persons in employment would grow by around 300,000 up until 2025, but would then drop by 0.8 million to 43 million in the following years as a result of demographic developments (Figure 22). However, this positive scenario of accelerated digitalisation is not a foregone conclusion. Rather, it relies on a number of policy decisions. One of the most important factors in this context is a secure future supply of skilled labour that is tailored to the changing working world.
5.1 Demand for skilled labour against the backdrop of digital transformation

First and foremost, for the German labour market, accelerated digitalisation would mean continued structural change. It would stimulate strong employment especially in the digital technology manufacturing sectors and services. These include traditional industrial sectors, vehicle manufacturing and the electronics industry as well as IT services, business services and research and development. Furthermore, the drop in employment in the mechanical engineering sector would be far less pronounced overall in the accelerated digitalisation scenario, as more new jobs would be created compared with the baseline scenario. This growth cannot, however, reverse the general downward trend in employment. Rather, digital technology will lead to a drop in employment in industries applying the technology. This is especially true for the retail sector, the paper and printing industry, and public administration. However, this loss of around 750,000 jobs would be more than offset by the growth of roughly one million jobs in the industries favoured by digitalisation (Figure 23).
If we analyse the effect of an accelerated digitalisation strategy at the occupational level, increased demand is particularly expected for IT occupations, management and business organisation occupations, and occupations in the advertising and marketing sector. At the same time, the demand for skilled labour in the fields of mechatronics, mechanical engineering and vehicle engineering will also increase in the course of Industry 4.0. There is likely to be a lower demand for skilled workers in...
manufacturing occupations, such as in metal production and metalworking or in the textile and clothing sector. Furthermore, in a scenario with accelerated digitalisation, fewer people will work in transport and sales. Generally speaking, the impact of accelerated digitalisation is far less visible at the occupational structure level than at the business sector level. This can be explained by the ongoing adaptation of occupational work profiles, with the result that the vast majority of digital work requirements are already incorporated into existing occupational tasks. On balance, in an accelerated digitalisation scenario, employment gains of around 580,000 jobs in the favoured occupations would contrast with around 310,000 job losses in the disadvantaged occupations.

5.2 Matching: the focus of a secure skills base

There is no denying that the labour market will continue to change. It is also clear that the extent of this change will be very different in both a scenario with accelerated digitalisation and in a scenario where the pace of digitalisation is steady. This is because work varies depending on the sector, business, field of activity or region. Some sectors will adapt more dynamically to new technical opportunities and individual businesses will take on a pioneering role, while change will only come about slowly in other sectors and businesses due to structural or cultural circumstances. Moreover, the change not only affects the work content but also the work culture, the organisation and forms of work, the values associated with the work and workers’ preferences (Chapter 3). It is also likely that people’s career pathways will become more dynamic. For example, some workers in Germany are already switching from the occupation in which they originally trained to another occupation to get a better job or increase their income. This trend is likely to become more pronounced in the future in light of changing job profiles and shifting demand for certain occupations. Depending on the occupational field, there will then be job opportunities in a number of areas owing to the task-specific knowledge.

Even though the current skilled labour shortages are also a reflection of a prospering labour market, the shortages in specific occupations and regions point to the need to adapt the Federal Government’s Skilled Labour Concept, which was adopted in 2011. This is because the concept, with its five paths for securing skilled labour supply and associated measures, has primarily focused on the supply side of the labour market up until now. While this was the right focus in the past and continues to be an important basis – as the more efficient exploitation of the existing skills pool will lead to higher economic growth, at least temporarily"71 – it is not enough to tackle the ongoing skills shortage in specific occupations.

70 Maier et al. 2014.
71 The exact circumstances will dictate the extent to which this will involve lasting higher growth rates, as a larger supply of skilled labour results in higher total factor productivity. The endogenous growth theory indicates that the external effects this will require will result from specialists and very highly skilled staff, in particular.
After all, a regional or sectoral skills shortage can also hamper national economic growth. Therefore, Germany needs to focus more closely on the interaction of labour supply and business demand for labour in the future.

While the German labour market currently has a very high absorption rate owing to the favourable economic climate, we must continue to place a priority on matching the additional supply of skilled labour with demand. However, given that demand is changing at an increasingly dynamic pace, a skilled labour strategy that follows a purely quantitative approach could lead to more unemployment. In addition, despite a significant expansion of the skills base, businesses’ demand for specific labour can remain unsatisfied. This is reflected, for example, in the ongoing difficulty in filling positions in technical occupations. In these areas there is a mismatch between people’s choice of training and occupation and the existing needs of the market. Here, the market does not manage to balance the labour supply and the labour demand. Labour shortages are, therefore, essentially the result of skills mismatch.

To be able to address the increasing mismatch between labour supply and demand more effectively in the future, the problems of market balancing in specific segments of the German labour market need to be examined more closely. This calls for the continuous monitoring of the skilled labour situation in terms of general, regional and sector-specific labour market developments. The following challenges clearly outline how important the elimination of mismatch problems could be in the present day and in the future.

• Digitalisation and the entailing globalisation of value chains presents new opportunities to secure the skills base. At the same time, it also gives rise to a specific demand for new skills and qualifications, which cannot be met by formally upskilling the skilled labour base. Rather, the content and flexible structures of education and skills development measures will play a decisive role in ensuring that the labour force in Germany is adapted to the digital transformation in a manner that meets demand.

• The sharp increase in the higher education entry rates is a turning point, given the speed of the change. Looking at the dual system of vocational training and education, this could harbour significant mismatch risks if the process of making vocational training more academic also changes the structure of the skills and qualifications obtained. Currently, little is known about how well the many additional graduates of the tertiary education system will be able to meet businesses’ existing needs. If the anticipated increase in university-qualified workers generates additional demand for skilled workers with a vocational training, this could exacerbate the impending shortages at the medium skills level in Germany.
• The ongoing shortages of skilled workers in certain regions and specific occupational groups are also an indication that structural labour market mechanisms are causing the mismatch. For example, not all workers can take up job offers that adequately suit their qualifications. High transaction and mobility costs frequently mean that the process of establishing a balance between local demand for skilled labour and the supply of skilled labour can be slow. In addition to the general expansion of the supply of skilled labour, particular attention should also be given here to improving the functioning of the labour market segments affected.

• Mismatches in regions and occupational groups overlap to some extent. To help the regions adapt to the structural change, continuous exchange is needed between the regional and national labour market stakeholders with regard to best practices and approaches to work organisation and the adaptation of training resources and CVET services to the change. Evidence-based contributions from the skilled labour monitoring system should serve as the basis for such exchange.

• Lastly, the intake of large numbers of asylum seekers also increasingly places the mismatch in the low-skills sector in the spotlight. The successful integration of low-skilled asylum seekers into the labour market can only go hand in hand with a sustainable skilled labour supply if the activation and skills development strategies are geared towards specific occupational segments. In addition to a general reduction in the unskilled rate, it would be necessary to focus on increasing the skills development rate in segments of the labour market affected by labour shortages.
5.3 Skilled labour in a digital future: qualifications and skills

Germany’s future as a place to do business depends crucially on its professionals being well educated and skilled, and on striking the right balance between university-educated workers and workers with qualifications earned through the vocational training system. Against the backdrop of the digital transformation, this is not only the job of good school education and vocational training, but also calls for lifelong learning to an increasing extent. Just like the working world on the whole, occupations and fields of work are also in a constant state of change. As a result of new trade relations, new business models or technological progress, for example, new jobs emerge, while others disappear. New jobs require new skills; the changing need for skills, in turn, causes a shift in demand for labour.

Digitalisation is currently a key driver of this shift. A study by Bitkom, Germany’s digital association, highlights how this development has affected German businesses in the past few years: of the businesses surveyed, around one in ten stated that job profiles at their companies have disappeared in the last ten years in the course of digitalisation, while roughly twice as many businesses confirmed that they had introduced new job profiles in the same period as a result of digitalisation. According to the companies surveyed by Bitkom, the move to more complex tasks and the demand for skills this entails will also continue in the coming years. In this context, qualifications and skills development will become a central issue for individuals to maintain their employability, and to secure the skills base in an innovative and productive economy.72

Shorter development cycles and the use of new technologies also mean that knowledge is more dynamic and has a shorter half-life. The digital transformation is changing the mix of tasks within existing occupational profiles and leading to a more complex blend of required skills, which will make digital skills compulsory in almost all sectors and occupations. ‘Digital literacy’, i.e. the ability to confidently work with Internet sources and, more generally, with new, mobile computer and online media, is becoming a basic requirement for participation in the labour market, irrespective of age. Social, communication and intercultural skills, systemic and creative thinking, the capacity for abstract thinking, and rapid information processing and data selection capabilities will continue to be vital for success in a rapidly changing labour market.73 In the field of production, in particular, it is important to teach the basics on the use of technology, the Internet and multi-media, as the basic rules, risks and possibilities of working with digital technology are important in any job.74

72 Bitkom 2016.
73 OECD 2016b.
74 Acatech 2016.
Social selectivity with regard to participation in continuing vocational education and training is an aspect that requires particular attention. Good progress has been made here in the past few years, with every second person aged 18–64 participating in a CVET measure. While it is true that, at 44%, unskilled and semi-skilled workers take part in further training less often compared with skilled workers and managers, most progress has been achieved in this area with a growth of 7 percentage points. Furthermore, significant progress has also been made in the past decade with the participation of older persons in continuing vocational training and education. Nevertheless, achieving higher participation rates of older persons, migrants, persons with a lower secondary school certificate (Hauptschulabschluss) and unskilled and semi-skilled workers remains a central challenge.

A successful labour market policy of the future will, therefore, depend more than ever on early preventive action, the strengthening of skills and the development of talents. The Federal Government and the Länder have created the appropriate legal framework for this in recent years, with better support not only given to the long-term unemployed but also to low-skilled workers with regard to continuing vocational training and education. Further to this, targeted incentives have been introduced to encourage people to stay the course over several years of training until they successfully attain a vocational qualification. Likewise, more attention has been paid to the promotion of basic skills in the area of CVET, which include IT skills in addition to reading, writing and arithmetic. In addition, support for continuing training in small and medium-sized businesses has been made more flexible. Alongside the measures introduced by the Federal Government and the Länder, a new culture of continuing training is needed in businesses, characterised by working conditions that encourage learning and by businesses investing specifically in continuing training. Accordingly, any state support for CVET should be compatible with company and collectively agreed solutions and specifically seek to support small and medium-sized enterprises. This also includes better dovetailing between the various measures and services offered by the Federal Government.
5.4 The labour market integration and potential of asylum seekers

The year 2015 was characterised by extraordinarily high numbers of people fleeing to Europe. Around 890,000 people sought protection in Germany alone. Thanks to the joint efforts of the Federal Government, the Länder, municipalities and civil society, it was possible to accommodate and provide care to these asylum seekers. The integration of foreign nationals with good prospects of remaining in Germany into training and the labour market is a central task for the immediate future and social cohesion will hinge on its success. Furthermore, this integration is absolutely vital if people are to live independently, away from government benefits, and integrate socially. In terms of securing the skills base, this presents both a challenge and an opportunity.

In this respect, current conditions are very favourable as the many asylum seekers are encountering a labour market that is in very good shape. Gainful activity and employment subject to compulsory social security contributions have been on the rise for several years. Medium-term growth forecasts are stable and the demographic change is also a favourable factor in this context. The majority of the asylum seekers are young: three-fifths are under 25 and over 80% are younger than 35.

The impact of this forced migration on the German labour market is now visible. Since the summer of 2016, data have been available on the numbers of job-seeking and unemployed people who came to Germany after fleeing their homes. In June 2017, around 490,000 job-seeking asylum seekers were being attended to by an employment agency or a job centre; of these 181,000 were unemployed.

The integration of several hundred thousand asylum seekers into work and society is a challenge that the Federal Government, Länder, municipalities, industrial associations and individual businesses are responding to with a variety of measures and initiatives. The basic consensus in this context is that successful integration into the German labour market depends crucially on sufficient language skills. This is why asylum seekers are encouraged to participate in measures that promote their German-language skills and employment opportunities at an early stage, if possible during the asylum procedure. In addition to good language skills and basic school qualifications, the individuals’ vocational qualifications and skills – and the extent to which these are recognised and expanded upon – are deciding factors in successful integration.

76 Aumüller 2016.
78 An overview of the Federal Government’s measures to integrate refugees into work and society is provided in the compendium entitled ‘Presentation of measures of the Federal Government to promote the integration and German-language skills of refugees’ (Federal Ministry of Labour and Social Affairs, 2016).
The Federal Government and the Länder have put the necessary legal framework in place to enable asylum seekers to integrate into the labour market as quickly as possible. Employment at a level that matches the individuals’ skills and qualifications is in the interest of both the individuals and of general efforts to secure the skills base.

Since June 2016, initial representative data have been available that allow conclusions to be drawn regarding the education and skills/qualification structures of those seeking asylum. The data reveal that vocational qualifications are well below the German average and the level is also lower compared with other migrants. According to the statistics, only 19% attended a university or other institute of higher education and 9% attended a vocational training institute.

However, the need to flee meant that many people had to interrupt their education in their native country, a fact particularly reflected in the level of school education and in (non-)completed formal education. For example, around 9% of asylum seekers have not attended any form of school, 10% attended primary school and a further 31% attended some form of middle school. Over one-third of asylum seekers in Germany attended a post-secondary education institution. Two-thirds attended schools of general education for ten years and more. Further to this, the educational pathways of female asylum seekers are often shorter than those of men for child-rearing reasons.

The educational aspirations of the asylum seekers is a factor which deserves particular mention: around two-thirds aim to earn a qualification, and most were in work before they fled to Germany. On the whole, however, the percentage of asylum seekers who are already in employment in Germany is still low. Nevertheless, citizens of non-European countries of origin of asylum seekers have been able to benefit from the good labour market performance overall. Growth in employment subject to compulsory social security payments has also increased appreciably among this group in recent times (Figure 24).

79 The Institute for Employment Research (IAB), the Research Centre on Migration, Integration and Asylum of the Federal Office for Migration and Refugees (BAMF-FZ) and the Socio-Economic Panel (SOEP) at the German Institute for Economic Research (DIW Berlin) are currently conducting a representative survey of foreign nationals who have sought asylum in Germany since 2013. This is a longitudinal study that is performed in three phases in 2016, 2017 and 2018. In addition to information on school education, vocational training and current professional situation, the survey also gathers information on language, basic values, the individuals’ living situation, family situation, social participation and contact with Germans and their own communities. It also examines the effectiveness of a variety of support programmes.
The business sector and society continues to be very willing to employ individuals seeking asylum in Germany, and thereby increase the potential pool of workers overall.\textsuperscript{80} With a view to securing the skills base, the future challenge will also be to align the individual capabilities of the asylum seekers with regional and sector-specific skilled labour needs. If these efforts are successful, this has the potential to be a real win-win situation: it allows those who have migrated to Germany to live a self-determined life in freedom and democracy and build a future for themselves. And for Germany, it is an opportunity to secure the skills base on the medium term.

\textsuperscript{80} Aumüller 2016.

![Fig 24: Development in the numbers of workers with compulsory social security coverage who are citizens of the eight main non-European countries of origin of asylum seekers in Germany](source: Federal Employment Agency 2017a.)
### Annex

#### General economic data

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<td>Price-adjusted GDP, year on year</td>
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<td>3.3%</td>
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<td>Working hours, year on year</td>
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<tr>
<td>Average annual working hours, year on year</td>
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<td>−0.4%</td>
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<td>Population aged 20–64, in thousands*</td>
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<td>49,774</td>
<td>49,651</td>
<td>49,561</td>
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<tr>
<td>Gainfully employed (domestic concept), in thousands</td>
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<td>40,325</td>
<td>40,856</td>
<td>40,892</td>
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<td>Vacancies on the primary labour market, in thousands</td>
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<td>953</td>
<td>883</td>
<td>939</td>
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<td>Unemployed in thousands</td>
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<td>2,950</td>
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<td>Unemployed per vacancy</td>
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<td>19.9%</td>
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<td>Unemployment rate for persons with an apprenticeship/technical college certificate</td>
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<td>7.0%</td>
<td>6.0%</td>
<td>6.6%</td>
<td>5.8%</td>
<td>5.1%</td>
<td>5.0%</td>
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<td>4.6%</td>
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<td>Unemployment rate for persons with a degree from a university/university of applied sciences</td>
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<td>2.5%</td>
<td>2.5%</td>
<td>2.4%</td>
<td>2.4%</td>
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<td>2.4%</td>
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<td>Net migration in thousands</td>
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<td>−13</td>
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<td>1,139</td>
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</table>

Sources:
A Federal Statistical Office
B Institute for Employment Research (working time calculation)
C Federal Statistical Office/National Accounts
D Institute for Employment Research
E Federal Employment Agency

* Break in time series from 2011.
** Calculation of values for 2014 and 2015 as average of quarterly figures.
### Path 1 for securing skilled labour supply: Activation and securing employment

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<tr>
<td>Total employment rate for 20–64-year-olds</td>
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<td>72.9%</td>
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<td>Employment with compulsory social insurance coverage in June, in millions*</td>
<td>26.53</td>
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<td>27.60</td>
<td>27.97</td>
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<td>Rate of employment with compulsory social insurance coverage for 20–64-year-olds in June**</td>
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<td>53.4%</td>
<td>54.4%</td>
<td>55.5%</td>
<td>56.5%</td>
<td>56.9%</td>
<td>59.1%</td>
<td>60.1%</td>
<td>61.0%</td>
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<td>Full-time employment with compulsory social insurance coverage in June, in millions*/***</td>
<td>21.27</td>
<td>21.60</td>
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<td>21.72</td>
<td>21.77</td>
<td>21.80</td>
<td>x</td>
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<td>22.84</td>
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<td>5.33</td>
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<td>Employment rate for 55–64-year-olds</td>
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<td>61.6%</td>
<td>63.6%</td>
<td>65.6%</td>
<td>66.2%</td>
<td>68.6%</td>
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<tr>
<td>Employment rate for 55–59-year-olds</td>
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<td>70.1%</td>
<td>71.7%</td>
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<td>Rate of employment with compulsory social insurance coverage for 55–59-year-olds in June**</td>
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<td>58.0%</td>
<td>59.2%</td>
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<tr>
<td>Employment rate for 60–64-year-olds</td>
<td>29.7%</td>
<td>32.9%</td>
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<td>38.6%</td>
<td>41.0%</td>
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<td>49.9%</td>
<td>52.6%</td>
<td>53.3%</td>
<td>56.0%</td>
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<td>Rate of employment with compulsory social insurance coverage for 60–64-year-olds in June**</td>
<td>15.6%</td>
<td>18.4%</td>
<td>20.5%</td>
<td>23.5%</td>
<td>26.1%</td>
<td>27.6%</td>
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<td>31.9%</td>
<td>34.9%</td>
<td>35.6%</td>
<td>37.5%</td>
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<td>Employment rate for 20–64-year-old women</td>
<td>65.0%</td>
<td>66.7%</td>
<td>67.8%</td>
<td>68.7%</td>
<td>69.7%</td>
<td>71.3%</td>
<td>71.6%</td>
<td>72.5%</td>
<td>73.1%</td>
<td>73.6%</td>
<td>74.5%</td>
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<td>Number of 15–64-year-olds long-term unemployed, in millions</td>
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<td>1.00</td>
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<td>0.92</td>
<td>0.85</td>
<td>0.72</td>
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<td>Number of people with severe disabilities, and people with an equal status, in employment with compulsory social insurance coverage, in thousands****</td>
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<td>950</td>
<td>989</td>
<td>1,019</td>
<td>1,040</td>
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<td>1,125</td>
<td>1,152</td>
<td>1,198</td>
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</tr>
</tbody>
</table>

Sources:
E Federal Employment Agency
F Eurostat, labour force survey

* Calculated according to the ‘place of work’ principle.
** Calculated according to the ‘place of residence’ principle.
*** Revision of employment statistics in August 2014.
**** Calculation from the annual notification procedure pursuant to Section 80 (2) of Book IX of the Social Code plus the small-scale surveys conducted every 5 years on employers outside the scope of the compulsory employment rules pursuant to Section 80 (4) of Book IX of the Social Code.

x No data for June 2012 due to change in the activity key for employer social security reporting.
**Path 2 for securing skilled labour supply: Better work/family balance**

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<td>Employment rate for 20–64-year-old mothers with at least one underage child</td>
<td>64.1%</td>
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<td>Employment rate for 20–64-year-old mothers with a youngest child under 3 years of age</td>
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<td>Working mothers with a youngest child of between 1 and 2 years of age</td>
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<td>32%</td>
<td>36%</td>
<td>38%</td>
<td>40%</td>
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<td>42%</td>
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<td>Working mothers with a youngest child of between 2 and under 3 years of age</td>
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<td>44%</td>
<td>46%</td>
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<td>51%</td>
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<td>654</td>
<td>636</td>
<td>629</td>
<td>616</td>
<td>613</td>
<td>615</td>
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<td>609</td>
<td>593</td>
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<tr>
<td>Percentage of women in executive positions</td>
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<td>27%</td>
<td>29%</td>
<td>30%</td>
<td>29%</td>
<td>29%</td>
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<td>Children under 3 years of age in day care, as at 1 March, in thousands</td>
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<td>320</td>
<td>362</td>
<td>414</td>
<td>470</td>
<td>514</td>
<td>558</td>
<td>597</td>
<td>661</td>
<td>693</td>
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<td>Childcare enrolment rate for children under 3 years of age, as at 1 March</td>
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<td>15.5%</td>
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<tr>
<td>Children aged 3 to under 6 in day care, as at 1 March, in thousands</td>
<td>1,955</td>
<td>1,944</td>
<td>1,951</td>
<td>1,927</td>
<td>1,911</td>
<td>1,914</td>
<td>1,930</td>
<td>1,951</td>
<td>1,947</td>
<td>1,962</td>
<td>1,999</td>
<td>A</td>
</tr>
<tr>
<td>Childcare enrolment rates for children aged 3 to under 6, as at 1 March</td>
<td>87.2%</td>
<td>89.4%</td>
<td>91.1%</td>
<td>91.5%</td>
<td>92.1%</td>
<td>92.9%</td>
<td>93.4%</td>
<td>93.6%</td>
<td>93.5%</td>
<td>94.9%</td>
<td>93.6%</td>
<td>A</td>
</tr>
<tr>
<td>Children aged 6 to under 14 in day care, as at 1 March, in thousands</td>
<td>771</td>
<td>786</td>
<td>783</td>
<td>788</td>
<td>791</td>
<td>797</td>
<td>786</td>
<td>803</td>
<td>804</td>
<td>815</td>
<td>833</td>
<td>A</td>
</tr>
<tr>
<td>Childcare enrolment rate for children aged 6 to under 14, as at 1 March</td>
<td>12.0%</td>
<td>12.4%</td>
<td>12.5%</td>
<td>12.7%</td>
<td>12.9%</td>
<td>13.2%</td>
<td>13.3%</td>
<td>16.5%</td>
<td>15.7%</td>
<td>18.2%</td>
<td>14.4%</td>
<td>A</td>
</tr>
<tr>
<td>Schoolchildren in private and public all-day general education schools, in %</td>
<td>20.9%</td>
<td>24.1%</td>
<td>26.9%</td>
<td>28.1%</td>
<td>31.0%</td>
<td>33.1%</td>
<td>35.8%</td>
<td>37.7%</td>
<td>39.3%</td>
<td></td>
<td></td>
<td>H</td>
</tr>
<tr>
<td>Schoolchildren in public and private all-day primary schools, in %</td>
<td>16.2%</td>
<td>18.9%</td>
<td>21.5%</td>
<td>22.8%</td>
<td>26.4%</td>
<td>28.7%</td>
<td>31.4%</td>
<td>33.1%</td>
<td>34.5%</td>
<td></td>
<td></td>
<td>H</td>
</tr>
</tbody>
</table>

Sources:
A Federal Statistical Office
C Federal Statistical Office/Microcensus
D Institute for Employment Research
E Federal Employment Agency
G German Institute for Economic Research (SOEP)
H Standing Conference of the Ministers of Education and Cultural Affairs

* Due to a revision of the statistics on basic income support in 2016, the revised data indicated here may deviate slightly from older publications.
Path 3 for securing skilled labour supply: Educational opportunities

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</tr>
</thead>
<tbody>
<tr>
<td>Percentage of school-leavers without a qualification*</td>
<td>7.9%</td>
<td>8.2%</td>
<td>7.5%</td>
<td>7.0%</td>
<td>6.5%</td>
<td>6.2%</td>
<td>5.9%</td>
<td>5.7%</td>
<td>5.8%</td>
<td>5.9%</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Percentage of foreign-national school-leavers without a qualification* in relation to all foreign-national school-leavers</td>
<td>16.8%</td>
<td>16.0%</td>
<td>15.0%</td>
<td>13.8%</td>
<td>12.8%</td>
<td>11.8%</td>
<td>11.4%</td>
<td>10.7%</td>
<td>11.9%</td>
<td>11.8%</td>
<td></td>
<td>I, A</td>
</tr>
<tr>
<td>Percentage of early school-leavers (18–24-year-olds without an upper secondary (level qualification)</td>
<td>14.1%</td>
<td>12.7%</td>
<td>11.8%</td>
<td>11.1%</td>
<td>11.9%</td>
<td>11.7%</td>
<td>10.6%</td>
<td>9.9%</td>
<td>9.5%</td>
<td>10.1%</td>
<td></td>
<td>J</td>
</tr>
<tr>
<td>Staff/child ratio for groups with children aged 0 to under 3, children per preschool teacher</td>
<td>4.6</td>
<td>4.1</td>
<td>4.1</td>
<td>4.0</td>
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<tr>
<td>Eastern Germany</td>
<td>6.1</td>
<td>5.7</td>
<td>6.3</td>
<td>5.8</td>
<td>5.8</td>
<td>5.7</td>
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<tr>
<td>Western Germany</td>
<td>3.9</td>
<td>3.8</td>
<td>3.8</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
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<td>K</td>
</tr>
</tbody>
</table>

Sources:
A Federal Statistical Office
I Federal Ministry of Education and Research
K Federal Statistical Office, Dortmund Centre for Statistics on Child and Youth Welfare

* Without a lower secondary school certificate (Hauptschulabschluss).
### Path 4 for securing skilled labour supply: Initial and continuing training

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</tr>
</thead>
<tbody>
<tr>
<td>Percentage of young adults aged between 20 and 29 without an occupational qualification and not in training</td>
<td></td>
<td>13.3%</td>
<td>13.1%</td>
<td>12.7%</td>
<td>12.7%</td>
<td>n/a</td>
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<td>A</td>
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<tr>
<td>Percentage of young adults beginning a higher education course of study (higher education entry rate)*</td>
<td>35.6%</td>
<td>37.0%</td>
<td>40.3%</td>
<td>43.3%</td>
<td>46.0%</td>
<td>55.6%</td>
<td>55.9%</td>
<td>58.5%</td>
<td>58.3%</td>
<td>58.2%</td>
<td>55.5%</td>
<td>A</td>
</tr>
<tr>
<td>Student dropout rate for bachelor programmes**</td>
<td>30.0%</td>
<td>25.0%</td>
<td>28.0%</td>
<td>28.0%</td>
<td>29.0%</td>
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<td>L</td>
</tr>
<tr>
<td>Student dropout rate for master programmes (Diplom/Magister)***</td>
<td>26.0%</td>
<td>27.0%</td>
<td>23.0%</td>
<td>27.0%</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td>L</td>
</tr>
<tr>
<td>Student dropout rate for state examinations</td>
<td>7.0%</td>
<td>10.0%</td>
<td>11.0%</td>
<td>13.0%</td>
<td></td>
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<td>L</td>
</tr>
<tr>
<td>Percentage of third-level education of individuals with vocational qualifications</td>
<td>0.5%</td>
<td>0.4%</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.6%</td>
<td>0.6%</td>
<td>2.0%</td>
<td>2.4%</td>
<td>2.8%</td>
<td>2.5%</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Percentage of 30–34-year-olds with tertiary educational qualifications (ISCED 2011 5-8)</td>
<td>25.8%</td>
<td>26.5%</td>
<td>27.7%</td>
<td>29.4%</td>
<td>29.7%</td>
<td>30.6%</td>
<td>31.8%</td>
<td>31.9%</td>
<td>31.4%</td>
<td>32.3%</td>
<td>33.2%</td>
<td>F</td>
</tr>
<tr>
<td>Participation in continuing education/training among 18–64-year-olds</td>
<td></td>
<td>44.0%</td>
<td>42.0%</td>
<td>49.0%</td>
<td>51.0%</td>
<td>50.0%</td>
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<td>M</td>
</tr>
<tr>
<td>Participation in continuing education/training among 55–64-year-olds****</td>
<td></td>
<td>27.0%</td>
<td>34.0%</td>
<td>38.0%</td>
<td>39.0%</td>
<td>44.0%</td>
<td></td>
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<td>M</td>
</tr>
<tr>
<td>Percentage of women in STEM degree courses</td>
<td></td>
<td>30.8%</td>
<td>30.9%</td>
<td>30.5%</td>
<td>30.7%</td>
<td>29.9%</td>
<td>27.3%</td>
<td>29.9%</td>
<td>30.5%</td>
<td>28.8%</td>
<td>29.2%</td>
<td>29.4%</td>
</tr>
</tbody>
</table>

Sources:
A Federal Statistical Office
L HIS Gmbh/DZHW project reports
C Microcensus (Federal Statistical Office)
F Eurostat Labour Force Survey
M AES – Adult Education Survey

* Based on the location of the higher education institute (winter semester). The higher education entry rate for 2016 is a provisional figure.
** The percentage was not calculated in 2014 because the qualifications are only of peripheral significance.
*** Total percentage was not calculated in 2014 due to significant changes with regard to the teaching degree programme.
Path 5 for securing skilled labour supply: Integration and immigration of skilled workers

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<tr>
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</thead>
<tbody>
<tr>
<td>Employed with compulsory social security coverage in June, in thousands*</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>from EU 8 countries**</td>
<td>118</td>
<td>126</td>
<td>133</td>
<td>142</td>
<td>152</td>
<td>195</td>
<td>275</td>
<td>344</td>
<td>409</td>
<td>485</td>
<td>550</td>
<td>E</td>
</tr>
<tr>
<td>from all EU states (EU 28)</td>
<td>758</td>
<td>780</td>
<td>803</td>
<td>810</td>
<td>832</td>
<td>917</td>
<td>1,053</td>
<td>1,182</td>
<td>1,363</td>
<td>1,565</td>
<td>1,764</td>
<td>E</td>
</tr>
<tr>
<td>from third countries***</td>
<td>972</td>
<td>998</td>
<td>1,041</td>
<td>1,010</td>
<td>1,036</td>
<td>1,092</td>
<td>1,130</td>
<td>1,148</td>
<td>1,189</td>
<td>1,252</td>
<td>1,353</td>
<td>E</td>
</tr>
<tr>
<td>EU Blue Card for standard occupations (issuance in respective year)****</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>1,328</td>
<td>6,150</td>
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<tr>
<td>EU Blue Card for occupations with a shortage of skilled labour (issuance in respective year)****</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>788</td>
<td>5,140</td>
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<tr>
<td>Proceedings for recognition of occupational qualifications*****</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>10,989</td>
<td>16,700</td>
</tr>
<tr>
<td>Rate of qualification recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>82%</td>
<td>75%</td>
</tr>
<tr>
<td>Residence permit under Section 16 (4) of the Residence Act (graduate jobseekers) – issuance in respective year******</td>
<td>2,031</td>
<td>2,856</td>
<td>3,753</td>
<td>4,418</td>
<td>5,141</td>
<td>4,875</td>
<td>5,069</td>
<td>4,544</td>
<td>4,999</td>
<td>5,182</td>
<td>4,557</td>
<td>M</td>
</tr>
</tbody>
</table>

Sources:
A Federal Statistical Office
E Federal Employment Agency
I Federal Ministry of Education and Research
M Central Foreigners Register

* Time series for 2006 enlarged to include Bulgaria and Romania and for all years to include Croatia (EU 28).
** Estonia, Latvia, Lithuania, Poland, Slovak Republic, Slovenia, Czech Republic and Hungary.
*** Foreign countries minus EU countries (excluding Germany), Iceland, Liechtenstein, Norway and Switzerland.
**** The law only entered into force on 1 August 2012 which is why the period of issuance is limited to the period from 1 August 2012 to 31 December 2012.
***** The law entered into force on 1 April 2012, the survey period is therefore limited to the period from 1 April 2012 to 31 December 2012.
The qualification recognition rate only considered completed proceedings.
****** From 2010 onwards the figures have been approximated as closely as possible due to changes in survey methodology.
******* Jan.–Sept. 2016 (provisional migration monitor).
### Current list of occupations with labour shortages

Occupational groups and qualification levels and the associated classification numbers according to the 2010 classification of occupations*

<table>
<thead>
<tr>
<th>No.</th>
<th>Occupational group</th>
<th>Type(s) of occupation affected</th>
<th>Qualification level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>244 Metalworking and welding</td>
<td>244 14 Occupations in metalworking</td>
<td>4 Expert</td>
</tr>
<tr>
<td>2</td>
<td>252 Automotive, aerospace and marine engineering</td>
<td>252 14 Occupations in automotive engineering</td>
<td>4 Expert</td>
</tr>
<tr>
<td>3</td>
<td>261 Mechatronics and automation engineering</td>
<td>261 12 Occupations in mechatronics</td>
<td>2 Skilled worker</td>
</tr>
<tr>
<td>4</td>
<td>261</td>
<td>261 22 Occupations in automation engineering</td>
<td>2 Skilled worker</td>
</tr>
<tr>
<td>5</td>
<td>261</td>
<td>261 23 Occupations in automation engineering</td>
<td>3 Specialist</td>
</tr>
<tr>
<td>6</td>
<td>261</td>
<td>261 24 Occupations in automation engineering</td>
<td>4 Expert</td>
</tr>
<tr>
<td>7</td>
<td>262 Energy technology</td>
<td>262 12 Construction electrician occupations</td>
<td>2 Skilled worker</td>
</tr>
<tr>
<td>8</td>
<td>262</td>
<td>262 22 Electro-mechanical technician occupations</td>
<td>2 Skilled worker</td>
</tr>
<tr>
<td>9</td>
<td>262</td>
<td>262 23 Electrical industrial engineering occupations</td>
<td>2 Skilled worker</td>
</tr>
<tr>
<td>10</td>
<td>262</td>
<td>262 24 Cable installation and maintenance occupations</td>
<td>2 Skilled worker</td>
</tr>
<tr>
<td>11</td>
<td>272 Technical drawing, design, model construction</td>
<td>272 24 Occupations in design and equipment engineering</td>
<td>4 Expert</td>
</tr>
<tr>
<td>12</td>
<td>321 Building construction</td>
<td>321 93 Master craftsman in building construction</td>
<td>3 Specialist</td>
</tr>
<tr>
<td>13</td>
<td>322 Civil engineering</td>
<td>322 93 Master craftsman in civil engineering</td>
<td>3 Specialist</td>
</tr>
<tr>
<td>14</td>
<td>333 Interior finishing work, dry lining, insulation,</td>
<td>333 93 Master craftsman in interior finishing work, dry</td>
<td>3 Specialist</td>
</tr>
<tr>
<td></td>
<td>carpentry, glazing, roller shutter and venetian blind</td>
<td>lining, carpentry, glazing, roller shutter and venetian</td>
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<tr>
<td></td>
<td>installation</td>
<td>blind installation</td>
<td></td>
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<tr>
<td>15</td>
<td>342 Plumbing, pipe fitting sanitary installation,</td>
<td>342 02 Occupations in plumbing (w/o spec.)</td>
<td>2 Skilled worker</td>
</tr>
<tr>
<td></td>
<td>heating, ventilation and air conditioning (HVAC)</td>
<td></td>
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<tr>
<td>16</td>
<td>342</td>
<td>342 12 Occupations in pipe fitting/sanitary installation,</td>
<td>2 Skilled worker</td>
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<tr>
<td></td>
<td></td>
<td>HVAC</td>
<td></td>
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<tr>
<td>17</td>
<td>342</td>
<td>342 13 Occupations in pipe fitting/sanitary installation,</td>
<td>3 Specialist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HVAC</td>
<td></td>
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<tr>
<td>18</td>
<td>342</td>
<td>342 22 Occupations in building of stoves and air heating</td>
<td>2 Skilled worker</td>
</tr>
<tr>
<td></td>
<td></td>
<td>systems</td>
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<td>19</td>
<td>342</td>
<td>342 32 Occupations in refrigeration technology</td>
<td>2 Skilled worker</td>
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<tr>
<td>20</td>
<td>342</td>
<td>342 33 Occupations in refrigeration technology</td>
<td>3 Specialist</td>
</tr>
<tr>
<td>21</td>
<td>342</td>
<td>342 93 Master craftsman in plumbing, pipe fitting/sanitary</td>
<td>3 Specialist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>installation, HVAC</td>
<td></td>
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<tr>
<td>22</td>
<td>434 Software development, programming</td>
<td>434 14 Occupations in software development</td>
<td>4 Expert</td>
</tr>
<tr>
<td>23</td>
<td>511 Technical air, railway and shipping operation</td>
<td>511 13 Occupations in technical railway operation</td>
<td>3 Specialist</td>
</tr>
<tr>
<td>24</td>
<td>512 Transport infrastructure supervision and</td>
<td>512 22 Railway infrastructure supervision and</td>
<td>2 Skilled worker</td>
</tr>
<tr>
<td></td>
<td>maintenance</td>
<td>maintenance</td>
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<tr>
<td>25</td>
<td>522 Drivers in rail transport system</td>
<td>522 02 Train drivers</td>
<td>2 Skilled worker</td>
</tr>
<tr>
<td>26</td>
<td>813 Healthcare, nursing, emergency rescue service,</td>
<td>813 02 Healthcare and nursing occupations (w/o spec.)</td>
<td>2 Skilled worker</td>
</tr>
<tr>
<td></td>
<td>obstetrics</td>
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<tr>
<td>27</td>
<td>813</td>
<td>813 13 Specialised nursing occupations</td>
<td>3 Specialist</td>
</tr>
<tr>
<td>28</td>
<td>813</td>
<td>813 32 Surgical technology/medical technical assistance</td>
<td>2 Skilled worker</td>
</tr>
<tr>
<td></td>
<td>occupations</td>
<td></td>
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<tr>
<td>29</td>
<td>813</td>
<td>813 42 Occupations in the ambulance and emergency rescue</td>
<td>2 Skilled worker</td>
</tr>
<tr>
<td></td>
<td>services</td>
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</tr>
<tr>
<td>30</td>
<td>813</td>
<td>813 53 Occupations in obstetrics and maternity care</td>
<td>3 Specialist</td>
</tr>
<tr>
<td>31</td>
<td>814 Medicine and dentistry</td>
<td>814 04 Medical doctors (w/o spec.)</td>
<td>4 Expert</td>
</tr>
<tr>
<td>32</td>
<td>814 Medical specialists in paediatric and young adult</td>
<td>814 14 Occupational medicine specialists in</td>
<td>4 Expert</td>
</tr>
<tr>
<td></td>
<td>medicine</td>
<td>paediatric and young adult medicine</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Occupational group</td>
<td>Type(s) of occupation affected</td>
<td>Qualification level</td>
</tr>
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</tr>
<tr>
<td>33</td>
<td>814</td>
<td>814 24 Medical specialists for internal medicine</td>
<td>Expert</td>
</tr>
<tr>
<td>34</td>
<td>814</td>
<td>814 34 Specialist surgeon</td>
<td>Expert</td>
</tr>
<tr>
<td>35</td>
<td>814</td>
<td>814 44 Medical specialists for skin diseases, sensory organs and sexual organs</td>
<td>Expert</td>
</tr>
<tr>
<td>36</td>
<td>814</td>
<td>814 54 Medical specialists in anaesthesiology</td>
<td>Expert</td>
</tr>
<tr>
<td>37</td>
<td>814</td>
<td>814 64 Medical experts for neurology, psychiatry and psychotherapy</td>
<td>Expert</td>
</tr>
<tr>
<td>38</td>
<td>814</td>
<td>814 84 Medical doctors (other spec. act.)</td>
<td>Expert</td>
</tr>
<tr>
<td>39</td>
<td>817</td>
<td>817 13 Physical therapy occupations</td>
<td>Specialist</td>
</tr>
<tr>
<td>40</td>
<td>818</td>
<td>818 04 Chemist/pharmacist</td>
<td>Expert</td>
</tr>
<tr>
<td>41</td>
<td>821</td>
<td>821 02 Occupations in geriatric care (w/o spec.)</td>
<td>Skilled worker</td>
</tr>
<tr>
<td>42</td>
<td>821</td>
<td>821 82 Occupations in geriatric care (other spec. act.)</td>
<td>Skilled worker</td>
</tr>
<tr>
<td>43</td>
<td>821</td>
<td>821 83 Occupations in geriatric care (other spec. act.)</td>
<td>Specialist</td>
</tr>
<tr>
<td>44</td>
<td>823</td>
<td>823 93 Master craftsman in hairdressing</td>
<td>Specialist</td>
</tr>
<tr>
<td>45</td>
<td>825</td>
<td>825 12 Occupations in orthopaedic and rehabilitation technology</td>
<td>Specialist</td>
</tr>
<tr>
<td>46</td>
<td>825</td>
<td>825 12 Occupations in hearing aid systems</td>
<td>Skilled worker</td>
</tr>
<tr>
<td>47</td>
<td>825</td>
<td>825 13 Occupations in orthopaedic and rehabilitation technology</td>
<td>Specialist</td>
</tr>
<tr>
<td>48</td>
<td>825</td>
<td>825 93 Master craftsman in orthopaedic technology and hearing aid systems**</td>
<td>Specialist</td>
</tr>
<tr>
<td>49</td>
<td>845</td>
<td>845 13 Driving instructor</td>
<td>Specialist</td>
</tr>
</tbody>
</table>

Source: Federal Employment Agency 2016b

* The 2010 classification of occupations was developed by the Federal Employment Agency and has been valid since 1 January 2011.
** Excluding medical technology, optometry and dental technology.
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Telecommunications relay service: gebaerdentelefon@sip.bmas.buergerservicebund.de

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Service for the deaf/hard of hearing:
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