B 2 SKILL SHORTAGES AND INNOVATION

In the decades to come, Germany's potential labour supply will be subjected to systematic, long-term transformations caused by demographic change. Both the number of persons who enter the job market and the number of young employees are decreasing in relation to the number of older employees. This will lead to an ageing, or rather, a lack of rejuvenation, of businesses.[158] At that point in time, it will not be possible anymore to meet new qualification requirements by hiring young persons who newly enter the labour market.

In addition to this, the structure of demand for goods and services is also subjected to change. One of the reasons for this is the ageing of society as a whole; another reason is an increase in the economy's knowledge intensity. As a result of these structural changes, demand for certain qualifications will increase disproportionately while others will somewhat decrease. Those occupational fields that are growth-oriented can be expected to display a shortage, while other vocational fields will be characterised by an oversupply. This will lead to the necessity to shift qualified personnel between different occupational fields and groups of products. According to recent estimates,[159] it is to be expected that by 2050 more than one sixth of jobs will have to be restructured, i.e. shifted.

A sufficiently large pool of suitably qualified, highly skilled labour is a crucial prerequisite for maintaining the innovative strength and competitive edge of German businesses and Germany as a location. This, in turn, will be a crucial prerequisite for securing sustainable financing for maintaining Germany's social insurance system.[160] Against this background, the process of demographic change poses a major challenge that has to be addressed swiftly and sternly. To address these issues, the Expert Commission suggests the following approaches in particular:

– Education and training policies for adjusting the qualifications structure of the workforce
– Operational measures for utilising and maintaining the valuable qualification of older employees
– A more efficient use of the so-called "hidden labour market reserve", i.e. a skilled female workforce that is not active in the labour market, and its underlying qualification potential
– A migration policy that allows to tap on international qualification reserves.[161]

Developing education and training policies

Policies for vocational education and training are particularly important factors in dealing with Germany's skill shortages. While the public sector is certainly called upon here, businesses and individuals, too, will have to engage in further training so as to contribute to providing Germany with a suitable qualification structure.

Unlike many other countries, Germany has two main pillars that provide for a solid qualification for those entering the job market: the dual vocational training system, and the higher education system. Whenever Germany's training system is being discussed, the dual vocational training system is often somewhat forgotten. Given the relevance of the dual system, it should be ensured that, despite the decrease in school-leaving cohorts, sufficient numbers of well-qualified school leavers will be attracted to entering dual vocational training.

As regards developments in the higher education system, the Expert Commission expresses its concern about the fact that the proportion of graduates with engineering degrees has been continuously decreasing when compared with the total number of graduates.[162] In 1998, the proportion of graduates with an engineering degree was still above 20 percent and thus higher than the OECD average. By 2007, this number had decreased to 12 percent, a value that is just about within the OECD average (cf. Table 4).

The proportion of graduates from the fields of life sciences, physics and agricultural sciences has also decreased over time, while the proportion of graduates from mathematics and computer sciences has increased slightly, albeit at a low level, thus mildly exceeding the current OECD average. Due to a continuous increase in new enrollments, the absolute number of students in MINT subjects has increased, yet engineering programmes in particular have benefitted less from this increase than other fields of study. (cf. Figures 9, 10)

TAB 04 **Proportion of tertiary graduates in engineering and natural sciences subjects of all graduates in 1998, 2000, and 2005 to 2007 in international comparison** (figures in percent)

	1998	2000	2002	2005	2006	2007
Engineering, manufacturing, civil engineering						
OECD average	14	13	13	12	12	12
Germany	20	19	18	16	13	12
Life sciences, physics, agricultural sciences						
OECD average	9	9	8	7	7	7
Germany	12	11	10	10	9	9
Mathematics, computer sciences						
OECD average	4	4	5	5	5	5
Germany	5	5	5	8	8	8
Technical/natural sciences subjects in total						
OECD average	27	26	26	25	24	24
Germany	38	34	33	33	29	29

Source: OECD (2011): *Bildung auf einen Blick* (Education at a Glance), Tab. F5-20web.

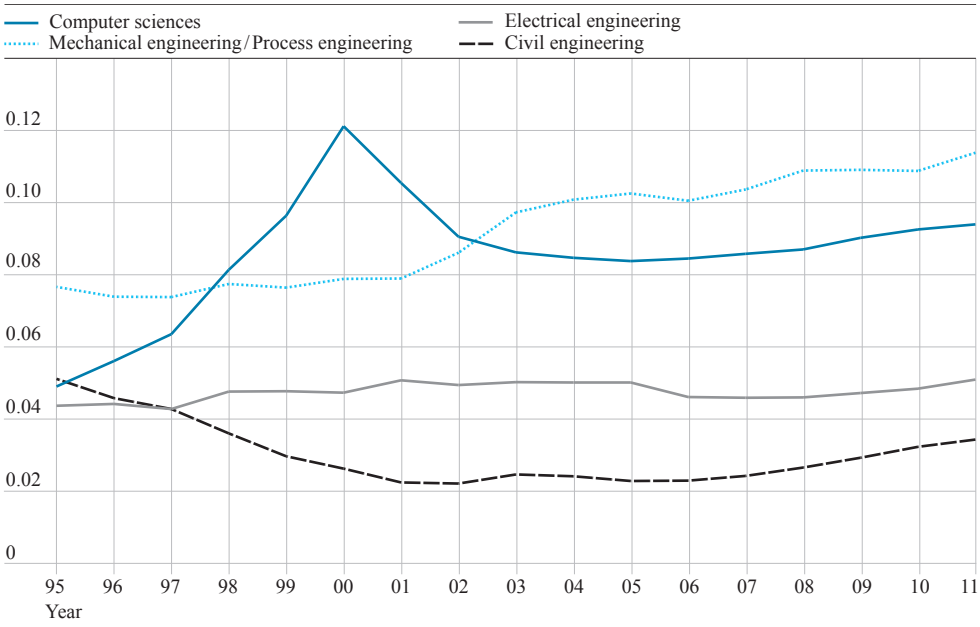
Figure 9 clearly demonstrates that, when measured against the overall number of new enrollments, the proportion of first-year students especially in electrical engineering and civil engineering has remained fairly stable over the last two decades, while the proportion of students in mechanical engineering has increased slightly. Striking evidence also exists for a rapid rise in the proportion of computer sciences students prior to the bursting of the dotcom bubble, and an almost equally rapid downturn following the bursting, which ultimately led to a stable medium position within the MINT subjects group.

Figure 10 further shows that the absolute number of students in electrical engineering and civil engineering at German higher education institutions has barely increased over the last two decades, while the total number of students has increased dramatically over the same period of time. This goes to show that engineering study programmes – with the exception of mechanical engineering – have only marginally benefitted from this significant growth in student numbers.

Yet, a high number of graduates from engineering sciences would be particularly relevant as a higher proportion of engineering graduates is generally accompanied by an increase in macroeconomic growth. This has been suggested by important studies on the correlation between the proportion of different academic subjects and a country's economic growth.[163] Hence, one of the main challenges in developing Germany's higher education system will be the implementation of education policies that succeed to attract sufficient numbers of students to those fields of study that are growth and innovation-oriented.

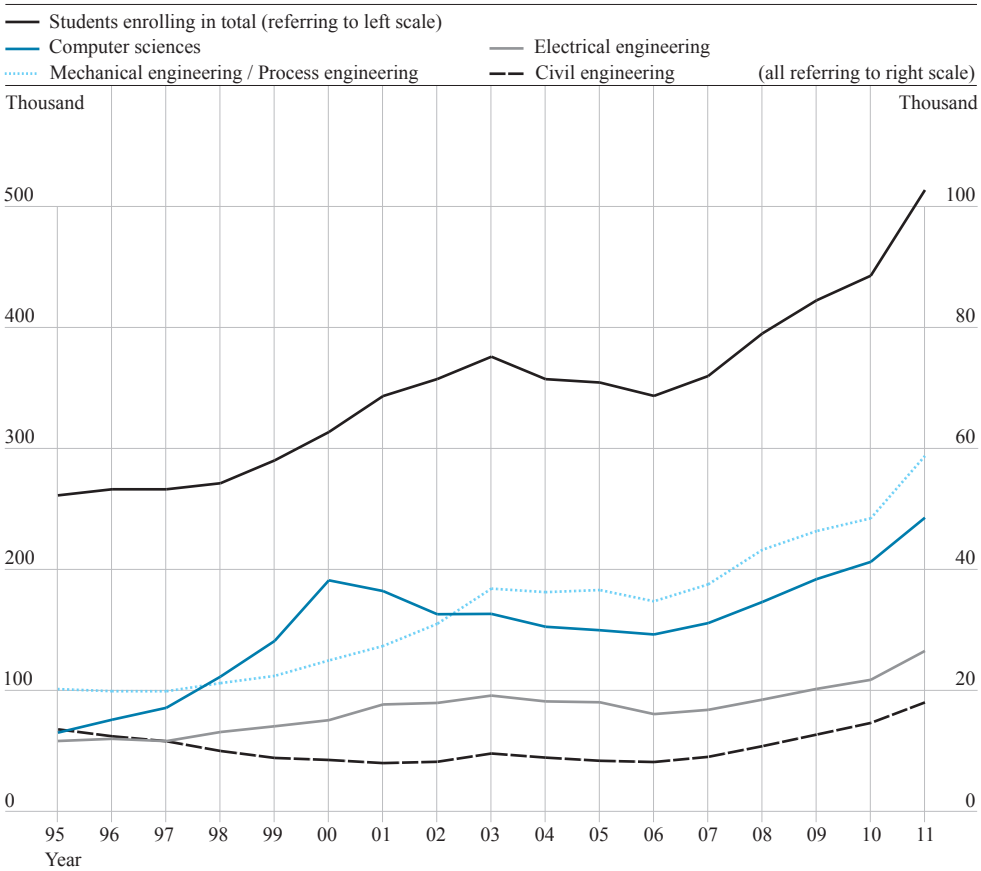
All the same, the structural transition caused by Germany's demographic change cannot be overcome by primarily focussing on those entering the labour market – regardless of whether they are graduates of the dual system or tertiary graduates. Instead, the existing labour force will have to be supplied with systematic training and qualifications. This means that the system for further training is becoming ever more important. Yet, at this stage, Germany is so far not well prepared to take on this challenge. To avoid excessive windfall profits, the primary goal of public support measures should be to increase the participation of underrepresented groups of society in further education measures. Others, e.g. the large majority of participants in further training are already reaping individual benefits from participating in continuous training. Given the increase in demand for highly skilled employees, it is in fact in the employees' own interest to enhance their efforts in vocational training.

Proportion of students enrolling in MINT subjects of all students enrolling (1995–2011) FIG 09



Source: Federal Statistical Office (*Statistisches Bundesamt* 2011): *Bildung und Kultur, Schnellmeldungsergebnisse der Hochschulstatistik zu Studierenden und Studienanfänger/-innen*, preliminary results for the winter semester of 2011/2012, Wiesbaden 2011, p. 13.

Absolute growth in the number of students enrolling FIG 10



Source: Federal Statistical Office (*Statistisches Bundesamt* 2011): *Bildung und Kultur, Schnellmeldungsergebnisse der Hochschulstatistik zu Studierenden und Studienanfänger/-innen*, preliminary results for the winter semester of 2011/2012, Wiesbaden 2011, p. 11 ff.

Those groups of employees that have been underrepresented – primarily low-skilled workers, immigrants and persons with disabilities – should receive more training, which will better prepare them for the ongoing structural change and the different qualification requirements that are associated with it. As a matter of fact, vocational training as it is today is not a means of compensating for a lack of training in the past; rather, it is sharpening existing differences within the workforce.[164] In order to activate disadvantaged groups of employees, the use of education vouchers is recommendable. Experimental studies have shown that education vouchers prove to be useful and efficient instruments, provided that certain criteria are met.[165] As regards the contents of further training, government intervention or support is required especially in those cases where training candidates are lacking essential basic skills that are a prerequisite for participating in further training. These skills include reading, writing and arithmetic, but also the use of information technologies and new media.

Businesses must also become more committed to providing continuous training and development options in the workplace; especially with regard to low-skilled workers.The willingness of low-skilled workers to get involved in training measures is likely to increase if training options are provided onsite.[166] One of the challenges will be to train low-skilled workers who are employed in small enterprises, since participation in further training proves to be particularly low in small enterprises. This is an issue that appears to be even more pressing as approximately 60 percent of employees in Germany work for small and medium-sized companies.[167] Thus the relatively low participation rate of small and medium-sized enterprises in further training is posing a major problem to the objective of lifelong learning.[168]

Not only the anticipated structural changes in the demand for goods and services, but also the economy's knowledge intensification is creating substantial changes in Germany's labour market. To address the issues emerging from this, occupational mobility will have to be increased both horizontally and vertically. In order to improve horizontal mobility, it is particularly important to grant acknowledgement for skills acquired in professional life, and also to provide qualification components which employees might have missed out on earlier. To improve vertical mobility and to keep the dual vocational training system attractive, the institutionalised further education system and the permeability of the higher education system have to be improved. In the course of this development, the higher education sector will be under increased pressure to provide attractive, academically sound options for further education qualifications. If not sooner, the pressure is expected to increase once the number of first-year students drops as a result of demographic change.

This development will further promote the process of differentiation and division of labour that is currently underway in Germany's higher education system. In the future, higher education institutions will have to sharpen their profiles and highlight more clearly their individual comparative advantages, while positioning themselves based on individually defined "roles and missions". None of the higher education institutions will be able to cater for the whole academic range, i.e. first-class basic research, application-oriented development, training of top researchers, training of first generation students, provision of full-time study programmes and part-time degrees for professionals. Therefore it is vital that higher education institutions develop a distinguishable profile. Depending on a university's focus, this differentiation process will also have to be designed according to different sources of financing (i.e. public sector, private sector, individuals). In the course of this process, new types of collaboration between universities and universities of applied sciences may also emerge. However, the comparative advantages of such collaborations should not blur the differences between these two types of education institution.

Improving conditions in the school system – promoting MINT subjects from an early age

The foundations for lifelong learning and occupational flexibility are laid in the school system. Because of this, it is important to also systematically improve and strengthen the German school system. Drop-outs are still too frequent a problem in Germany, and the public sector does not sufficiently cater for children from low socio-economic backgrounds. Thus, in the most recent PISA survey, the proportion of German children from low socio-economic backgrounds who made it to the upper third of (national or international) results was dramatically

low in international comparison.[169] Test results of economically disadvantaged children were especially weak if the children did not speak the respective national language at home and if their school offered only a low number of mandatory classes in science subjects.[170] Therefore, education policy should ensure to promote the language skills of children from a migrant background. In addition to that, the choice of courses in science subjects should be expanded and adapted to the requirements of disadvantaged groups. Contrary to popular assumptions, barely any evidence exists to prove the hypothesis that a school's equipment has a positive impact on the success of children from low socio-economic backgrounds. Instead, a much more important factor seems to be the pupils' self-assessment and self-esteem, as well as the study time invested.[171]

The important role of science subjects in schools has also been emphasised in other research publications. When choosing their course of study, male first generation students, i.e. tertiary students whose parents do not have an academic education, most frequently choose mechanical engineering degrees (28 percent), followed by business studies (17 percent), mathematics/computer sciences (12 percent) and electrical engineering (9 percent). The selection of an engineering programme is particularly likely among individuals who had chosen MINT subjects as their advanced courses in upper secondary school. As regards female first generation students, the teaching professions have proven to be the most typical field of study.[172]

Extending the period of work – making better use of older employees' talents

As a supporting measure to master the challenges of demographic change, it is also important to ensure that older employees remain in the labour force for longer. New empirical studies demonstrate that there is no evidence for the naive assumption that elderly employees generally perform less efficiently than their younger counterparts. On the contrary, it has been shown that performance may vary throughout one's professional life, and that older employees, too, are characterised by a high ability to learn and a strong willingness to engage in further training.[173] To extend the duration of peoples' working lives, it is necessary to revise pension-related regulations and, even more importantly, to adjust companies' organisational structures.[174] The latter entails a greater use of teams of mixed ages, as well as workplaces that promote learning; both measures contribute to maintaining the mental fitness of older employees.[175] It is here also essential to find the ideal balance between age structure and operational organisation. Approaches for achieving such balance have been presented e.g. in the context of the recent "Demopass" project.[176] To complement these efforts, the idea of lifelong learning will also have to be advanced, and valuable human capital will have to be sustainably utilised via "second careers", i.e. employment in different fields of work, taken up at a later stage of an extended working life.[177] Second careers are especially suitable in cases where continued employment in traditional occupational fields is not an option due to age reasons.[178] Provided that such employment is more easily found e.g. in the services sector (as opposed to the industrial sector), an enhanced permeability between different types of qualifications could facilitate access to a second career. Again, lifelong learning and the systematic acknowledgement of skills acquired during one's professional career will play a key role in this process.

The implications and consequences of extending the working life of older employees still produce a range of unresolved issues from various disciplinary perspectives. To address these issues, the Federal Cabinet has launched its cross-departmental "Research Agenda of the Federal Government for Demographic Change", a research plan that focusses on older employees' later working life. Adopted in November 2011, the agenda can be regarded as a major contribution to developing solutions to this problem. In the light of the current demographic change, and the challenges to the social insurance systems that are resulting from this, there is no doubt about the necessity to extend the duration of working lives.

Utilising the labour market's "hidden labour market reserves"

Compared with other countries, Germany possesses extensive "hidden labour market reserves", i.e. a qualified female workforce that is not active in the labour market. Thus the participation of women in the labour market is rather weak when compared with other industrialised countries. Although

participation of women in the labour market has increased, there are still six million women of working age who are economically inactive. Many of these have obtained mid-level and higher qualifications but do not contribute their skills to the labour market. What is more, only 55 percent of women who are economically active work on a full-time basis,[179] which puts Germany second from last in EU rankings. Moreover, when it comes to part-time employment, the average number of weekly hours worked by women is slightly below 18; this is a very low value that puts Germany last from among all of the EU-15 countries.[180]

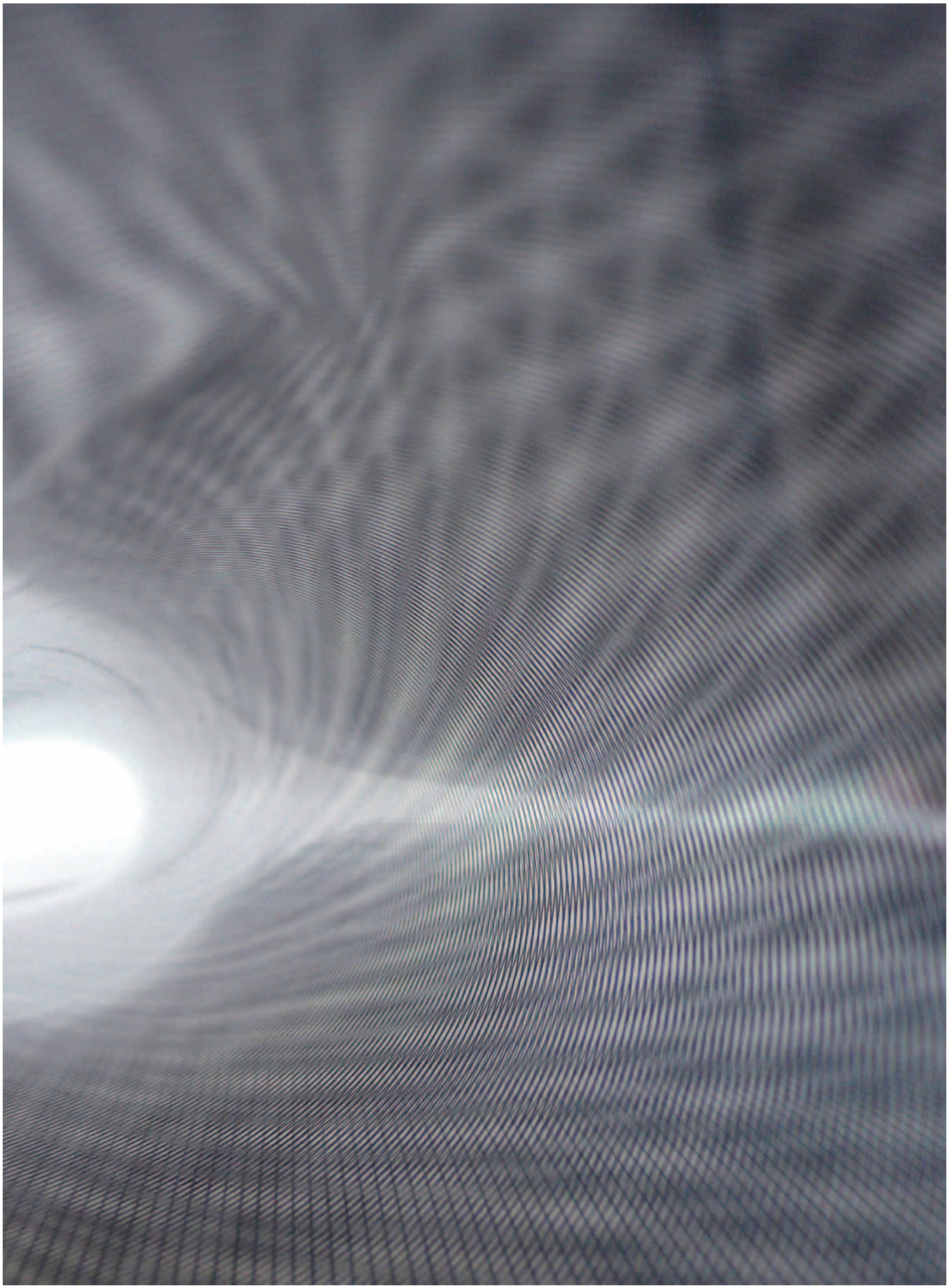
Here, efforts should be made to integrate women into the labour market during and after having a family. Again, further training – during and after parental leave – will play a major role. Another important objective is to reconcile work and family life in order to improve womens' willingness to return, and their opportunities for returning to the workforce. Successful examples in this regard include the "Women in technical professions" (FiT) programme[181] that was launched by Cologne-based Ford-Werke GmbH, as well as measures launched by Airbus S.A.S. in Hamburg, which aim at increasing the proportion of women on apprenticeship, skilled labour and management levels.[182]

Given the strategic importance of the female labour force potential, the issue of reconciling work and family life should no longer be regarded as a womens' issue, unless we are willing to accept the risk that the "hidden labour market reserves" be utilised at the expense of a further decrease in population due to a decrease in birth rates.[183] Women must be given a clearer message that they are needed and welcome in the workplace with or without children. It must be highlighted more clearly to men that they are needed and welcome in the domain of child-rearing and family labour. Unfortunately, tax regulations such as the *Ehegattensplitting* – that is, the taxation of the total income of a married couple on the basis of equal halves – has a negative effect on women mostly, since the spouse with the lower income will be disadvantaged in terms of tax deductions. This creates a disincentive primarily for women to engage in paid labour as women are often those with the lower wage. Similarly, social benefits such as the planned childcare supplement for parents who are not engaged in paid labour create further incentives for staying outside the labour market. In short, any provisions that create an incentive mostly for women to refrain from work, or to work only to a minor extent, have a detrimental effect on Germany as an innovation location. Such provisions should be abolished, or not be implemented at all.

Another important issue to be addressed is the rather one-sided choice of young women when deciding on their course of studies, as MINT subjects in particular are being largely disregarded. When compared on an international scale, it appears that the proportion of female graduates from science subjects had increased disproportionately from 32 percent in 2000 to 44 percent in 2009 (i.e. 12 percentage points). Yet, the proportion of female graduates from engineering programmes largely remained at its low starting level (cf. Table 5). It merely increased by 2 percentage points, from 20 percent to 22 percent. Thus, in 2009, the proportion of female engineering graduates in Germany was even further below the OECD average than it was in 2000.[184] Still, Germany managed to surpass OECD levels with a highly disproportionate increase in female scientists within the same period of time.[185] This suggests that women in Germany do not generally dislike study programmes from the MINT subjects group. More likely, it is engineering programmes that seem to have only little appeal to women. Stakeholders from politics, science and business should not take the current dislike as a given – instead, they should take suitable measures to catch up with countries such as Denmark, Estonia, Iceland, Poland, or Spain. All of these countries have managed to increase the proportion of female graduates in engineering degrees to approximately one third of the total of engineering graduates.

In Germany, the number of female graduates from tertiary institutions has increased significantly over the last years. Yet, this increase is almost exclusively on the account of arts and humanities, while engineering programmes remain to be unattractive to women (cf. Table 6).[186]

A more detailed breakdown of academic fields available in Germany, based on data from the Federal Statistical Office, further demonstrates that since 1995 the increase in female graduates has been particularly evident in veterinary medicine (a course of study that has almost turned into an all-female domain) and in the fields of human medicine / health



5/10 Moiré effect: line pattern

6/10 Accelerated movement of elements with reflective surfaces

Proportion of women among graduates from higher education institutions in engineering and natural sciences subjects (2000 and 2009) in international comparison (figures in percent) TAB 05

	2000			2009		
	Total	Engineering*	Natural sciences	Total	Engineering	Natural sciences
Country						
Australia	57	22	41	56	25	37
Denmark	49	26	42	60	32	37
Germany	*45*	*20*	*32*	*55*	*22*	*44*
Finland	58	19	46	63	23	46
France	56	24	43	54	29	38
Great Britain	54	20	44	56	23	38
Iceland	67	25	49	66	35	40
Japan	36	9	25	41	12	25
Canada	58	23	45	60	24	49
Netherlands	55	13	28	57	19	21
New Zealand	61	33	45	61	30	44
Norway	62	27	28	61	25	37
Austria	46	18	33	54	26	33
Poland	64	24	65	65	34	44
Sweden	59	25	47	64	28	46
Switzerland	38	11	24	50	19	33
Spain	59	27	47	60	34	42
South Korea	45	23	47	46	23	39
Hungary	55	21	31	65	24	35
USA	57	21	44	58	21	44
OECD average	**54**	**23**	**40**	**58**	**26**	**41**

* Engineering, manufacturing and construction
Source: Figures according to Lesczensky et al. (2012).

sciences. These are followed, albeit at a considerable distance, by agricultural sciences / forestry / nutrition sciences, as well as law / business and social sciences (cf. Table 7).

Recent empirical studies on the career progress of pupils who had obtained their study entrance qualification in 2006 demonstrate that the more technical fields of study, electrical engineering and mechanical engineering, are increasingly turning into an all-male domain, while gender-specific differences in other fields of study have changed only little since 2002. The surveys were conducted on the basis of data from the Higher Education Information System (HIS).[187]

The Expert Commission speculates that the low proportion of women in engineering programmes cannot be overcome on the basis of education policy measures alone. The choice of a study field or occupational area seems to be closely linked with the graduates' anticipated employment opportunities and working conditions, as well as the perceived opportunities for reconciling work and family life in the respective occupational field. Women will become more interested in taking up engineering degrees if and only if companies can offer technical, engineering-related jobs that are attractive to women. Recent empirical studies have examined the underlying reasons for the significantly low proportion of women in German technical/engineering programmes. One of the findings was that a major reason for gender-specific differences in the choice of a study programme lies in differences in life and career planning patterns.[188] Another reason, which is even more important, is that women tend to perceive that they have no comparable advantages when it comes to technical skills.

TAB 06 **Proportion of women among graduates according to subjects in 2009 and 2000: Germany and the OECD in comparison** (figures in percent)

	All subjects groups	Education sciences	Humanities and arts	Health and welfare	Social sciences, business and law	Services	Engineering, manufacturing and construction	Natural sciences	Agricultural sciences
2000									
OECD average	54	74	65	68	52	43	23	40	43
Difference to OECD	−9	−3	2	−12	−10	15	−2	−8	4
Germany	45	71	67	56	42	58	20	32	47
2009									
OECD average	58	77	66	75	58	54	26	41	52
Difference to OECD	−3	−4	7	−7	−6	2	−4	3	1
Germany	55	73	73	68	52	56	22	44	53

grey fields: proportion in Germany below OECD average; blue fields: proportion in Germany above OECD average.
Figures according to OECD (2011): *Bildung auf einen Blick* (Education at a Glance), p. 101.

TAB 07 **Proportion of female higher education graduates* among all graduates from first-degree studies for the years 1995, 2000, and 2005 to 2008 according to subjects groups** (figures in percent)

		Subjects groups**								
Year of final exams	Graduates (male and female) from all subjects groups	Linguistics, cultural studies	Sports	Law, business and social sciences	Mathematics, natural sciences	Human medicine/ health sciences	Veterinary medicine	Agriculture, forestry and nutrition sciences	Engineering	Art and art-related subjects
1995	41.2	72.2	51.9	45.3	37.5	44.6	63.8	47.0	14.0	63.1
2000	45.6	72.7	53.5	46.3	38.3	47.6	77.8	51.9	19.5	64.7
2005	50.8	76.8	49.9	52.2	39.6	57.3	85.2	56.8	22.4	65.3
2006	51.6	77.1	51.1	52.8	40.3	60.4	84.6	57.1	22.5	66.0
2007	51.8	77.2	50.7	53.0	40.1	62.1	85.6	57.9	22.7	66.0
2008	52.2	77.2	49.7	53.2	40.9	64.2	86.7	57.7	22.8	66.5

* including public administration universities of applied sciences
** Breakdown does not include the subjects group “other than fields of study classified”
Source: Statistical offices of the Federation and the *Länder*, higher education statistics.

Government programmes such as the "Go MINT!" initiative, which was launched as part of the National Pact for Women in MINT Careers, but also promotional programmes from research facilities and businesses such as FiT, FEMTEC and Girls' Campus[189] are certainly steps in the right direction. These initiatives reflect a growing social awareness for the necessity to attract more women to professions in the technical/sciences occupational fields.

Managing and shaping migration flows

Finally, it is up to national migration policy to meet the structural shortage of specialists that will remain in spite of the introduction of the above-mentioned measures. This has to be done swiftly, and with a sustainable outlook. Efforts to improve integration of foreign employees will have to be advanced on all qualification levels. The priority review has already been abolished in shortage occupations. This step is pointing in the right direction, and so is the planned reduction of income thresholds for foreign employees. The points system employed by the Canadian government as an instrument for managing migration can be regarded as an appropriate advancement in migration policy. At the same time, policy-makers have to ensure that an influx of qualified migration is not perceived as a threat but rather as an opportunity for Germany and its domestic employees.

A necessary prerequisite for introducing such a points system will be the recognition of foreign educational qualifications. With its "Recognition Act", to come into effect on 1 March 2012, the Federal Government has now created a modern basis for the recognition of foreign professional qualifications.[191] The new "Assessment and Recognition of Foreign Professional Qualifications Act" entitles citizens of EU member states and third-country nationals to apply for an individual equivalence review. In the past, the exercise of a profession and access to such recognition procedures, had been reserved for individuals with German citizenship or citizenship from other EU countries; a regulation that affected a wide range of occupational fields in Germany. The new legislation largely abolishes this linkage to a person's citizenship. Based on the new law, a Turkish medical doctor for instance can obtain a doctor's licence provided that he or she meets the professional requirements. Previously, this could not be done – even if the doctor had completed his or her studies in Germany.[192]

According to the new law, the decision regarding the equivalence or non-equivalence of a qualification is due within the course of three months. The Recognition Act aims to simplify and improve the inconsistent practice of assessment that had previously been in place. The implementation of the assessment procedures falls to the federal states, which are entitled to bundle responsibilities for recognition procedures according to regions of origin or occupational groups.

A more open migration policy will most likely not result in a massive influx of foreign workers, as has often been assumed. The following recent example

BOX 09

The Canadian points system for managing migration

In the view of the Expert Commission, the Federal Government should develop a system to facilitate immigration of highly qualified workers. This could be implemented based on the model employed by countries such as Canada or Australia. The launch of an immigration system would contribute to strengthening economic growth in Germany. Immigration into Canada for instance is regulated based on the following criteria: completed education, language skills, work experience, age, presumed adaptability to the country, and availability of job positions. Canada, too, is currently undergoing a process of demographic change. Because of this, the Canadian approach is not oriented towards concrete employment but rather at attracting human capital as such. The Canadian approach thus aims to secure additional knowledge in an economy that is increasingly knowledge-based. The 2005 Canadian immigration law provides different regulations for the influx of highly qualified personnel such as scientists, teaching staff and senior managers: individuals who are able to demonstrate a high level of qualification can enter Canada more freely and take up employment more easily. However, the Canadian approach does not cater e.g. for specialist workers, who are actually sought after by the industrial sector. These are recruited via provincial complementary nomination procedures and temporary work programmes.[190]

BOX 10

Germany's new immigration law: the legislative proposal for implementing the "Blue Card" Directive

The Federal Government has amended its legislation for the immigration of highly qualified workers from non-EU member states. With its new immigration act, Germany seeks to establish easier and more attractive entry conditions.[193]

Once the German Parliament *(Bundestag)* and the Federal Council *(Bundesrat)* have granted consent, the new legislation could come into force in the second half of 2012. The legislative proposal is based on an EU Directive on the admission of highly skilled immigrants. The Directive also provides for the introduction of the "EU Blue Card", which entitles potential immigrants to a work and residence permit of up to four years. To obtain the EU Blue Card, applicants have to demonstrate that they have completed tertiary education and that their annual income is at least EUR 44,000. For highly skilled personnel from occupations that are subject to shortage, an annual income of EUR 33,000 suffices. Shortage occupations include all fields of engineering, academic and comparable staff in information and communication technology, as well as medical doctors. Provided all of these conditions are met, a priority review in favour of domestic employees will be abandoned in the future. After two years of employment subject to mandatory social insurance contributions, the holder of an EU Blue Card can obtain a permanent residence permit. Family members of such highly qualified immigrants are entitled to immediately take up unrestricted employment.

As regards the permanent residence permit, the Federal Government's legislative proposal goes beyond the provisions of the Blue Card scheme. Currently, to obtain an immediate permanent residence permit or settlement permit without the waiting period entailed in the EU Directive, highly skilled workers have to have an annual income of at least EUR 66,000. According to the new legislative proposal, this income threshold has been lowered to EUR 48,000 per year. However, if a person receives unemployment or social benefits within three years of obtaining the settlement permit, he or she will lose their unlimited residence entitlement.

According to the new legislative proposal, foreign graduates of German higher education institutions shall have one-year unrestricted access to the labour market to find employment that corresponds to their academic qualifications. According to the legal provisions that are currently in place, foreign graduates are allowed to engage in paid labour for only 90 days within that year. In addition to that, the procedure for providing researchers with work entitlement shall also be facilitated. In the future, the hosting agreement between the researcher and the research organisation will not have to specify a concrete research venture. The current regulation has often been criticised by research organisations as they felt they would disclose confidential information by specifying the exact title of a research venture.

The Federal Government's legislative proposal partially corresponds with the recommendations made by the German non-partisan initiative *Hochrangige Konsensgruppe Fachkräftebedarf und Zuwanderung* ("High-level Consent Group Skill Needs and Migration"). Yet, in several major points it falls short of the recommendations made by this panel of experts. The current immigration law provides for a general ban on recruiting new foreign labour, albeit with permit reservations. In the view of the Consent Group, recruitment should be generally permitted, and a ban reservation should be allowed for only in specific cases. The objective of such reverse policy is to clearly signal to highly skilled international workers that they are welcome in Germany.

The Expert Commission welcomes the existence of a non-partisan proposal for reform in a subject domain that is politically challenging. The Expert Commission is particularly in favour of complementing the German immigration law by adding criteria-based immigration options, as suggested by the Consent Group.[194]

may illustrate this. Since 1 May 2011, workers from the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Slovenia and Slovakia (known as the EU-8 countries) are entitled to immigrate to Germany without restrictions. All of these Central and Eastern European countries had become EU members in 2004. Contrary to concerns expressed before the enactment of these new regulations,[195] the number of immigrants from the EU-8 countries has increased only moderately. According to recent estimates from the Institute for Employment Research (IAB), net migration for 2011 amounted to 50,000 to 60,000 persons.

Compared with estimates for the period prior to the expiry of the interim provisions, these numbers are relatively low, which suggests that an increase in migration activity has not taken place. A much higher increase has been observed in the number of domestic employees whose country of origin is an EU-8 country. This suggests that persons who had been previously self-employed and persons who had been recorded by the labour market statistics as economically inactive have since taken up employment.[196]

To complement a migration policy that will attract qualified workers, it is also important to facilitate employment for foreign graduates who have successfully completed their studies in Germany and wish to remain. Migration policy and the legislation governing admission to higher education must be designed in a way that will attract the largest possible number of international top-class candidates, while at the same time providing simplified conditions (i.e. without elaborate tests) for those who wish to remain in Germany following their graduation. The abolition of the priority review for foreign graduates from German higher education institutions, and the provision of a one-year residence permit that enables graduates to seek suitable employment after the completion of tertiary education, are important moves in the right direction. At the same time, surveys among foreign university students show that the options available for remaining in Germany are often misperceived: thus, two thirds of the surveyed students stated that they could envisage staying in Germany following their graduation – only one third of surveyed students felt that they would be welcome on the German labour market and that it would be possible to remain in the country. This view was expressed by students from engineering and natural sciences[197] in particular; who indeed have the qualifications that will be increasingly needed in the future. This goes to show that, in addition to improving existing rules and regulations, it is also important to improve information policies and campaigning, with the aim of keeping the best foreign graduates in the country – a policy that is employed by traditional immigration countries such as Australia or Canada.

In view of the expected shortage of skilled workers, it is also worth considering attracting higher numbers of apprentices from abroad. This might in fact create a win-win situation with Southern EU member states or other countries that have a high youth unemployment rate. To integrate these young people into the workplace, priority should be attached to solving language issues from the start. Since a standard apprenticeship does not allow for time and financial resources that are required for learning an entirely new language, support from the public sector is particularly important here.

The measures outlined above should be complemented by systematic efforts to win back highly qualified German expatriates by offering them attractive working conditions. These efforts should be applied not only to experts from the science sector but also to engineers, managers and skilled workers.[198]

Maintaining and enhancing flexibility and mobility of the German education system

Given the demographic change anticipated, it is generally agreed that a future skills shortage is a very likely scenario. Yet, when it comes to identifying the very occupational fields that will be affected by this, no clear-cut answers have been provided yet. Projections that have been made so far either differ considerably or have not been very convincing in the first place.[199] Some of the surveys suggest that there will be a substantial shortage in higher education graduates as such; yet the subject-specific needs have not been outlined in detail. Other surveys, mostly those based on estimates from industries, increasingly indicate that there will also be a shortage in traditional German skilled workers in certain industries and certain regions. The Expert Commission believes that also in the future no clear-cut answers are to be expected, especially since the

industrial and technical development of knowledge-based economies is generally difficult to predict.

It is for precisely this reason that it is necessary to make the German education system more flexible. There are two main approaches for achieving this. First, training programmes will have to be designed in a way that provides graduates with more flexible employment options. This means that Bachelor's degrees will have to supply students with a solid basic knowledge that can be applied broadly and diversely. Only in a second step would students then obtain specialist knowledge through a Master's programme, or obtain a concrete occupational specialisation via vocational training programmes.[200] Second, Germany's education system will have to be further developed so as to ensure the highest possible degree of vertical and horizontal permeability.[201] This would also imply that education policy cannot solely focus on guaranteeing the largest possible number of tertiary graduates. Instead, education policy-makers should aim to provide high-quality education on all levels and to create maximum permeability between vocational and academic training programmes.[202] An emphasis on increased permeability would also pay justice to the fact that the emerging need of skilled personnel cannot be fully covered by persons who have newly entered the job market. Instead, it takes into consideration those persons who are already part of the workforce and embark on further education.

In this regard it is also worth keeping in mind that the combination of dual vocational training and academic tertiary training constitute the main pillar of the German innovation system. Thus other education systems that have a stronger focus on the higher education sector cannot provide a useful reference point for the further development of the German education system. These systems keep increasing their numbers of university graduates to solve the problem of the qualification shortage in the workforce. Due to Germany's functioning dual vocational training system, this issue does not exist to such a great extent.

Recommendations: increasing permeability of the education system – making better use of labour force potentials

German education policy will have to focus on increasing vertical and horizontal permeability of the entire education system. A sustainable education policy for Germany cannot solely focus on ensuring a sufficient number of tertiary graduates; it must also provide the highest possible quality of education on all levels, particularly apprenticeship graduates, while at the same time allowing for maximum permeability between vocational and academic training programmes. Both the dual vocational training system and the higher education system will have to be strengthened.

In the face of decreasing pupil numbers, the attractiveness of the vocational training system will have to be highlighted more clearly. The aim is to attract sufficient numbers of qualified secondary drop-outs to take up dual vocational training.

To increase vertical mobility and maintain the attractiveness of dual training places, formal continuous training measures and the permeability of the higher education system will have to be further developed. This however requires that higher education institutions sharpen their profiles to a much greater degree; a task which some of the universities will then treat as one of their priority issue.

In the future, higher education institutions should focus much more on their comparative advantages and strive to position themselves on the market, based on their defined "role and mission". While in recent years the emphasis had been on vertical differentiation, e.g. within the framework of the Excellence Initiative, increasing attention should now also be paid to horizontal differentiation between educational facilities. The spectrum of profile-building options is broad and has to be adjusted to the different financing options available. These may range from public sector funding to foundation-based funding and corporate funding, or tuition fees within the framework of "executive education" models.[203] In terms of contents, the scope of options comprises basic research, application-oriented development, as well as initial training, further training, full-time study programmes and part-time courses for working professionals. When developing one's profile, thought

TAB 08

Drop-out rates* for German students in first-degree studies in 2006 according to subjects groups, types of diploma and selected fields of study (figures in percent)

Student drop-out rate in percent	Total	Male	Female
Total	21	26	15
Universities	20	25	16
Universities of Applied Sciences	22	26	14
According to type of diploma			
Diplom / Magister	26	–	–
Staatsexamen	7	–	–
Bachelor's	30	–	–
Bachelor's Universities	25	34	19
Bachelor's Universities of Applied Sciences	39	42	35
Universities (field of study, subjects group)			
Linguistics, cultural studies, sports	27	35	24
Linguistics, cultural studies	32	–	–
Education sciences, sports	20	–	–
Law, business, social sciences	19	24	14
Social sciences	10	–	–
Law	9	–	–
Business	27	–	–
Mathematics, natural sciences	28	31	24
Mathematics	31	–	–
Computer sciences	32	–	–
Physics, geology	36	–	–
Chemistry	31	–	–
Pharmacy	6	–	–
Biology	15	–	–
Geography	15	–	–
Medicine	5	3	6
Human medicine	5	–	–
Dentistry, veterinary medicine	3	–	–
Agriculture, forestry, nutrition sciences	7	14	2
Engineering	25	28	16
Mechanical engineering	34	–	–
Electrical engineering	33	–	–
Construction	16	–	–
Art	12	17	10
Teacher training	8	8	8
Universities of Applied Sciences (field of study, subjects group)			
Business, welfare	19	28	13
Welfare	13	–	–
Business	24	–	–
Mathematics, natural sciences	26	25	32
Computer sciences	25	–	–
Agriculture, forestry, nutrition sciences	12	16	9
Engineering	26	28	19
Mechanical engineering	32	–	–
Electrical engineering	36	–	–
Construction	14	–	–

* Calculation method according to the Higher Education Information System (HIS), excluding foreign students and excluding second-degree students. The student drop-out rate is calculated as the quotient of final year graduates and university entrants of the respective years of enrollment (cf. www.his.de/pdf/pub_kia/kia200501.pdf for more detailed information on this procedure.)

should also be given to developing a system that offers a wide choice of Bachelor's study programmes, combined with more specialised Master's and further training programmes. Moreover, new forms of collaboration should also be considered, e.g. between universities and universities of applied sciences, between the higher education sector and the private sector, and between higher education institutions and non-university research institutions. Education policy-makers should support the development and implementation of new, ambitious profiles by providing suitable financing incentives and experimental clauses.

To complement this process, higher education institutions will have to ensure study conditions that make innovation-oriented and growth-oriented study programmes, and engineering programmes in particular, more attractive as an option. The same has to be achieved on the part of the private sector: again, businesses have to make an effort and design work places in a way that will make these occupational fields more attractive to the public. Here, the important target group of women should be taken into consideration as much as possible.

Since the foundations for choosing a study programmes in natural sciences/technical fields are laid in primary and secondary school, the range of hard sciences subjects should be broadened and adapted to the needs of social groups that have been disadvantaged in the past. Furthermore, schools have to even more vigorously promote language skills of children from migrant backgrounds, since language skills are one of the major prerequisites for successfully participating in any type of further education.

The continuing training system has to be further developed in a way that promotes the participation of employees who have been underrepresented in the past. Disadvantages or shortcomings in initial education have to be levelled out through further education. The support of the public sector is particularly important in those cases where potential training participants are lacking basic skills that are a prerequisite for taking part in continuing training measures. If a person lacks reading, writing, or arithmetic skills, or lacks basic knowledge in new information technologies, he or she will not be able to successfully participate in most of the training measures available. Employees and apprentices from migrant backgrounds who have insufficient German language skills are particularly affected by this predicament.

In addition to this, efforts to integrate foreign employees into the German labour market have to be increased on all qualification levels. The Expert Commission welcomes measures such as improved immigration regulations for tertiary graduates, well-qualified foreigners and foreigners participating in an apprenticeship, as well as an improved information policy regarding residence options available. These recruiting activities should be flanked by measures aimed at fostering public awareness for the need for immigration and at promoting societal support for the integration of foreigners.

Concerted efforts in several policy areas must be taken to motivate those women who are currently part of the "hidden labour market reserve" to use their talents and skills on the labour market. In the future, women must be given a much clearer message that they are needed and welcome in the workplace, with or without children. Men must be given a much clearer message that they have to take on more responsibility in raising children and doing domestic work. Tax regulations such as the previously mentioned *Ehegattensplitting* and social benefits such as the planned childcare supplement create an incentive primarily for women to stay away from the job market. Considering Germany's demographic development, this is something that cannot be justified from a macroeconomic perspective.