

Global Talent Mobility, Innovation and Growth

**Global Talent Attraction and Retention.
Case Study: Germany**

**Aoi Saginuma
Martin Geiger
Nicola Deuticke
Evelyn Rothkranz**

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This report examines the recruitment and retention of highly skilled professionals and international students in the case of Germany. The aim of this study is to foster a deeper understanding of the role that policy programs and industry strategies play in attracting and retaining migrant professionals in STEM (Science, Technology, Engineering and Mathematics).

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For further information, visit <http://globalmobilityoftalent.info>, join us on Twitter [@migrateinnovate](https://twitter.com/migrateinnovate), or contact Dr. Martin Geiger, Carleton University at martin.geiger@carleton.ca

Table of Contents

Key Messages	1
I. Economic Situation and STEM Sector	2
II. Employment and STEM Workforce	25
III. Global Talent Recruitment and Retention	34
IV. Stakeholder Viewpoints	45
Conclusions and Recommendations	54

Key Messages

- **The largest economy in Europe and 4th strongest in the world, Germany has maintained its strong reputation due to its stable economy based on automotive manufacturing, mechanical engineering, machine and electrical industry, and chemical production.**

Germany is an innovative and competitive economic hub in Europe due to the size of its heavy industry and industry-focused investments. The German economy is largely reinforced by the automotive industry as well as engineering and related services. It is noticeably unique that these industries are dependent on family owned small and medium sized enterprises called *Mittelstand* instead of large companies, representing the majority of businesses in the country. *Mittelstand* companies have played a crucial role due to their stable, longstanding localized business operation style, as well as their strong alliances with major suppliers. Ideas which are crucial to market improvement and innovations are also often made by *Mittelstand*.

- **Germany has been facing a severe demographic change, namely a rapidly aging population, and related labour shortage throughout the country that should support the country's industries especially in the STEM field due to digitalization. There is a strong demand for skilled workers and immigration is a key to filling the skills gap and addressing the declining working population and lack of experts.**

Germany is one of the most known countries for aging society. Coupled with the demand for digital technology, firms in Germany have experienced difficulties in recruiting and retaining qualified high-skilled workers. The research shows that more than 50% of all companies in STEM view the shortage of skilled employees as a direct threat to their economic development. The government is required to establish effective policies to retain foreign skilled professionals in response to growing labour market demands.

- **The federal government has been making an effort to establish a suitable law framework to accept immigrants from other countries outside of the EU. The current issues to be addressed are complicated and diverse, including prolonged documentation and credential recognition processes as well as language barriers.**

While Germany has not been considered a welcoming country to immigrants for a long time, the government has been trying to attract immigrants since around the 2000s by renewing the Immigration Act. Several reforms were made particularly targeting highly skilled immigrant workers. In 2020, the *Skilled Immigration Act* was also newly introduced, effectively reducing legal barriers to immigrate to Germany. In the meantime, the federal government should review its overly complicated and time-consuming bureaucratic process of immigrant applications. Furthermore, it has been a major problem that while language training services are provided locally, a large number of firms are hesitant to hire foreign workers without enough language ability even if they have qualifiable technical skills.

I. Economic Situation and STEM Sector

Since 1980, Germany has been Europe's largest economy, followed by the United Kingdom (UK), France, Italy, and Spain.¹ It has maintained a positive annual gross-domestic product (GDP) rate since 2010 until the COVID-19 pandemic.² Prior to the outbreak of COVID-19, Germany's nominal gross-domestic product marked 3.89 trillion USD with 1.1% annual growth in 2019.³⁴ The growth rate significantly lowered to -3.7% in 2020 due to the global health crisis, however in 2021, the country's economy showed a recovery with 2.6% of the growth rate.⁵ As of 2021, Germany's nominal GDP recorded 4.22 trillion USD, establishing it as the 4th largest economy in the world after the United States (US) with 23 trillion, China with 17 trillion, and Japan with 5 trillion.⁶

Despite areas for improvement, the German economy is surely competitive and has one of the best performances in the European Union (EU) and the world. Prior to the pandemic, Germany ranked 7th on the 2019 Global Competitiveness Index published by the World Economic Forum (WEF), positioning it 3rd overall in Europe, behind the Netherlands (4th) and Switzerland (5th). The report highlighted the country's excellent innovation capability (1st in the world), macroeconomic stability (5th), educated labour force (5th), and infrastructure (8th).⁷ Germany's rank dropped by 4 positions compared to the year before, yet, the country notably features in the top 10 of seven pillars out of twelve, ranking first in two of them, and surpassing the OECD average on all pillars, with the exception of Information and Communication

¹ O'Neill, Aaron (2022), "Gross domestic product (GDP) of Europe's largest economies 1980-2026*", <https://www.statista.com/statistics/959301/gdp-of-europes-biggest-economies/>

² The World Bank, "GDP growth (annual %): Germany," 2022, <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=DE>

³ The World Bank, "GDP (current US\$): Germany," 2022, <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=DE>

⁴ The World Bank, "GDP growth (annual %): Germany," 2022, <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=DE>

⁵ The World Bank, "GDP growth (annual %): Germany," 2022, <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=DE>

⁶ Aaron O'Neill, "Countries with the largest gross domestic product (GDP) 2021, July 27, 2022, <https://www.statista.com/statistics/268173/countries-with-the-largest-gross-domestic-product-gdp/>

⁷ Klaus Schwab, *Global Competitiveness Report 2019*, Geneva: World Economic Forum, 2019, 16, http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

Technology (ICT) adoption.⁸ The WEF points out that the country's largest weakness is its relatively low level of ICT adoption, which ranked 36th, trailing behind all the Baltic and Nordic countries, some Gulf countries, China, and Russia.⁹ Remarkably, fibre optic broadband access remains the privilege of the few, with less than one subscription per 100 people, compared to 32 in Korea and 20 in Lithuania, for example.¹⁰ The report also suggested that Germany should recognize other issues which offer room for improvement, such as product market efficiency (9th), labour market functioning (14th), and the skills gap through the upskilling and reskilling of the current workforce, in addition to improving the employability of graduates (13th).¹¹

As of 2020, Germany has continuously maintained its top 10 ranking on the Global Innovation Index issued by the World Intellectual Property Organization (WIPO) since 2016 when it re-entered the top 10.^{12,13} In 2020, the country ranked 2nd in research and development (R&D) expenditures and remains the leader in patents by origin and logistic performance.¹⁴ Ten of the world's top 100 science and technology clusters are found in Germany, with Cologne (19th) and Munich (23rd) ranked among the top 25.¹⁵ Overall, the Index points out that the country has a good human capital and research system, while its weakest spot can be found in market sophistication.¹⁶

⁸ Klaus Schwab, *Global Competitiveness Report 2019*, Geneva: World Economic Forum, 2019, 16, http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

⁹ Klaus Schwab, *Global Competitiveness Report 2019*, Geneva: World Economic Forum, 2019, 16, http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

¹⁰ Klaus Schwab, *Global Competitiveness Report 2019*, Geneva: World Economic Forum, 2019, 16, http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

¹¹ Klaus Schwab, *Global Competitiveness Report 2019*, Geneva: World Economic Forum, 2019, 16, http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

¹² Soumitra Dutta, Bruno Lanvin, and Sacha Wunsch-Vincent, "Global Innovation Index 2019," *World Intellectual Property Organization*, 2019, xxi, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2019.pdf

¹³ Soumitra Dutta, Bruno Lanvin, and Sacha Wunsch-Vincent, "Global Innovation Index 2020," *World Intellectual Property Organization*, 2020, 12, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf

¹⁴ German Patent and Trademark Office "Global innovation index 2020", June 10, 2021, https://www.dpma.de/english/our_office/publications/background/globalinnovationindex2020/index.html.

¹⁵ Soumitra Dutta, Bruno Lanvin, and Sacha Wunsch-Vincent, "Global Innovation Index 2020," *World Intellectual Property Organization*, 2020, 44, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf

¹⁶ World Intellectual Property Organization, "Germany," *Global Innovation Index 2020*, 2020, 6, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020/de.pdf

While the economy has grown over the years with its share of added value being one of the highest in the world, Germany is simultaneously facing severe demographic changes, similar to other industrialized countries. According to a 2019 report published by the United Nations (UN), Germany has the 4th highest economic old-age dependency ratio in the world.¹⁷ In 2021, the population aged 65 or over accounted for approximately 18.3 million among the total German population of around 83.1 million.¹⁸ According to Statistisches Bundesamt [*Federal Statistical Office*], it is estimated that the number of people of retirement age (67 years and above) will rise by approximately 4 million to at least 20 million until the middle of the 2030s.¹⁹ Even though in 2014 and the following years the German population experienced an extraordinary increase due to the so-called refugee crisis in the Middle East,²⁰ this has had minimal impact on the ageing of German society and did not alleviate the shortage of qualified personnel.²¹ Due to rapid digitalization, the STEM sector, among others, is showing signs of an acute shortage of skilled workers and the currently projected immigration levels will not be sufficient to compensate for the developing labour shortage.²²

Germany invests an abundant amount of its GDP in R&D. The government has invested over 3% of its GDP in R&D since 2017, with 3.168% in 2019 and 3.130% in 2020.²³ The country recognizes R&D as one of the most important areas for the development of the national economy. German industry and the public sector have made a commitment to spend around 3% of the national GDP per year on R&D activities, totalling roughly 70 billion euros each year.²⁴ As previously mentioned, Germany is one of the highest spenders on

¹⁷ United Nations, Department of Economic and Social Affairs, “World Population Ageing 2019: Highlights,” 2019, *New York*, <https://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2019-Highlights.pdf>

¹⁸ World Bank, “Population, total: Germany,” (2022), <https://data.worldbank.org/indicator/SP.POP.TOTL?locations=DE>

¹⁹ Statistisches Bundesamt [The Federal Statistical Office], “Population projection,” *Population*, December 2, 2022, https://www.destatis.de/EN/Themes/Society-Environment/Population/Population-Projection/_node.html

²⁰ Mediendienst Integration [Media service integration], “Zahl der Flüchtlinge [Number of refugees]”, 2021, <https://mediendienst-integration.de/migration/flucht-asyl/zahl-der-fluechtlinge.html>.

²¹ Statistisches Bundesamt [The Federal Statistical Office], “Bevölkerung im Wandel. Annahmen und Ergebnisse der 14. koordinierten Bevölkerungsberechnung [Population in Transition. Assumptions and Results of the 14th Coordinated Population Calculation],” 5, https://www.destatis.de/DE/Presse/Pressekonferenzen/2019/Bevoelkerung/pressebroschuere-bevoelkerung.pdf?__blob=publicationFile.

²² Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Climate Action of Germany], “Fachkräfte für Deutschland [Skilled workers for Germany],” 2022, <https://www.bmwi.de/Redaktion/DE/Dossier/fachkraeftesicherung.html>.

²³ OECD, “Gross domestic spending on R&D,” Research and Development (R&D), 2022, https://www.oecd-ilibrary.org/industry-and-services/gross-domestic-spending-on-r-d/indicator/english_d8b068b4-en

²⁴ Germany Trade& Invest (GTAI), “Grants for R&D,” 2022, <https://www.gtai.de/en/invest/investment-guide/incentive-programs/r-and-d-incentives>

R&D, ranking 2nd globally in R&D expenditures according to the 2020 Global Innovation Index.²⁵ The domestic business sector performs and finances a high share of R&D expenditures.²⁶ The Index also points out that the nation presents an excellent human capital and research system owing to its high number of graduates in science and engineering, top R&D-intensive global companies, and strong university system.²⁷ The level of interactivity within the German innovation ecosystem is also remarkable, ranking in 8th position in university/industry collaborations and 3rd in cluster development.²⁸ The German government describes that innovative research and development ideas often do not stem from large companies in Germany, but rather from small or medium sized enterprises (SMEs), so called '*Mittelstand*'.²⁹

According to scholars, it is widely agreed that German *Mittelstand* is, in short, characterized by family-owned German SMEs.³⁰ Due to its structure, *Mittelstand* is known for generational continuity, long-term vision, family-like corporate culture, solid regional ties, strong investments in its workforce, and low fluctuation rates.³¹ *Mittelstand* is extremely diverse, ranging from family-owned companies that were established generations ago, to trendy start-ups, traditional crafts firms, self-employed people and service providers, retailers and freelancers, pioneering high-tech companies, regional suppliers, and global players.³² Family-owned SMEs represent approximately 99.6% of Germany's economic workforce, employing about 58.5% of all socially insured workers and generating 35.3% of national total sales,

²⁵ World Intellectual Property Organization, "Germany," *Global Innovation Index 2020*, 2020, 2, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020/de.pdf

²⁶ World Intellectual Property Organization, "Germany," *Global Innovation Index 2020*, 2020, 2, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020/de.pdf

²⁷ World Intellectual Property Organization, "Germany," *Global Innovation Index 2020*, 2020, 2, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020/de.pdf

²⁸ World Intellectual Property Organization, "Germany," *Global Innovation Index 2020*, 2020, 2, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020/de.pdf

²⁹ Die Bundesregierung [The Federal Government], "Make it in Germany: Das Informationsportal der Bundesregierung für Fachkräfte aus dem Ausland [Make it in Germany: The Federal Government's Information Portal for Skilled Workers from Abroad]," 2022, <https://www.make-it-in-germany.com/en/living-in-germany/discover-germany/economy>.

³⁰ Julian Schenkenhofer and Dominik Wilhelm, "Fuelling Germany's Mittelstand with Complementary Human Capital: The Case of the Cooperative State University Baden-Württemberg," *European journal of higher education* 10, no. 1 (2020): 72–92, 75; Roscher, Franziska, "What makes Germany's Mittelstand special", August 17, 2015, <https://www.handelsblatt.com/english/handelsblatt-explains-what-makes-germanys-mittelstand-special/23505268.html?ticket=ST-5662506-sJlwb0T0rfdVJxYfRJY-ap2>.

³¹ Julian Schenkenhofer and Dominik Wilhelm, "Fuelling Germany's Mittelstand with Complementary Human Capital: The Case of the Cooperative State University Baden-Württemberg," *European journal of higher education* 10, no. 1 (2020): 72–92, 75

³² Federal Ministry for Economic Affairs and Climate Action, "The German Mittelstand as a model for success," 2023, <https://www.bmwk.de/Redaktion/EN/Dossier/sme-policy.html>

according to the Federal Ministry for Economic Affairs and Climate Action.³³ They can often be found in rural areas, have strong regional ties, and share intergenerational knowledge.³⁴ Since the innovative force of these SMEs is very high, they are also called the “hidden champions” of the German industry, contributing to a large amount of Germany’s economic success.³⁵ These SMEs often have alliances or are suppliers for major companies which use highly automated and capital-intensive production methods. Cooperation between SMEs and larger companies as well as service companies significantly contributes to the strength of German industry today.³⁶ Nevertheless, digitalization, global competition, and demographic changes have presented challenges to these companies. Over the years, it has become increasingly difficult for SMEs to find apprentices and qualified workers as the number of applications is declining.³⁷

Germany’s above-average participation in global economic activities is because many of the internationally in-demand industry branches can be found in German technology and industry sectors. Germany's economy is widely recognized for its robust manufacturing sector and impressive ability to export goods.³⁸ German industry is dominated by the automotive sector, mechanical engineering, and the production of electronic products.³⁹ As a result of its strong export businesses, Germany has experienced a certain

³³ Federal Ministry for Economic Affairs and Climate Action, “The German Mittelstand as a model for success,” 2023, <https://www.bmwk.de/Redaktion/EN/Dossier/sme-policy.html>

³⁴ Bundesverband mittelständische Wirtschaft Unternehmerverband Deutschland e.V. [Federal Association of Small and Medium-Sized Businesses Entrepreneurs' Association Germany], “Der Mittelstand ist Garant für Stabilität und Fortschritt [The Mittelstand sector is the guarantor of stability and progress],” n.d., <https://www.bvmw.de/themen/mittelstand/zahlen-fakten/>.

³⁵ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Wertschätzung-Stärkung-Entlastung. Mittelstandsstrategie [Appreciation-Reinforcement-Relief.

Medium-sized business strategy],” 2019, https://www.bmwi.de/Redaktion/DE/Publikationen/Mittelstand/mittelstandsstrategie.pdf?__blob=publicationFile&v=8.

³⁶ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Industriestrategie 2030. Leitlinien für eine deutsche und europäische Industriepolitik [Industrial Strategy 2030. Guidelines for a German and European Industrial Policy]” 2019, https://www.bmwi.de/Redaktion/DE/Publikationen/Industrie/industriestrategie-2030.pdf?__blob=publicationFile&v=20.

³⁷ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Wirtschaftsmotor Mittelstand: Zahlen und Fakten zu den deutschen KMU [Mittelstand as an economic engine: Facts and figures on German SMEs]” 2019, <https://www.bmwi.de/Redaktion/DE/Publikationen/Mittelstand/wirtschaftsmotor-mittelstand-zahlen-und-fakten-zu-den-deutschen-kmu.html>.

³⁸ Horst Siebert, “Basic Features of the German Economy,” in *The German Economy: Beyond the Social Market* (New Jersey: Princeton University Press, 2005), 11

³⁹ Dirk Dohse, Marc Bachmann, Frank Bickenbach, Eckhardt Bode, Robert Gold, Richard Grimmeiss, Aoife Hanley, Julian Kirchherr, Julia Klier, Johannes Lettner, Wan-Hsin Liu, Sebastian Pfülb, Björn Saß, Finn-Ole Semrau, Neslihan Ana Sönmez, Sebastian Stern, Ulrich Stolzenburg, Julian Vehrke, Marvin Wenserski, “Analyse der industrierelevanten wirtschaftlichen Rahmenbedingungen in Deutschland im internationalen Vergleich [Analysis of industry-relevant economic conditions in Germany in international comparison],” 20, https://www.bmwi.de/Redaktion/DE/Publikationen/Studien/industriestudie.pdf?__blob=publicationFile&v=4

“reindustrialization”; after the financial and economic crisis in 2008, the net domestic product of the German industry recorded a significant increase. Compared to France, the UK, and the US, Germany’s industry contributed more than double to the amount of the total added value and employment activity in the years before the pandemic.⁴⁰ Germany also has the highest share of industry compared to other major advanced countries, with a total gross product value of 21.6% in 2019, followed by Japan with 20.8% and Italy with 16.6%.⁴¹ The country is the fourth largest producer of industry products worldwide, with a turnover of approximately 2.1 billion euros in 2022.⁴² Germany’s dependency on the global export market enables it to be the motor of a flourishing industry, while also being subject to trade conflicts and fluctuations in the global economy. The U.S.-China trade conflict in 2019, for example, had a considerable impact on global trade and investments as well as the German economy, where production is specialized on goods with prior concessions or investments.⁴³

The country’s most important industry branches include: automotive manufacturing, mechanical engineering and construction, chemical industries, and electrical industries.⁴⁴ While Germany has sustained its proficiency in manufacturing, it has fallen behind in service delivery and in the knowledge economy sector, which encompasses the creation and utilization of ICT products to enhance productivity in private

⁴⁰ Dirk Dohse, Marc Bachmann, Frank Bickenbach, Eckhardt Bode, Robert Gold, Richard Grimmeiss, Aoife Hanley, Julian Kirchherr, Julia Klier, Johannes Lettner, Wan-Hsin Liu, Sebastian Pfülb, Björn Saß, Finn-Ole Semrau, Neslihan Ana Sönmez, Sebastian Stern, Ulrich Stolzenburg, Julian Vehrke, Marvin Wenserski, “Analyse der industrierelevanten wirtschaftlichen Rahmenbedingungen in Deutschland im internationalen Vergleich [Analysis of industry-relevant economic conditions in Germany in international comparison]”, 21, https://www.bmwi.de/Redaktion/DE/Publikationen/Studien/industriestudie.pdf?__blob=publicationFile&v=4

⁴¹ Verband der chemischen Industrie e.V [German Chemical Industry Association], “Industrieland Deutschland [Germany as an industrialized country],” January 2021, <https://www.vci.de/ergaenzende-downloads/industrieland-deutschland-daten-fakten-bedeutung-deutsche-industrie.pdf>.

⁴² Verband der chemischen Industrie e.V [German Chemical Industry Association], “Industrieland Deutschland [Germany as an industrialized country],” January 2021, <https://www.vci.de/ergaenzende-downloads/industrieland-deutschland-daten-fakten-bedeutung-deutsche-industrie.pdf>.

⁴³ Timo Wollmershäuser, Silvia Delrio, Clemens Fuest, Marcell Göttert, Christian Grimme, Carla Krolage, Stefan Lautenbacher, Robert Lehmann, Wolfgang Nierhaus, Andreas Peichl, Magnus Reif, Radek Šauer, F. Schröter, Tobias Schuler, Marc Stöckli, Klaus Wohlrabe, Anna Wolf, and Christoph Zeiner, “ifo Konjunkturprognose 2017–2019: Deutsche Wirtschaft auf dem Weg in die Hochkonjunktur [ifo Economic Forecast 2017–2019: German Economy on the Way to a Boom],” *ifo Schnelldienst* 70, no. 24 (2017): 28–81, 43, <https://www.ifo.de/publikationen/2017/aufsatz-zeitschrift/ifo-konjunkturprognose-2017-2019-deutsche-wirtschaft-auf-dem>

⁴⁴ Martin Orth, “Industrieland Deutschland: Sechs starke Zahlen [Germany as an industrialized country: Six strong figures],” August 24, 2018, <https://www.deutschland.de/de/topic/wirtschaft/deutschlands-industrie-die-wichtigsten-zahlen-und-fakten>

service sectors.⁴⁵ The *New York Times* once called Germany's specialization in certain industrial products the "unsexy side of the industrial spectrum" and "not smartphones or iPads but machinery and other heavy equipment".⁴⁶ In the meantime, rising global awareness of anthropogenic climate change and its consequences is slowly leading to a shift within many traditional industry-based companies. As the demand for electric vehicles and renewable energy rises due to global public concern for the environment, German companies are starting to focus more on so-called green technologies.⁴⁷ Germany is leading in the renewable energy sector including photovoltaic, wind power, and highly efficient power plant technology.⁴⁸

Of all industry sectors in Germany, the automotive sector plays one of the largest roles in the country's economic development. Its share of the total gross value-added lies at 5%, with a total turnover of 436 billion euros (430 billion USD) in 2019, prior to the pandemic.⁴⁹ Two German automotive producers, Mercedes-Benz (11th), and Volkswagen (25th), rank among the top 25 global brands and generated 109.9 billion USD in brand value in 2020.⁵⁰ The German automotive industry creates the highest number of jobs in the country, 2.2 million which accounts for 7% of all socially insured workers in Germany.⁵¹ The manufacturing of automotive parts is also reliant on smaller suppliers from the chemical, steel, and mechanical engineering industries who profit from this interrelation. Chemical and mechanical industries have formed around 70% of the added value of the automotive industry in Germany.⁵² 643,000 people are

⁴⁵ Ashoka Mody, "German Productivity Growth: An Industry Perspective," in *Germany in an Interconnected World Economy* (Washington, D.C: International Monetary Fund, 2013), 55

⁴⁶ Die Bundesregierung [The Federal Government], "Make it in Germany: Das Informationsportal der Bundesregierung für Fachkräfte aus dem Ausland [Make it in Germany: The Federal Government's Information Portal for Skilled Workers from Abroad]," 2022, <https://www.make-it-in-germany.com/en/living-in-germany/discover-germany/economy>

⁴⁷ Die Bundesregierung [the Federal Government], "German industry generates high earnings," *Economy*, 2022, <https://www.make-it-in-germany.com/en/living-in-germany/discover-germany/economy>

⁴⁸ Die Bundesregierung [the Federal Government], "German industry generates high earnings," *Economy*, 2022, <https://www.make-it-in-germany.com/en/living-in-germany/discover-germany/economy>

⁴⁹ Die Bundesregierung [The Federal Government], "Make it in Germany: Das Informationsportal der Bundesregierung für Fachkräfte aus dem Ausland [Make it in Germany: The Federal Government's Information Portal for Skilled Workers from Abroad]," 2022, <https://www.make-it-in-germany.com/en/living-in-germany/discover-germany/economy>

⁵⁰ Soumitra Dutta, Bruno Lanvin, and Sacha Wunsch-Vincent, "Global Innovation Index 2020," *World Intellectual Property Organization*, 2020, 27, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf

⁵¹ Bundesministerium für Wirtschaft und Klimaschutz [Federal Ministry for Economic Affairs and Climate Action], "Wirtschaftsbranchen: Automobilindustrie [Automotive industry]," n.d., <https://www.bmwk.de/Redaktion/DE/Textsammlungen/Branchenfokus/Industrie/branchenfokus-automobilindustrie.html>

⁵² Bundesministerium für Wirtschaft und Klimaschutz [Federal Ministry for Economic Affairs and Climate Action], "Wirtschaftsbranchen: Automobilindustrie [Automotive industry]," n.d., <https://www.bmwk.de/Redaktion/DE/Textsammlungen/Branchenfokus/Industrie/branchenfokus-automobilindustrie.html>

employed in the secondary market, for instance, for spare parts and in trade, while 654,000 people are suppliers in other sectors.⁵³ Meanwhile, it was stated that Germany seems to be coming close to a ‘technical recession’ as automobile production has severely dropped by 16% since mid-2018.⁵⁴ It is believed that new driving technologies and the hesitancy of global consumers in response to new environmental regulations and alternative mobility have contributed to this decline.⁵⁵ In order to maintain competitiveness and sustainable growth, the automotive industry has increased its R&D expenditures by 5%.⁵⁶ The Federal Ministry for Economic Affairs and Energy identified that challenges and possibilities are diverse and do not solely concern the vehicle, but the production of vehicles more broadly.⁵⁷ Digitalization, automation, and emerging technologies are changing production processes, business models, and mobility services in this branch.⁵⁸

Closely connected to the automotive branch, the production of machinery and equipment/mechanical engineering also has a significant impact on the German economy. Germany is the third largest producer of machines worldwide and has a leading export role in this area.⁵⁹ Unlike in the automotive sector, the EU is the main destination for exports, accounting for 47.8% of exports in 2019. There are over 6,600 mostly

⁵³ Bundesministerium für Wirtschaft und Klimaschutz [Federal Ministry for Economic Affairs and Climate Action], “Wirtschaftsbranchen: Automobilindustrie [Automotive industry],” n.d.,

<https://www.bmwk.de/Redaktion/DE/Textsammlungen/Branchenfokus/Industrie/branchenfokus-automobilindustrie.html>

⁵⁴ Timo Wollmershäuser, Florian Eckert, Marcell Göttert, Christian Grimme, Carla Krolage, Stefan Lautenbacher, Robert Lehmann, Sebastian Link, Heiner Mikosch, Stefan Neuwirth, Wolfgang Nierhaus, Ann-Christin Rathje, Magnus Reif, Radek Šauer, Marc Stöckli, Klaus Wohlrabe and Anna Wolf, “ifo Konjunkturprognose Winter 2019: Deutsche Konjunktur stabilisiert sich [ifo Economic Forecast Winter 2019: German Economy Stabilizing],” *ifo Schnelldienst* 72, no. 24 (December 19, 2019): 27-89, 47, <https://www.ifo.de/DocDL/sd-2019-24-wollmershaeuser-et-al-konjunkturprognose-winter-2019-12-19.pdf>

⁵⁵ Timo Wollmershäuser, Florian Eckert, Marcell Göttert, Christian Grimme, Carla Krolage, Stefan Lautenbacher, Robert Lehmann, Sebastian Link, Heiner Mikosch, Stefan Neuwirth, Wolfgang Nierhaus, Ann-Christin Rathje, Magnus Reif, Radek Šauer, Marc Stöckli, Klaus Wohlrabe and Anna Wolf, “ifo Konjunkturprognose Winter 2019: Deutsche Konjunktur stabilisiert sich [ifo Economic Forecast Winter 2019: German Economy Stabilizing],” *ifo Schnelldienst* 72, no. 24 (December 19, 2019): 27-89, 48, <https://www.ifo.de/DocDL/sd-2019-24-wollmershaeuser-et-al-konjunkturprognose-winter-2019-12-19.pdf>

⁵⁶ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Zukunftsinvestitionen für Fahrzeughersteller und Zulieferindustrie [Investments in the future for vehicle manufacturers and the supplier industry],” 2021, <https://www.bmwi.de/Redaktion/DE/Textsammlungen/Industrie/zukunftsinvestitionen-fahrzeughersteller-zulieferindustrie.html>

⁵⁷ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Zukunftsinvestitionen für Fahrzeughersteller und Zulieferindustrie [Investments in the future for vehicle manufacturers and the supplier industry],” 2021, <https://www.bmwi.de/Redaktion/DE/Textsammlungen/Industrie/zukunftsinvestitionen-fahrzeughersteller-zulieferindustrie.html>

⁵⁸ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Zukunftsinvestitionen für Fahrzeughersteller und Zulieferindustrie [Investments in the future for vehicle manufacturers and the supplier industry],” 2021, <https://www.bmwi.de/Redaktion/DE/Textsammlungen/Industrie/zukunftsinvestitionen-fahrzeughersteller-zulieferindustrie.html>

⁵⁹ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Maschinen- und Anlagenbau [Mechanical and plant engineering],” 2021, <https://www.bmwi.de/Redaktion/DE/Artikel/Branchenfokus/Industrie/branchenfokus-maschinen-und-anlagenbau.html>

small and medium sized enterprises with more than 1 million employees, of which 200,000 of them are engineers. The total turnover was approximately 220 billion euros in 2019.⁶⁰ According to the Federal Ministry for Economic Affairs and Energy, every second engineer in Germany works in the fields of research, development and construction.⁶¹

The industry surrounding electrical engineering recorded an added value share of 38% in the EU and a turnover of 191 billion euros in 2019.⁶² As a supplier for other industry branches, it primarily provides support for industry products such as automation, medical technology, security systems, cybersecurity, or signaling.⁶³ The most renowned German company in this branch is *Siemens*.

The chemical industry in Germany is considered to be the fourth most important branch of the country's economy. Most of the products are intermediate goods used in the machinery, automotive and construction industries.⁶⁴ With gross sales of 220 billion euros in 2021, the German chemical-pharmaceutical industry recorded the largest sales in Europe and 3rd worldwide, followed by China and the US⁶⁵ The country also has the largest export and third largest import markets in the world.⁶⁶ 8% of the world's chemical and pharmaceutical patents come from Germany, making the country the fourth largest innovative country in

⁶⁰ Florian Scholl, "Maschinenbau in Zahl und Bild [Mechanical engineering in numbers and images]," Volkswirtschaft Und Statistik (VDMA) [Economics And Statistics (VDMA)], 2020, <https://oesterreich.vdma.org/viewer/-/v2article/render/48262358>

⁶¹ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], "Maschinen- und Anlagenbau [Mechanical and plant engineering]," 2021, <https://www.bmwi.de/Redaktion/DE/Artikel/Branchenfokus/Industrie/branchenfokus-maschinen-und-anlagenbau.html>

⁶² Zentralverband Elektrotechnik- und Elektronikindustrie e.V. [German Electrical and Electronic Manufacturers' Association], "Die deutsche Elektroindustrie: Daten, Zahlen und Fakten [The German electrical industry: Data, facts and figures]," 2021, 1, https://www.zvei.org/fileadmin/user_upload/Presse_und_Medien/Pressebereich/2021-006_Elektroindustrie_erwartet_fuer_2021_Wachstum_von_fuenf_Prozent/Faktenblatt_PK-Januar-2021.pdf

⁶³ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], "Elektrotechnik- und Elektronikindustrie [Electrical engineering and electronics industry]," 2021, <https://www.bmwi.de/Redaktion/DE/Artikel/Branchenfokus/Industrie/branchenfokus-elektrotechnik-und-elektronikindustrie.html>

⁶⁴ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], "Chemie und Pharmazie [Chemistry and pharmacy]," 2021, <https://www.bmwi.de/Redaktion/DE/Artikel/Branchenfokus/Industrie/branchenfokus-chemie-pharmazie.html>

⁶⁵ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], "Chemie und Pharmazie [Chemistry and pharmacy]," 2021, <https://www.bmwi.de/Redaktion/DE/Artikel/Branchenfokus/Industrie/branchenfokus-chemie-pharmazie.html>

⁶⁶ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], "Chemie und Pharmazie [Chemistry and pharmacy]," 2021, <https://www.bmwi.de/Redaktion/DE/Artikel/Branchenfokus/Industrie/branchenfokus-chemie-pharmazie.html>

chemical production, after the US, China, and Japan.⁶⁷ Among the different branches in the manufacturing sector, the chemical industry is among the top three most innovative and research-intensive branches with annual R&D expenditures of 10 billion euros.⁶⁸ It is also worth noting that around 92% of German chemical companies are SMEs with fewer than 500 employees.⁶⁹

Leading German technology and innovation clusters

As Germany is a federally governed country, innovative clusters are not only located in metropolitan areas but are also found in rural areas as well as medium-sized cities. According to the 2021 Regional Innovation Scoreboard by the European Commission, three of the top ten regional innovation leaders are in Germany (another three in Switzerland, two in Sweden, and one each in Denmark and Finland).⁷⁰ Seven German regions are listed in the top 25.⁷¹ Nonetheless, it is notable that important hotspots of innovation clusters are often located in the southern and western parts of the country.⁷² The south of Germany is known for its strong economy and low unemployment rates, with the region of “Oberbayern” (Upper Bavaria) recognized as one of the largest economies in Europe with an annual GDP exceeding 349 billion euros in 2018.⁷³

There are strong regional differences between South and East Germany and between urban and rural areas, with regard to employment and innovation in the field of Information Technology (IT). The cities of Hamburg, Berlin, and Bremen, for example, have a higher proportion of IT employees than in many eastern

⁶⁷ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Chemie und Pharmazie [Chemistry and pharmacy],” 2021, <https://www.bmwi.de/Redaktion/DE/Artikel/Branchenfokus/Industrie/branchenfokus-chemie-pharmazie.html>

⁶⁸ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Chemie und Pharmazie [Chemistry and pharmacy],” 2021, <https://www.bmwi.de/Redaktion/DE/Artikel/Branchenfokus/Industrie/branchenfokus-chemie-pharmazie.html>

⁶⁹ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Chemie und Pharmazie [Chemistry and pharmacy],” 2021, <https://www.bmwi.de/Redaktion/DE/Artikel/Branchenfokus/Industrie/branchenfokus-chemie-pharmazie.html>

⁷⁰ The European Commission, “Regional Innovation Scoreboard 2021,” 2021, 21, <https://ec.europa.eu/docsroom/documents/46032/attachments/1/translations/en/renditions/native>

⁷¹ The European Commission, “Regional Innovation Scoreboard 2021,” 2021, 21, <https://ec.europa.eu/docsroom/documents/46032/attachments/1/translations/en/renditions/native>

⁷² The European Commission, “Regional Innovation Scoreboard 2021,” 2021, 24, <https://ec.europa.eu/docsroom/documents/46032/attachments/1/translations/en/renditions/native>

⁷³ Statistisches Bundesamt [The Federal Statistical Office], “Daten und Fakten[Data and facts],” 2022, <https://www.statistikportal.de/de#daten-und-fakten>

states.⁷⁴ On the index of Tech Hubs in Germany, Munich ranks first, with a higher proportion of employees in IT when compared to Berlin, which is ranked second (roughly 30,000 more than Berlin in 2019).⁷⁵ Meanwhile, it is also indicated that the size of a city is not decisive of its innovation capacity. Smaller cities show great potential and have developed into important technology sites; for example, the cities of Darmstadt in central Germany, Erlangen in southern Germany, Karlsruhe in the south-west, and Aachen in the west are among the ten most important Tech Hubs, and are also known for their university research programs in STEM fields.⁷⁶ In Erlangen, for example, STEM occupations account for 30% of total employment and the city is considered a leader in the share of complex STEM occupations, even in those that require at least five years of study.⁷⁷ In addition, the city of Regensburg has had the largest percentage increase in STEM employment in the last five years, after Munich.⁷⁸

(I) Oberbayern

Oberbayern - Bavaria, more specifically Upper Bavaria, is a region that transformed from an agrarian rural region to a highly productive industrial region in Germany. Oberbayern is the largest government district in Bavaria. The 2021 Regional Innovation Scoreboard describes Oberbayern as the most innovative region in Germany and third most innovative region in Europe.⁷⁹ In 2018, it was the third largest export region in the country, accounting for about 18.7% of all global exports from Germany.⁸⁰ The region is an innovation leader in the EU with an increase in innovation of 14.6%.⁸¹ In 2020, its GDP was 610 billion euros,

⁷⁴ Christina Anger, Oliver Koppel, Axel Plünnecke, Enno Röben, and Ruth Maria Schüler “MINT Herbstreport 2019: MINT-Basis zur Zukunftssicherung durch Forschung und Digitalisierung [MINT Fall Report 2019: MINT- Basis for Securing the Future through Research and Digitization],” *Institut Der Deutschen Wirtschaft*, 2019, 6, https://www.iwkoeln.de/fileadmin/user_upload/Studien/Gutachten/PDF/2019/IW-Gutachten-MINT-Herbstreport-2019.pdf

⁷⁵ Alexander Börsch, “Tech-Hub-Index: deutsche Städte im Vergleich [Tech Hub Index: German cities in comparison],” 2019, 10, <https://www.wirtschaftsdienst.eu/inhalt/jahr/2019/heft/10/beitrag/tech-hub-index-deutsche-staedte-im-vergleich.html>

⁷⁶ Alexander Börsch, “Tech-Hub-Index: deutsche Städte im Vergleich [Tech Hub Index: German cities in comparison],” 2019, 10, <https://www.wirtschaftsdienst.eu/inhalt/jahr/2019/heft/10/beitrag/tech-hub-index-deutsche-staedte-im-vergleich.html>

⁷⁷ Alexander Börsch, “Tech-Hub-Index: deutsche Städte im Vergleich [Tech Hub Index: German cities in comparison],” 2019, 10, <https://www.wirtschaftsdienst.eu/inhalt/jahr/2019/heft/10/beitrag/tech-hub-index-deutsche-staedte-im-vergleich.html>

⁷⁸ Alexander Börsch, “Tech-Hub-Index: deutsche Städte im Vergleich [Tech Hub Index: German cities in comparison],” 2019, 10, <https://www.wirtschaftsdienst.eu/inhalt/jahr/2019/heft/10/beitrag/tech-hub-index-deutsche-staedte-im-vergleich.html>

⁷⁹ The European Commission, “Regional Innovation Scoreboard 2021,” 2021, 24, <https://ec.europa.eu/docsroom/documents/46032/attachments/1/translations/en/renditions/native>

⁸⁰ European Commission, “Internal Market, Industry, Entrepreneurship and SMEs,” n.d., <https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/bavaria>

⁸¹ The European Commission, “Regional Innovation Scoreboard 2021,” 2021, 24, <https://ec.europa.eu/docsroom/documents/46032/attachments/1/translations/en/renditions/native>

representing around 18% of the country's nominal GDP.⁸² 38% of all Bavarian employees work in Oberbayern and 44% of Bavaria's GDP comes from this region.⁸³ Its import volume has continuously risen until 2019, while the export volume has lightly fallen by -0.8%.⁸⁴ The most important export market for Oberbayern is the United States.⁸⁵ Similar to other industrial regions in Germany, major economic branches in Oberbayern include the automotive industry and its supply chain sectors; electrical and mechanical engineering, automation, and robotics.⁸⁶ The region has been crucial in Europe due to its leading role in high technology fields such as ICT and life sciences.⁸⁷ This is also due to the many institutes, universities, and cluster initiatives which "allow Bavaria to achieve one of the highest percentages of employees in the high-tech sector".⁸⁸ In 2017, 4.8% of the Bavarian population worked in high-technology manufacturing and knowledge intensive services, slightly lower than the national and European share at 4.2%.⁸⁹ Several global players in the automotive industry (BMW, Audi) can be found in Munich and its surroundings, as well as ICT (Siemens), media and publishing industries.⁹⁰ The "Bavarian Cluster Initiative" initiated by the Bavarian state government in 2020 supports seventeen platforms which are dedicated to high-tech and traditional industries in order to build networks of companies and research institutes: "This initiative aims to boost the competitiveness of Bavarian companies in five different areas: digitalization, energy, health, materials and mobility".⁹¹ Another initiative created by the Bavarian State Ministry for Digital Affairs in 2021 is a pilot program to support SMEs with Artificial Intelligence (AI) topics in Upper Bavaria. Regional

⁸² Bavarian Ministry of Economic Affairs, Regional Development and Energy, "Why Bavaria", 2022, <https://www.invest-in-bavaria.com/en/advantage-bavaria/why-bavaria>

⁸³ Mediengruppe Münchner Merkur tz [Münchner Merkur media group tz], "Wirtschaftsraum München: Oberbayern. [Economic region Munich: Oberbayern]," 2020, 5, <http://standortportal.bayern.de/Anhaenge/wirtschaftsraum-muenchen-oberbayern-2019-2020.pdf>

⁸⁴ Mediengruppe Münchner Merkur tz [Münchner Merkur media group tz], "Wirtschaftsraum München: Oberbayern. [Economic region Munich: Oberbayern]," 2020, 16, <http://standortportal.bayern.de/Anhaenge/wirtschaftsraum-muenchen-oberbayern-2019-2020.pdf>

⁸⁵ Mediengruppe Münchner Merkur tz [Münchner Merkur media group tz], "Wirtschaftsraum München: Oberbayern. [Economic region Munich: Oberbayern]," 2020, 16, <http://standortportal.bayern.de/Anhaenge/wirtschaftsraum-muenchen-oberbayern-2019-2020.pdf>

⁸⁶ Eurostat, "Regions in Europe: 2021 interactive edition," 2021, <https://ec.europa.eu/eurostat/cache/digpub/regions/#median-age>

⁸⁷ Eurostat, "Regions in Europe: 2021 interactive edition," 2021, <https://ec.europa.eu/eurostat/cache/digpub/regions/#median-age>

⁸⁸ Eurostat, "Regions in Europe: 2021 interactive edition," 2021, <https://ec.europa.eu/eurostat/cache/digpub/regions/#median-age>

⁸⁹ Eurostat, "Regions in Europe: 2021 interactive edition," 2021, <https://ec.europa.eu/eurostat/cache/digpub/regions/#median-age>

⁹⁰ Bavarian Ministry of Economic Affairs, Regional Development and Energy, "Cluster Initiative Bavaria," 2020, <https://www.cluster-bayern.de/en/clusters/>

⁹¹ Bavarian Ministry of Economic Affairs, Regional Development and Energy, "Cluster Initiative Bavaria," 2020, <https://www.cluster-bayern.de/en/clusters/>

centers support companies with the implementation of AI and help develop AI skills among their employees as well as work on long-term solutions for companies concerning AI.⁹² It also recorded the highest increase in highly qualified personnel in Germany between 2014 and 2018.⁹³

Nevertheless, Oberbayern's highest barrier to growth remains a lack of skilled workers.⁹⁴ Much alike the other regions, Oberbayern recognizes the need to attract more highly skilled workers to the region in order to sustain long-term sustainability and innovation. Alongside the Bavarian government, the association "*Vereinigung der Bayrischen Wirtschaft*" launched an initiative in 2019 called "*Initiative Fachkräftesicherung+ (FSK+)*" to secure skilled workers. The initiative's goal was to attract 250,000 skilled workers by 2023 for the Bavarian economy. In addition, a special task force has been created, aimed towards supporting companies in Bavaria – according to the general manager of the initiative, the demand is already high.⁹⁵

Employers in Germany have the opportunity to start an expedited procedure to hire foreign workers. They can either receive help from the local authority for foreigners or at the central office for the immigration of skilled workers (ZSEF) in Nuremberg.⁹⁶ Local chambers of industry and commerce, city councils, and other regional stakeholders like the *Integration through Qualification (IQ)* network for Bavaria, offer consultation hours and advice to companies in the region concerning the immigration of international professionals.⁹⁷ Applicants from non-EU countries who wish to work in Oberbayern can find information regarding visa

⁹² UnternehmerTUM GmbH [entrepreneurTUM Ltd.], "KI-Regionalzentren für den Mittelstand [AI regional centres for Mittelstand]," 2022, <https://www.ki-transfer-plus.de/ki-regionalzentren>

⁹³ Der Informationsdienst des Instituts der deutschen Wirtschaft [The information service of the Institute of the German Economy], "Akademiker zieht es in die Metropolen [Academics are drawn to the metropolises]," 2021, <https://www.iwd.de/artikel/akademiker-zieht-es-in-die-metropolen-496824/>

⁹⁴ Mediengruppe Münchner Merkur tz [Münchner Merkur media group tz], "Wirtschaftsraum München: Oberbayern. [Economic region Munich: Oberbayern]," 2020, 18, <http://standortportal.bayern.de/Anhaenge/wirtschaftsraum-muenchen-oberbayern-2019-2020.pdf>

⁹⁵ Bundesagentur für Arbeit [Federal Employment Agency], "Initiative Fachkräftesicherung+ der vbw und Staatsregierung und der Regionaldirektion Bayern kraftvoll angelaufen - Taskforce in Aktion [Initiative to secure skilled workers+ of the vbw and the state government and regional directorate of Bavaria off to a vigorous start - task force in action]," April 16, 2019, <https://www.arbeitsagentur.de/vor-ort/rd-by/2019-16>.

⁹⁶ Bayerisches Staatsministerium des Inneren, für Sport und Integration [The Bavarian Ministry of the Interior, Sport and Integration], "Fachkräftezuwanderung [Skilled labour immigration]," n.d., <https://www.stmi.bayern.de/mui/fachkraeftezuwanderung/index.php>

⁹⁷ Muenchen.de [Munich.de], "Beratung zur Einreise internationaler Fachkräfte [Advice on the entry of international professionals]," 2022, <https://stadt.muenchen.de/service/info/abteilung-migration-integration-teilhabe/10308042/>

processes on the website of the Federal Foreign Office or by contacting companies in Germany directly.⁹⁸

Every university in Bavaria additionally has a welcome center for international researchers that provides information on visa-related concerns and residence in Germany.⁹⁹

(II) Karlsruhe

With a 2019 population of 313,092, Karlsruhe is one of the smaller STEM regions in Germany but is ranked as an innovation leader on the European Scoreboard.¹⁰⁰ It is the third largest city in the federal state of Baden-Württemberg and the former capital of the Baden region.¹⁰¹ The region lies close to the French border and has also been the seat of the Federal Constitutional Court for seventy years.¹⁰² Though smaller than most other innovation leaders, the city and surrounding region are a high-tech hotspot and a German hub for AI. Karlsruhe is attractive to many professionals from the high-tech sector as well as international students.¹⁰³ It ranked first on the 2021 European Innovation Scoreboard for employment in innovative SMEs¹⁰⁴ and comes in fourth place on the list of the ten best places for AI in Europe.¹⁰⁵ Apart from high-tech, Karlsruhe is also known as a green city, and has been named the bike-friendliest city in Germany in the last few years.¹⁰⁶

⁹⁸ Federal Foreign Office, “Moving to Germany as a skilled worker,” December 29, 2020, <https://www.auswaertiges-amt.de/en/skilled-worker-immigration/2304796>

⁹⁹ Bavarian State Ministry of Science and the Arts, “Visas and residence,” 2022, <https://www.research-in-bavaria.de/de/visas-and-residence>.

¹⁰⁰ KTG Karlsruhe Tourismus GmbH [KTG Karlsruhe Tourism Ltd.], “Karlsruhe entdecken, erleben, besuchen [Discover, experience, visit Karlsruhe],” 2022, <https://www.karlsruhe-erleben.de/stadtportrait/Recht>

¹⁰¹ KTG Karlsruhe Tourismus GmbH [KTG Karlsruhe Tourism Ltd.], “Karlsruhe entdecken, erleben, besuchen [Discover, experience, visit Karlsruhe],” 2022, <https://www.karlsruhe-erleben.de/stadtportrait/Recht>

¹⁰² KTG Karlsruhe Tourismus GmbH [KTG Karlsruhe Tourism Ltd.], “Karlsruhe entdecken, erleben, besuchen [Discover, experience, visit Karlsruhe],” 2022, <https://www.karlsruhe-erleben.de/stadtportrait/Recht>

¹⁰³ The European Commission, “Regional Innovation Scoreboard 2021,” 2021, 77, <https://ec.europa.eu/docsroom/documents/46032/attachments/1/translations/en/renditions/native>

¹⁰⁴ The European Commission, “Regional Innovation Scoreboard 2021,” 2021, 77, <https://ec.europa.eu/docsroom/documents/46032/attachments/1/translations/en/renditions/native>

¹⁰⁵ KTG Karlsruhe Tourismus GmbH [KTG Karlsruhe Tourism Ltd.], “Karlsruhe entdecken, erleben, besuchen [Discover, experience, visit Karlsruhe],” 2022, <https://www.karlsruhe-erleben.de/stadtportrait/Recht>

¹⁰⁶ KTG Karlsruhe Tourismus GmbH [KTG Karlsruhe Tourism Ltd.], “Karlsruhe entdecken, erleben, besuchen [Discover, experience, visit Karlsruhe],” 2022, <https://www.karlsruhe-erleben.de/stadtportrait/Recht>

Karlsruhe has long been building its reputation as a tech location. In 1972, the first informatics faculty was founded and in 1984, Germany's first email was received in Karlsruhe.¹⁰⁷ In order to further innovate and strengthen the region, an alliance for action, the "Technologie Region Karlsruhe GmbH", was created in 1987.

Today, the city counts 26 research institutes and 10,000 students in STEM-related subjects.¹⁰⁸ In 2020, the city was ranked first by the Bitcom Smart City Index concerning digital administration and became Germany's first UNESCO city of Media Arts.¹⁰⁹ The KIT (*Karlsruher Institut für Technologie*) comes in as the fourth best rated university in Germany.¹¹⁰ As of 2022, there were roughly 4,400 digital companies with 30,000 workspaces in Karlsruhe, which cover various sectors in the digital field – from gaming to corporate software to IT security.¹¹¹ 41% of the city's trade taxes stem from companies in the digital sector, highlighting the importance of this sector for the local economy.¹¹² The rate of the workers employed in technology-intensive industries is higher than in almost any other region in Europe; around 1/3 of the workforce in the region work in the tech-industries.¹¹³

Projections for the "monitoring of skilled employees" (*Fachkräftemonitor*) show that there will be around 860,000 fewer skilled workers in the Federal State of Baden-Württemberg by 2035, and it is assumed that, by then, every fourth position in the state will be vacant.¹¹⁴ In 2013, an alliance for skilled employees was launched to address the most pressing challenges in the region. In addition, the region also offers a "welcome

¹⁰⁷ Wissenschaftsbüro Stadt Karlsruhe [Science Office City of Karlsruhe], "Informationen zum Digitalstandort Karlsruhe [Information about the digital location Karlsruhe]," n.d., <https://karlsruhe.digital/en/it-hotspot-karlsruhe/>

¹⁰⁸ Wissenschaftsbüro Stadt Karlsruhe [Science Office City of Karlsruhe], "Informationen zum Digitalstandort Karlsruhe [Information about the digital location Karlsruhe]," n.d., <https://karlsruhe.digital/en/it-hotspot-karlsruhe/>

¹⁰⁹ Wissenschaftsbüro Stadt Karlsruhe [Science Office City of Karlsruhe], "Informationen zum Digitalstandort Karlsruhe [Information about the digital location Karlsruhe]," n.d., <https://karlsruhe.digital/en/it-hotspot-karlsruhe/>

¹¹⁰ Wissenschaftsbüro Stadt Karlsruhe [Science Office City of Karlsruhe], "Informationen zum Digitalstandort Karlsruhe [Information about the digital location Karlsruhe]," n.d., <https://karlsruhe.digital/en/it-hotspot-karlsruhe/>

¹¹¹ W Wissenschaftsbüro Stadt Karlsruhe [Science Office City of Karlsruhe], "Informationen zum Digitalstandort Karlsruhe [Information about the digital location Karlsruhe]," n.d., <https://karlsruhe.digital/en/it-hotspot-karlsruhe/>

¹¹² Wissenschaftsbüro Stadt Karlsruhe [Science Office City of Karlsruhe], "Informationen zum Digitalstandort Karlsruhe [Information about the digital location Karlsruhe]," n.d., <https://karlsruhe.digital/en/it-hotspot-karlsruhe/>

¹¹³ Technologie Region Karlsruhe GmbH [Technology Region Karlsruhe Ltd.], "Hightech trifft Lebensart: Wir über uns [Hightech meets lifestyle: About us]," 2022, <https://technologie-region-karlsruhe.de/wir-ueber-uns>.

¹¹⁴ Geli Hensolt, "IHK: Fachkräftemangel in Baden-Württemberg verschärft sich [IHK: Shortage of skilled workers in Baden-Württemberg worsens]," July 12, 2021, <https://www.swr.de/swraktuell/baden-wuerttemberg/fachkraeftemangel-immer-groesser-100.html>

centre” for interested highly skilled workers, as well as hosts events to inform people about the processes in Germany, local initiatives, and the office for integration in Karlsruhe.¹¹⁵ The city’s Chamber for Industry and Commerce also promotes different federal programs for the recruitment of skilled workers including cooperations with African countries, a program for senior experts, and scholarship programs for young foreign professionals.¹¹⁶

(III) Stuttgart

Concerning the automotive industry and mechanical engineering, the region around Stuttgart, located in the province of Baden-Württemberg, is another important cluster in the industry and technology sector. Stuttgart is called the “cradle of the automobile” as the automobile was invented there 135 years ago and the region is home to the headquarters of two leading carmakers, *Mercedes Benz* and *Porsche* (part of Volkswagen group), and the *Daimler* group (the mother conglomerate including *Mercedes Benz*).¹¹⁷ It is also the place of origin of *Bosch*, one of the world’s leading electronics companies, and a few other globally active companies.¹¹⁸ The region of Stuttgart accommodates around 400 small and medium sized suppliers from different branches of the automotive cluster.¹¹⁹ Companies in the service industry, research facilities, and universities additionally form part of this regional cluster around Stuttgart.¹²⁰ In 2018, about 215,500 employees worked in the general automotive sector, accounting for a 17% share of all employees in the

¹¹⁵ Welcome Centre Baden-Württemberg and Welcome Centre Karlsruhe, “Discover the Karlsruhe Technology Region!,” 2022, <https://welcome.technologieregion-karlsruhe.de/en/>

¹¹⁶ IHK Karlsruhe, “Fachkräfte [Skilled workers],” 2022, <https://www.ihk.de/karlsruhe/produktmarken/fachkraefte>.

¹¹⁷ Jürgen Dispan, “Die Region Stuttgart im Umbruch: Transformation der Schlüsselindustrien als Herausforderung für die Regionalwirtschaft [The Stuttgart Region in Transition: Transformation of Key Industries as a Challenge for the Regional Economy],” *Bundeszentrale für politische Bildung [The Federal Agency for Civic Education]*, January 29, 2021, <https://www.bpb.de/apuz/stuttgart-2021/326252/transformation-der-schluesselindustrien-als-herausforderung-fuer-die-regionalwirtschaft>

¹¹⁸ Bosch, “Shifting paradigms: creativity, technology, trust,” 2020, 5, https://www.annualreports.com/HostedData/AnnualReportArchive/b/bosch_2020.pdf

¹¹⁹ Jürgen Dispan, “Die Region Stuttgart im Umbruch: Transformation der Schlüsselindustrien als Herausforderung für die Regionalwirtschaft [The Stuttgart Region in Transition: Transformation of Key Industries as a Challenge for the Regional Economy],” *Bundeszentrale für politische Bildung [The Federal Agency for Civic Education]*, January 29, 2021, <https://www.bpb.de/apuz/stuttgart-2021/326252/transformation-der-schluesselindustrien-als-herausforderung-fuer-die-regionalwirtschaft>

¹²⁰ Jürgen Dispan, “Die Region Stuttgart im Umbruch: Transformation der Schlüsselindustrien als Herausforderung für die Regionalwirtschaft [The Stuttgart Region in Transition: Transformation of Key Industries as a Challenge for the Regional Economy],” *Bundeszentrale für politische Bildung [The Federal Agency for Civic Education]*, January 29, 2021, <https://www.bpb.de/apuz/stuttgart-2021/326252/transformation-der-schluesselindustrien-als-herausforderung-fuer-die-regionalwirtschaft>

region.¹²¹ During the last 10 years, the number of employees in this cluster has continuously risen by up to 20% each year.¹²² Stuttgart and its surrounding region also provide intermediate products for around 400 machine building companies.¹²³ In 2019, this sector counted about 106,000 employees and recorded a turnover of 23.2 billion euros with an export share of 65.4%.¹²⁴ Given this, Stuttgart is unsurprisingly the leader in R&D expenditures according to the European Innovation Scoreboard. Moreover, Stuttgart ranks first in employment in knowledge-intensive activities (as a percentage of total employment) and ranks second in employment in innovative SMEs (as a percentage of total employment).¹²⁵ Although the industrial production of the region shows a mix of different areas of mechanical engineering, the main focus of this technology cluster lies in the production of machine tools for the metal industry.¹²⁶

Due to its large automotive industry, the Stuttgart region has had a high percentage of immigrant workers since as early as the 1960s. Almost a third of the population in this federal state has a migratory background, with many of them working in the automotive industry.¹²⁷

¹²¹ Jürgen Dispan, “Die Region Stuttgart im Umbruch: Transformation der Schlüsselindustrien als Herausforderung für die Regionalwirtschaft [The Stuttgart Region in Transition: Transformation of Key Industries as a Challenge for the Regional Economy],” *Bundeszentrale für politische Bildung [The Federal Agency for Civic Education]*, January 29, 2021, <https://www.bpb.de/apuz/stuttgart-2021/326252/transformation-der-schluesselindustrien-als-herausforderung-fuer-die-regionalwirtschaft>

¹²² Jürgen Dispan, “Die Region Stuttgart im Umbruch: Transformation der Schlüsselindustrien als Herausforderung für die Regionalwirtschaft [The Stuttgart Region in Transition: Transformation of Key Industries as a Challenge for the Regional Economy],” *Bundeszentrale für politische Bildung [The Federal Agency for Civic Education]*, January 29, 2021, <https://www.bpb.de/apuz/stuttgart-2021/326252/transformation-der-schluesselindustrien-als-herausforderung-fuer-die-regionalwirtschaft>

¹²³ The European Commission, “Regional Innovation Scoreboard 2021,” 2021, <https://ec.europa.eu/docsroom/documents/46032/attachments/1/translations/en/renditions/native>

¹²⁴ The European Commission, “Regional Innovation Scoreboard 2021,” 2021, <https://ec.europa.eu/docsroom/documents/46032/attachments/1/translations/en/renditions/native>

¹²⁵ The European Commission, “Regional Innovation Scoreboard 2021,” 2021, <https://ec.europa.eu/docsroom/documents/46032/attachments/1/translations/en/renditions/native>

¹²⁶ Jürgen Dispan, “Die Region Stuttgart im Umbruch: Transformation der Schlüsselindustrien als Herausforderung für die Regionalwirtschaft [The Stuttgart Region in Transition: Transformation of Key Industries as a Challenge for the Regional Economy],” *Bundeszentrale für politische Bildung [The Federal Agency for Civic Education]*, January 29, 2021, <https://www.bpb.de/apuz/stuttgart-2021/326252/transformation-der-schluesselindustrien-als-herausforderung-fuer-die-regionalwirtschaft>

¹²⁷ Ministerium für Soziales und Integration Baden-Württemberg [Ministry for Social Affairs and Integration Baden-Württemberg], “Integrationsbericht des Landes Baden-Württemberg 2020 [Integration Report of the State of Baden-Württemberg 2020],” 2020, 12, https://sozialministerium.baden-wuerttemberg.de/fileadmin/redaktion/m-sm/intern/downloads/Downloads_PIK/SIM_Landesintegrationsbericht_2020_P14_1.pdf.

(IV) Berlin

The German capital of Berlin is not often initially thought of as an industry hotspot or known for high export rates or specialized industries when compared to other industrial regions in Germany; however, it has continuously advanced as an innovation leader, competing with cities across Europe during the last few years. The German capital profits from its international popularity reflected by its unusually high employee potential and solid research landscape. Berlin's industry is characterized by a number of small companies with less than 20 employees due to its turbulent history, including the destructions during World War II, followed by the separation and subsequent reunification of the city into two different economic systems have led to a rapidly changing economic policy framework and a withdrawal of greater industry from the city.¹²⁸

Meanwhile, machine construction and the metal and electronic industry have a long tradition in Berlin. This sector and the chemical-pharmaceutical sector have the highest sales and employment rates among Berlin's industries. In 2018, the capital's industry contributed to Berlin's economic performance by 8.6% and export rate was at 56%.¹²⁹

Berlin has also risen as a hotspot for AI in the last decade and is renowned for being a start-up hub. As of 2019, approximately 30% of all German AI companies and nearly half of AI start-ups were located in Berlin.¹³⁰ Among the approximately 4,900 workers employed by these IT companies, 83% of them are working in SMEs.¹³¹ AI companies with the highest venture-capital financing are in the health, business

¹²⁸ IHK Berlin (2014), "Berliner Industrie in Zahlen 2014/2015 [Berlin Industry in Figures 2014/2015]," 5, <https://www.ihk.de/blueprint/servlet/resource/blob/2272486/3bdc2a0542e1277d7ace32dcfac22b1f/berliner-industrie-in-zahlen-2014-2015-data.pdf>

¹²⁹ Senatsverwaltung für Wirtschaft, Energie und Betriebe [Senate Department for Economics, Energy and Operations], "Berlins Industriestruktur: Vielfältig, innovativ und zukunftsorientiert [Berlin's industrial structure: Diverse, innovative and future-oriented]," 2018, <https://www.berlin.de/industriestadt/branchen/>.

¹³⁰ Brain City Berlin, "Fish, bees, and self-driving cars," June 7, 2019, <https://braincity.berlin/en/story/dahlem-center-for-machine-learning#:~:text=About%2030%25%20of%20all%20German,of%20innovative%20applications%20and%20solutions>

¹³¹ Senatsverwaltung für Wirtschaft, Energie und Betriebe [Senate Department for Economics, Energy and Operations], "Kompetenzfeld: Künstliche Intelligenz [Field of competence: Artificial intelligence]," 2018, <https://www.berlin.de/deeptech/standort/kompetenzfeld-ki/>

intelligence, and process management sectors, as well as in robotics.¹³² Berlin's image as an international, open, and 'hip' metropolis makes it attractive to foreign professionals, companies, and researchers. In addition, living expenses are still lower than in most other Western capitals. A noticeable fact is that more than half of all DAX-30 companies (German Share Index) with digitalization and innovation units are located in Berlin, even though their headquarters are located elsewhere in Germany.¹³³

Furthermore, Berlin invests a large amount in research. It is among the top 3 cities concerning R&D expenditures in Europe and is also the top ranked German city in employed ICT specialists (as a percentage of total employment in Europe).¹³⁴ Since 2011, Berlin and Brandenburg have been pursuing a joint innovation strategy with the aim of promoting innovation and growth potential and positioning the capital region at the forefront of international competition.¹³⁵ The city has also built a reputation as one of the leading research locations in Europe. This is ensured, among other things, by the 42 universities and colleges in Berlin.¹³⁶

Berlin was the first federal state to set up its own state immigration office which serves 400,000 clients each year, making it the largest immigration office in Germany by far.¹³⁷ 12% of all residence permits issued

¹³² Senatsverwaltung für Wirtschaft, Energie und Betriebe [Senate Department for Economics, Energy and Operations], "Kompetenzfeld: Künstliche Intelligenz [Field of competence: Artificial intelligence]," 2018, <https://www.berlin.de/deeptech/standort/kompetenzfeld-ki/>

¹³³ Senatsverwaltung für Wirtschaft, Energie und Betriebe [Senate Department for Economics, Energy and Operations], "Kompetenzfeld: Künstliche Intelligenz [Field of competence: Artificial intelligence]," 2018, <https://www.berlin.de/deeptech/standort/kompetenzfeld-ki/>

¹³⁴ The European Commission, "Regional Innovation Scoreboard 2021," 2021, <https://ec.europa.eu/docsroom/documents/46032/attachments/1/translations/en/renditions/native>

¹³⁵ IHK Berlin, "Daten zum Innovationsstandort Berlin und Deutschland [Data on the innovation location Berlin and Germany]," 2022, <https://www.ihk-berlin.de/politische-positionen-und-statistiken-channel/zahlenundfakten/statistiken-zur-berliner-wirtschaft/fallback1431024485852-2252662>

¹³⁶ Berlin Online Stadtportal GmbH & Co. KG [Berlin Online City Portal Ltd. & Co. KG], "Berliner Wirtschaft [Berlin economy]," 2022, <https://www.berlin.de/berlin-im-ueberblick/wirtschaft/berliner-wirtschaft/>

¹³⁷ Jens Anker, "Aus dem Ausländeramt wird ein Willkommensamt [The immigration office becomes a welcome office]," *Berliner Morgenpost*, May 29, 2019, <https://www.morgenpost.de/berlin/article225874375/Auslaenderbehoerde-Berlin-Aus-dem-Auslaenderamt-wird-ein-Willkommensamt.html>

nationwide are issued in Berlin.¹³⁸ In addition, foreign investors that finance start-ups not only provide funding, but also send specialists to work in Berlin.¹³⁹

Berlin is a cosmopolitan and young city. As of 2022, 37% of the population is of working age (20-45 years old) at an average age of 42.6, and 20% of all inhabitants are foreigners from 170 different countries.¹⁴⁰ However, the pandemic has simultaneously led to a surplus of emigration from Berlin for the first time in the last twenty years.¹⁴¹ Lack of living space has also led to an increase in emigration to the surrounding areas of Berlin.¹⁴²

(V) Cologne

The city of Cologne, located in the West of Germany, is the country's fourth largest city and the largest in the province of North Rhine-Westphalia (NRW) with about one million inhabitants. The Cologne region also includes the Rhine-Erft-district, the Rhein-Bergisch-district, and the city of Leverkusen. About 2.2 million people live in this region, accounting for about 12% of NRW's population.¹⁴³ Cologne and its surroundings not only have a reputation of being a media city and the capital of German "Carneval", but also of being a traditional and long-term industrial region in Germany. The region benefits from its central location in Europe and proximity to Belgium, France, and the Netherlands. This makes it a well-known

¹³⁸ Jens Anker, "Aus dem Ausländeramt wird ein Willkommensamt [The immigration office becomes a welcome office]," *Berliner Morgenpost*, May 29, 2019, <https://www.morgenpost.de/berlin/article225874375/Auslaenderbehoerde-Berlin-Aus-dem-Auslaenderamt-wird-ein-Willkommensamt.html>

¹³⁹ Benjamin Dierks, "Heimat auf Zeit: wie ausländische Fachkräfte Berlin verändern [Temporary home: how foreign professionals are changing Berlin]," February 5, 2018, <https://www.deutschlandfunk.de/heimat-auf-zeit-wie-auslaendische-fachkraefte-berlin-100.html>

¹⁴⁰ Berlin Partner: Business Location Center, "Arbeitskräftepotenzial[Workforce potential]," 2022, <https://www.businesslocationcenter.de/arbeitsmarkt/arbeitskraeftepotenzial/>.

¹⁴¹ IHK Berlin, "Wirtschaftsentwicklung und -struktur [Economic development and structure]," 2021, <https://www.ihk-berlin.de/politische-positionen-und-statistiken-channel/zahlenundfakten/highcharts-berliner-wirtschaft-in-zahlen/wirtschaftsentwicklung-und-struktur-2261080>

¹⁴² IHK Berlin, "Wirtschaftsentwicklung und -struktur [Economic development and structure]," 2021, <https://www.ihk-berlin.de/politische-positionen-und-statistiken-channel/zahlenundfakten/highcharts-berliner-wirtschaft-in-zahlen/wirtschaftsentwicklung-und-struktur-2261080>

¹⁴³ Regionalagentur Region Köln, "Handlungsplan der Region Köln zur Umsetzung der Fachkräfteinitiative NRW[Action plan of the Cologne region for the implementation of the NRW skilled workers initiative]," n.d., <https://www.fachkraefteinitiative-nrw.de/einzelregionen/region-koeln/koeln-handlungsplan.pdf>.

logistics location for international trade, where local companies form a strong and innovative logistics cluster.

Over 5,000 industry companies with more than 130,000 employees are located in the city.¹⁴⁴ Cologne is characterized industry-wise by its mix of multinational corporations and family-led SMEs. With a turnover of 48.9 billion euros in 2021, Cologne ranks fourth among all industrial regions in Germany.¹⁴⁵ The foreign sales of industry in the Cologne district amount to 25.9 billion euros, representing almost one fifth of NRW-wide sales on global markets outside of Germany.¹⁴⁶ With an export rate of about 53.1%, it exceeds the national industrial export rate of 48.2%.¹⁴⁷ Total domestic and foreign sales have decreased significantly compared to 2019 due to the COVID-19 pandemic, however, in 2021, the situation in the industry has improved again.¹⁴⁸ In the autumn 2021 economic report published by the *Cologne Chamber of Industry and Commerce*, industrial companies characterized their situation as significantly more positive than in spring 2021, with around 46% of companies reporting an improved situation.¹⁴⁹ The business situation has recovered in most industrial sectors, with the exception of vehicle manufacturing and the chemical and pharmaceutical industries, in which the situation has further deteriorated in the fall compared to spring 2021.¹⁵⁰

¹⁴⁴ IHK Köln, “Industriereport 2021: Die Industrie im IHK-Bezirk Köln [Industry Report 2021: Industry in the Cologne Chamber of Industry and Commerce District],” 2021, <https://ihk-koeln.de/hauptnavigation/wirtschaftsstandort/konjunktur/industriereport-2021-die-industrie-im-ihk-bezirk-koeln-5434258>

¹⁴⁵ IHK Köln, “Industriereport 2021: Die Industrie im IHK-Bezirk Köln [Industry Report 2021: Industry in the Cologne Chamber of Industry and Commerce District],” 2021, <https://ihk-koeln.de/hauptnavigation/wirtschaftsstandort/konjunktur/industriereport-2021-die-industrie-im-ihk-bezirk-koeln-5434258>

¹⁴⁶ IHK Köln, “Industriereport 2021: Die Industrie im IHK-Bezirk Köln [Industry Report 2021: Industry in the Cologne Chamber of Industry and Commerce District],” 2021, <https://ihk-koeln.de/hauptnavigation/wirtschaftsstandort/konjunktur/industriereport-2021-die-industrie-im-ihk-bezirk-koeln-5434258>

¹⁴⁷ IHK Köln, “Industriereport 2021: Die Industrie im IHK-Bezirk Köln [Industry Report 2021: Industry in the Cologne Chamber of Industry and Commerce District],” 2021, <https://ihk-koeln.de/hauptnavigation/wirtschaftsstandort/konjunktur/industriereport-2021-die-industrie-im-ihk-bezirk-koeln-5434258>

¹⁴⁸ IHK Köln, “Industriereport 2021: Die Industrie im IHK-Bezirk Köln [Industry Report 2021: Industry in the Cologne Chamber of Industry and Commerce District],” 2021, <https://ihk-koeln.de/hauptnavigation/wirtschaftsstandort/konjunktur/industriereport-2021-die-industrie-im-ihk-bezirk-koeln-5434258>

¹⁴⁹ IHK Köln, “Industriereport 2021: Die Industrie im IHK-Bezirk Köln [Industry Report 2021: Industry in the Cologne Chamber of Industry and Commerce District],” 2021, <https://ihk-koeln.de/hauptnavigation/wirtschaftsstandort/konjunktur/industriereport-2021-die-industrie-im-ihk-bezirk-koeln-5434258>

¹⁵⁰ IHK Köln, “Industriereport 2021: Die Industrie im IHK-Bezirk Köln [Industry Report 2021: Industry in the Cologne Chamber of Industry and Commerce District],” 2021, <https://ihk-koeln.de/hauptnavigation/wirtschaftsstandort/konjunktur/industriereport-2021-die-industrie-im-ihk-bezirk-koeln-5434258>

Concerning the different industry branches in Cologne, many companies from the automotive sector, chemistry, mechanical engineering, energy, and environmental branches are located there. Among the many industrial clusters in Germany, the automotive sector is the most important with regard to employment; almost 45% of all socially insured employees work in this sector.¹⁵¹ The automobile manufacturer *Ford* is the largest employer in Cologne.¹⁵² The chemical industry is also relevant in Cologne, accounting for more than a quarter of all of Germany's turnover in this sector.¹⁵³ With around 150 companies and almost 80,000 employees, the chemical industry is primarily represented in the areas of mineral oil processing and the manufacturing of chemical products and plastic goods.¹⁵⁴ Parts of the Cologne urban area, in addition to neighboring cities and districts, form the Cologne "chemical belt".¹⁵⁵ In order to enhance the attractiveness and competitiveness of this region for global investors, a regional network (ChemCologne e.V.) was created among various stakeholders including the chambers, cities and more.¹⁵⁶

In response to the lack of qualified personnel in the region, different initiatives have been taken by local institutions. The chamber for industry and commerce in Cologne, for example, hosts events for companies about the employment of global talents. The G.I.B. mbH also offers talks and workshops on the topic of global talent for stakeholders in the region of NRW. In January 2020, the cabinet of the regional government of the province also established a central office for skilled labor immigration in the nearby city of Bonn.¹⁵⁷ The provincial government transferred the responsibility for the new skilled worker immigration procedure

¹⁵¹ Stadt Köln, "Industrie [Industry]," n.d., <https://www.stadt-koeln.de/artikel/20017/index.html>

¹⁵² Stadt Köln, "Industrie [Industry]," n.d., <https://www.stadt-koeln.de/artikel/20017/index.html>

¹⁵³ Stadt Köln, "Industrie [Industry]," n.d., <https://www.stadt-koeln.de/artikel/20017/index.html>

¹⁵⁴ Stadt Köln, "Industrie [Industry]," n.d., <https://www.stadt-koeln.de/artikel/20017/index.html>

¹⁵⁵ Stadt Köln, "Industrie [Industry]," n.d., <https://www.stadt-koeln.de/artikel/20017/index.html>

¹⁵⁶ Stadt Köln, "Industrie [Industry]," n.d., <https://www.stadt-koeln.de/artikel/20017/index.html>

¹⁵⁷ Land Nordrhein-Westfalen, Staatskanzlei des Landes Nordrhein-Westfalen [State of North Rhine-Westphalia, State Chancellery of the State of North Rhine-Westphalia], "Fachkräftegewinnung in Nordrhein-Westfalen künftig einfacher und deutlich schneller möglich [Attracting skilled workers in North Rhine-Westphalia will be easier and much faster in the future]," 2022, <https://www.land.nrw/pressemitteilung/fachkraeftegewinnung-nordrhein-westfalen-kuenftig-einfacher-und-deutlich-schneller>

to the Cologne district government as the main foreigners' authority. It is now responsible for pre-consent in the visa procedure for foreign skilled workers and the associated family reunification in NRW.¹⁵⁸

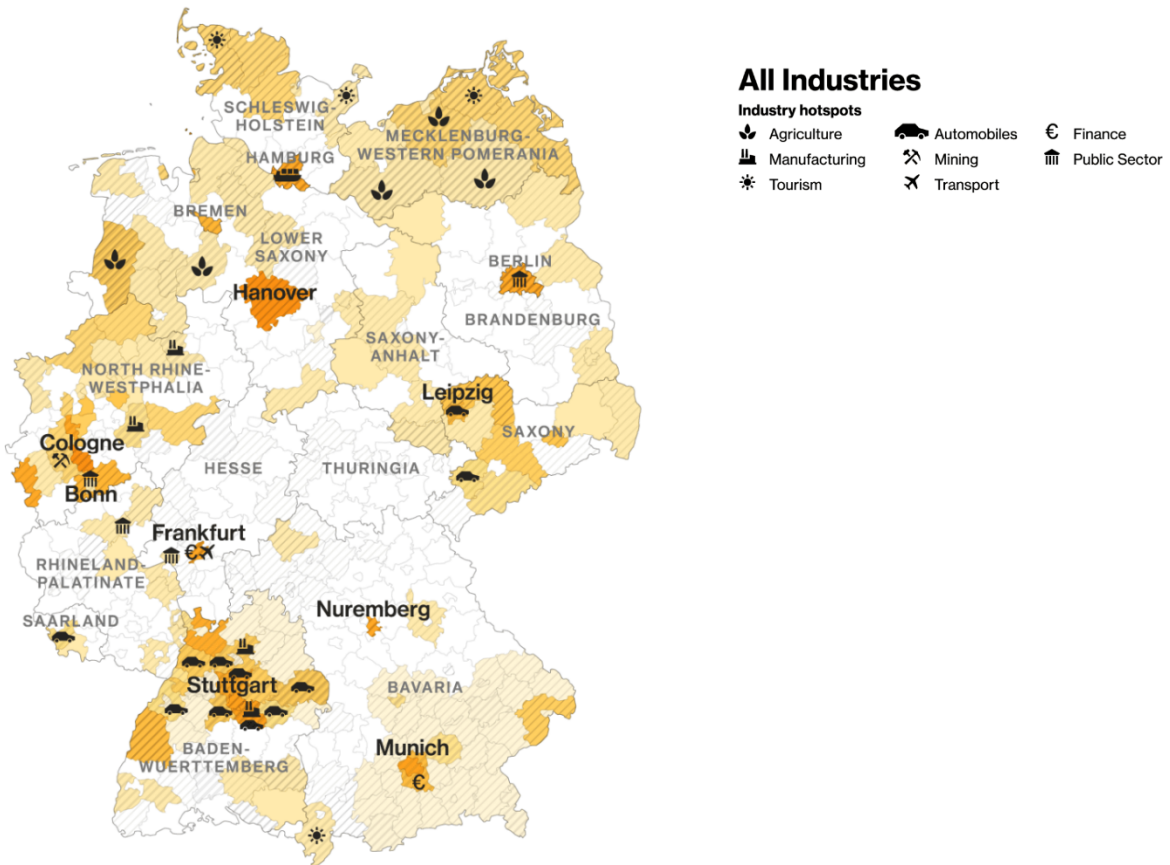


Figure 1 Map of German industry hubs¹⁵⁹

¹⁵⁸ Land Nordrhein-Westfalen, Staatskanzlei des Landes Nordrhein-Westfalen [State of North Rhine-Westphalia, State Chancellery of the State of North Rhine-Westphalia], “Fachkräftegewinnung in Nordrhein-Westfalen künftig einfacher und deutlich schneller möglich [Attracting skilled workers in North Rhine-Westphalia will be easier and much faster in the future],” 2022, <https://www.land.nrw/pressemitteilung/fachkraeftegewinnung-nordrhein-westfalen-kuenftig-einfacher-und-deutlich-schneller>

¹⁵⁹ Andre Tartar, Sam Dodge and Jeremy Scott Diamond, “Germany's Economy Is at a Crossroads,” *Bloomberg*, October 2, 2018, <https://www.bloomberg.com/graphics/2018-mapping-german-economy/?leadSource=uverify%20wall>

II. Employment and STEM Workforce

Employment trends in STEM

Before the outbreak of COVID-19, Germany had maintained a strong employment trend supported by an economy based on traditional heavy industry. Unlike other industrial countries such as the UK or France, Germany has not experienced a de-industrialization in the beginning of the new century.¹⁶⁰ The industry's share of the overall added value in the country has constantly risen in the past decades.¹⁶¹ Although Germany's industry is growing and traditional manufacturing methods in SMEs are still highly regarded, the digitalization megatrends, platform economy, and AI are challenges different branches are starting to face. This can especially be seen in machine and plant construction in which digitalization plays a significant role and will likely increase in the future.¹⁶² In response to this demand, the Federal Ministry of Education and Research initiated "Industrie 4.0" in 2011, with the plan to "combine production methods with state-of-the-art information and communications technology".¹⁶³ In 2013, the German Academy of Technical Science (Acatech) presented a scientific agenda which the federal ministries agreed on.¹⁶⁴ Given that around 15 million jobs in Germany depend on manufacturing industries, the government aims to transform manufacturing processes and to create new opportunities for businesses, particularly for SMEs.¹⁶⁵

¹⁶⁰ Verband der chemischen Industrie e.V. [German Chemical Industry Association], "Industrieland Deutschland [Germany as an industrialized country]", January 2021, 3, <https://www.vci.de/ergaenzende-downloads/industrieland-deutschland-daten-fakten-bedeutung-deutsche-industrie.pdf>

¹⁶¹ Statistisches Bundesamt [Federal Statistical Office], "Volkswirtschaftliche Gesamtrechnungen: Wichtige Zusammenhänge im Überblick [National accounts: Important interrelationships at a glance]," 2021, https://www.destatis.de/DE/Themen/Wirtschaft/Volkswirtschaftliche-Gesamtrechnungen-Inlandsprodukt/Publikationen/Downloads-Inlandsprodukt/zusammenhaenge-pdf-0310100.pdf?__blob=publicationFile

¹⁶² Jürgen Dispan, "Die Region Stuttgart im Umbruch: Transformation der Schlüsselindustrien als Herausforderung für die Regionalwirtschaft [The Stuttgart Region in Transition: Transformation of Key Industries as a Challenge for the Regional Economy]," 2021, <https://www.bpb.de/apuz/stuttgart-2021/326252/transformation-der-schlüsselindustrien-als-herausforderung-fuer-die-regionalwirtschaft>

¹⁶³ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], "Industrie 4.0 [Industry 4.0]," 2021, <https://www.bmwi.de/Redaktion/EN/Dossier/industrie-40.html>

¹⁶⁴ Bundesministerium für Bildung und Forschung [Federal Ministry of Education and Research], "Industrie 4.0," 2021, <https://www.bmbf.de/de/zukunftsprojekt-industrie-4-0-848.html>

¹⁶⁵ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], "Industrie 4.0 [Industry 4.0]," 2021, <https://www.bmwi.de/Redaktion/EN/Dossier/industrie-40.html>

Many industry branches are facing widespread shortages, more than 50% of all companies in STEM view the shortage of skilled employees as a direct threat to their economic development.¹⁶⁶ Digitalization has also created a need for highly skilled experts, a problem that all sectors in different industry branches are facing.¹⁶⁷ Unemployment rates in the technology industry as well as other economic branches in Germany are decreasing and reflect an increasing demand for workers. Particularly affected by the shortage of skilled workers are nursing, public administration, and technical professions.¹⁶⁸ Prior to the global health crisis, the Federal Employment Agency registered 241,000 job offers in STEM professions, especially in the technical sector in 2018.¹⁶⁹ More than a quarter of all employed people in Germany (29%) worked in the STEM field, counting 7.9 million experts in the same year.¹⁷⁰ The statistics also show that in 2018, 85% of all STEM experts were employed in technical jobs such as engineering, electronics, mechatronics, and that every tenth person employed in STEM worked in the field of informatics and software development.¹⁷¹ This shows that employment in the STEM sector has risen slightly more than in other occupations during the last years.¹⁷²

¹⁶⁶ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Fachkräfte für Deutschland [Skilled workers for Germany],” 2021, <https://www.bmwi.de/Redaktion/DE/Dossier/fachkraeftesicherung.html>

¹⁶⁷ Jürgen Dispan, “Die Region Stuttgart im Umbruch: Transformation der Schlüsselindustrien als Herausforderung für die Regionalwirtschaft [The Stuttgart Region in Transition: Transformation of Key Industries as a Challenge for the Regional Economy],” 2021, <https://www.bpb.de/apuz/stuttgart-2021/326252/transformation-der-schluesseindustrien-als-herausforderung-fuer-die-regionalwirtschaft>

¹⁶⁸ Informationsdienst des Instituts der deutschen Wirtschaft [Information service of the Institute of the German Economy], “Fachkräftemangel: Wo es brennt und was hilft [Shortage of skilled workers: where it burns and what helps],” 2018, https://www.iwd.de/artikel/fachkraeftemangel-wo-es-brennt-und-was-hilft-375797/?gclid=EAIaIQobChMlg_Ggs4iU8AIVGHYYCh1bzQErEAMYASAAEgIguPD_BwE

¹⁶⁹ Statistik der Bundesagentur für Arbeit [Statistics of the Federal Employment Agency], “Berichte: Blickpunkt Arbeitsmarkt - MINT-Berufe [Reports: Focus on the labor market - STEM professions],” 2019, 14, https://statistik.arbeitsagentur.de/DE/Statischer-Content/Statistiken/Themen-im-Fokus/Berufe/Generische-Publikationen/Broschuere-MINT.pdf?__blob=publicationFile

¹⁷⁰ Statistik der Bundesagentur für Arbeit [Statistics of the Federal Employment Agency], “Berichte: Blickpunkt Arbeitsmarkt - MINT-Berufe [Reports: Focus on the labor market - STEM professions],” 2019, 14, https://statistik.arbeitsagentur.de/DE/Statischer-Content/Statistiken/Themen-im-Fokus/Berufe/Generische-Publikationen/Broschuere-MINT.pdf?__blob=publicationFile

¹⁷¹ Statistik der Bundesagentur für Arbeit [Statistics of the Federal Employment Agency], “Berichte: Blickpunkt Arbeitsmarkt - MINT-Berufe [Reports: Focus on the labor market - STEM professions],” 2019, 14, https://statistik.arbeitsagentur.de/DE/Statischer-Content/Statistiken/Themen-im-Fokus/Berufe/Generische-Publikationen/Broschuere-MINT.pdf?__blob=publicationFile

¹⁷² Statistik der Bundesagentur für Arbeit [Statistics of the Federal Employment Agency], “Berichte: Blickpunkt Arbeitsmarkt - MINT-Berufe [Reports: Focus on the labor market - STEM professions],” 2019, 16, https://statistik.arbeitsagentur.de/DE/Statischer-Content/Statistiken/Themen-im-Fokus/Berufe/Generische-Publikationen/Broschuere-MINT.pdf?__blob=publicationFile

The share of global STEM talents in Germany rose from 14.3% in 2011 to 20.4% in 2017.¹⁷³ Compared to the employment of Germans, the employment of foreign specialists and workers in STEM-related jobs was many times higher during this period.¹⁷⁴ If the employment of foreign specialists had risen as slowly as the employment of German specialists since 2013, the gap of skilled potentials would have amounted to about half a million across the STEM sector by 2019.¹⁷⁵ The contributions of foreign STEM personnel to the German net domestic product are therefore very high: approximately 195.7 billion euros in 2018. Among academics in the STEM sector, the rate of foreign employees reached a record high of around 140,000 in 2019.¹⁷⁶

Meanwhile, as in other countries worldwide, the COVID-19 pandemic which was declared in March 2020 triggered an economic decline in Germany.¹⁷⁷ Following two country-wide lockdowns and about 150,000 deaths as of 2022, immigration to Germany has decreased drastically, further highlighting the extent to which the country relies on immigration to mitigate demographic change in the country.¹⁷⁸ In 2020, 55% of all companies that were surveyed reported bottlenecks and did not anticipate this would change in 2021.

¹⁷³ Christina Anger, Oliver Koppel, Axel Plünnecke, Enno Röben, and Ruth Maria Schüler “MINT Herbstreport 2019: MINT-Basis zur Zukunftssicherung durch Forschung und Digitalisierung [MINT Fall Report 2019: MINT- Basis for Securing the Future through Research and Digitization],” *Institut Der Deutschen Wirtschaft*, 2019, 31, https://www.iwkoeln.de/fileadmin/user_upload/Studien/Gutachten/PDF/2019/IW-Gutachten-MINT-Herbstreport-2019.pdf

¹⁷⁴ Christina Anger, Oliver Koppel, Axel Plünnecke, Enno Röben, and Ruth Maria Schüler “MINT Herbstreport 2019: MINT-Basis zur Zukunftssicherung durch Forschung und Digitalisierung [MINT Fall Report 2019: MINT- Basis for Securing the Future through Research and Digitization],” *Institut Der Deutschen Wirtschaft*, 2019, 31, https://www.iwkoeln.de/fileadmin/user_upload/Studien/Gutachten/PDF/2019/IW-Gutachten-MINT-Herbstreport-2019.pdf

¹⁷⁵ Christina Anger, Oliver Koppel, Axel Plünnecke, Enno Röben, and Ruth Maria Schüler “MINT Herbstreport 2019: MINT-Basis zur Zukunftssicherung durch Forschung und Digitalisierung [MINT Fall Report 2019: MINT- Basis for Securing the Future through Research and Digitization],” *Institut Der Deutschen Wirtschaft*, 2019, 31, https://www.iwkoeln.de/fileadmin/user_upload/Studien/Gutachten/PDF/2019/IW-Gutachten-MINT-Herbstreport-2019.pdf

¹⁷⁶ Christina Anger, Oliver Koppel, Axel Plünnecke, Enno Röben, and Ruth Maria Schüler “MINT Herbstreport 2019: MINT-Basis zur Zukunftssicherung durch Forschung und Digitalisierung [MINT Fall Report 2019: MINT- Basis for Securing the Future through Research and Digitization],” *Institut Der Deutschen Wirtschaft*, 2019, 43, https://www.iwkoeln.de/fileadmin/user_upload/Studien/Gutachten/PDF/2019/IW-Gutachten-MINT-Herbstreport-2019.pdf

¹⁷⁷ Geraldine Dany-Knedlik, “Corona-Krise: Welche Folgen hat die Pandemie für die Wirtschaft? [Corona crisis: What consequences does the pandemic have for the economy?],” May 18, 2020, <https://www.bpb.de/politik/innenpolitik/coronavirus/310192/wirtschaft>

¹⁷⁸ Matthias Mayer und Marius Clemens, “Fachkräftemigrationsmonitor: Fachkräftengpässe von Unternehmen in Deutschland, Trends zum Zuzug ausländischer Fachkräfte und die Situation ausländischer Erwerbstätiger am deutschen Arbeitsmarkt [Skilled Worker Migration Monitor: Skilled Worker Shortages of Companies in Germany, Trends on the Influx of Foreign Skilled Workers and the Situation of Foreign Workers in the German Labor Market],” 2021, <https://doi.org/10.11586/2020082>

About 27% of the companies surveyed were specifically in need of academics.¹⁷⁹ Although different options have been considered, including mobilizing potential work forces (e.g., women) and increasing the retirement age, the recruitment of foreign highly skilled workers still seems to be the most effective.¹⁸⁰ Yet, many German companies continue to show hesitation towards hiring foreign workers; only 17% of companies surveyed mentioned actively recruiting skilled workers from abroad.¹⁸¹ More of them prioritized apprenticeships, measurements and further training to achieve a better work-life balance for their employees.¹⁸²

Education in STEM field

Although a large part of workers in STEM have a dual or school-based vocational training (59.5%), every fourth worker is a specialist with a German craftsman's master or a bachelor.¹⁸³ 17.6% of all STEM employees are highly qualified experts with a university degree.¹⁸⁴ Since Germany is a leader in engineering and technical innovations, the rate of students enrolled in STEM is rising steadily.¹⁸⁵ In 2020, 35% of all Master's degrees in Germany were in a STEM subject, accounting for the largest number within the EU,

¹⁷⁹ Matthias Mayer und Marius Clemens, "Fachkräftemigrationsmonitor: Fachkräfteengpässe von Unternehmen in Deutschland, Trends zum Zuzug ausländischer Fachkräfte und die Situation ausländischer Erwerbstätiger am deutschen Arbeitsmarkt [Skilled Worker Migration Monitor: Skilled Worker Shortages of Companies in Germany, Trends on the Influx of Foreign Skilled Workers and the Situation of Foreign Workers in the German Labor Market]," 2021, 10-11, <https://doi.org/10.11586/2020082>

¹⁸⁰ Matthias Mayer und Marius Clemens, "Fachkräftemigrationsmonitor: Fachkräfteengpässe von Unternehmen in Deutschland, Trends zum Zuzug ausländischer Fachkräfte und die Situation ausländischer Erwerbstätiger am deutschen Arbeitsmarkt [Skilled Worker Migration Monitor: Skilled Worker Shortages of Companies in Germany, Trends on the Influx of Foreign Skilled Workers and the Situation of Foreign Workers in the German Labor Market]," 2021, 12, <https://doi.org/10.11586/2020082>

¹⁸¹ Matthias Mayer und Marius Clemens, "Fachkräftemigrationsmonitor: Fachkräfteengpässe von Unternehmen in Deutschland, Trends zum Zuzug ausländischer Fachkräfte und die Situation ausländischer Erwerbstätiger am deutschen Arbeitsmarkt [Skilled Worker Migration Monitor: Skilled Worker Shortages of Companies in Germany, Trends on the Influx of Foreign Skilled Workers and the Situation of Foreign Workers in the German Labor Market]," 2021, 12, <https://doi.org/10.11586/2020082>

¹⁸² Matthias Mayer und Marius Clemens, "Fachkräftemigrationsmonitor: Fachkräfteengpässe von Unternehmen in Deutschland, Trends zum Zuzug ausländischer Fachkräfte und die Situation ausländischer Erwerbstätiger am deutschen Arbeitsmarkt [Skilled Worker Migration Monitor: Skilled Worker Shortages of Companies in Germany, Trends on the Influx of Foreign Skilled Workers and the Situation of Foreign Workers in the German Labor Market]," 2021, 13, <https://doi.org/10.11586/2020082>

¹⁸³ Statistik der Bundesagentur für Arbeit [Statistics of the Federal Employment Agency], "Berichte: Blickpunkt Arbeitsmarkt - MINT-Berufe [Reports: Focus on the labor market - STEM professions]," 2019, 20, https://statistik.arbeitsagentur.de/DE/Statischer-Content/Statistiken/Themen-im-Fokus/Berufe/Generische-Publikationen/Broschuere-MINT.pdf?__blob=publicationFile

¹⁸⁴ Statistik der Bundesagentur für Arbeit [Statistics of the Federal Employment Agency], "Berichte: Blickpunkt Arbeitsmarkt - MINT-Berufe [Reports: Focus on the labor market - STEM professions]," 2019, 20, https://statistik.arbeitsagentur.de/DE/Statischer-Content/Statistiken/Themen-im-Fokus/Berufe/Generische-Publikationen/Broschuere-MINT.pdf?__blob=publicationFile

¹⁸⁵ J. Rudnicka, "Anzahl der Studierenden in MINT-Fächern in Deutschland in den Wintersemestern von 2009/2010 bis 2019/2020 [Number of students in STEM subjects in Germany in the winter semesters from 2009/2010 to 2019/2020]," October 22, 2020, <https://de.statista.com/statistik/daten/studie/1050904/umfrage/studierende-in-mint-faechern-in-deutschland/>

with the average rate of around 25%, followed by Portugal (32%) and Sweden (31%).¹⁸⁶ The trend of graduates in STEM subjects has continued to rise since 2003, as well as the enrollment rate of international students.¹⁸⁷ Top sending countries of international students are China, India, Russia, Austria, Italy, France, Cameroon, Ukraine, and Turkey.¹⁸⁸ During the last ten years, the number of foreign students studying STEM-oriented subjects in Germany has almost doubled (+ 96.4%).¹⁸⁹ This might also be partly due to the fact that four universities in Germany in the STEM sector rank highly on a worldwide scale; the Technical University of Munich, RWTH Aachen University, TU Berlin, and the Karlsruhe Institute of Technology were listed among the top 100 on the 2019 Quacquarelli Symonds (Q.S.) World University Ranking for Engineering and Technology.¹⁹⁰

Although the number of STEM graduates is rising and the share of academics in the metal and electrical industry is above average in Germany¹⁹¹, they have not succeeded in relieving the talent shortages in all STEM sectors.¹⁹² Similar to the other industrial countries, Germany's population is ageing and many skilled employees in the STEM sector will retire in the coming years. By the end of 2012, 15% of all STEM employees were aged 55 years or older and this number was estimated to rise more than 20% by March 2020.¹⁹³ This shows a high demand for qualified STEM personnel, particularly for IT specialists owing to

¹⁸⁶ Statistisches Bundesamt [Federal Statistical Office of Germany], "Master's degrees in STEM subjects: Germany and Portugal with highest share," 2022, [https://www.destatis.de/Europa/EN/Topic/Population-Labour-Social-Issues/Education-Culture/MINTFaecher.html#:~:text=In%20an%20EU%20comparison%2C%20Germany's,%25\)%%20and%20Cyprus%20\(7%25\)](https://www.destatis.de/Europa/EN/Topic/Population-Labour-Social-Issues/Education-Culture/MINTFaecher.html#:~:text=In%20an%20EU%20comparison%2C%20Germany's,%25)%%20and%20Cyprus%20(7%25))

¹⁸⁷ Study in Germany, "Germany International Students Statistics 2022," 2022, <https://www.studying-in-germany.org/germany-international-student-statistics/>

¹⁸⁸ Study in Germany, "Germany International Students Statistics 2022," 2022, <https://www.studying-in-germany.org/germany-international-student-statistics/>

¹⁸⁹ Statistik der Bundesagentur für Arbeit [Statistics of the Federal Employment Agency], "Berichte: Blickpunkt Arbeitsmarkt - MINT-Berufe [Reports: Focus on the labor market - STEM professions]," 2019, 21, https://statistik.arbeitsagentur.de/DE/Statischer-Content/Statistiken/Themen-im-Fokus/Berufe/Generische-Publikationen/Broschuere-MINT.pdf?_blob=publicationFile

¹⁹⁰ QS Quacquarelli Symonds, "Engineering and Technology: QS Top Universities," 2019, <https://www.topuniversities.com/university-rankings/university-subject-rankings/2019/engineering-technology>

¹⁹¹ Axel Plünnecke, "MINT-Berufe: Immer mehr IT-Fachkräfte fehlen [STEM professions: Increasing shortage of IT specialists]," 2019, <https://www.iwd.de/artikel/mint-berufe-immer-mehr-it-fachkraefte-fehlen-433188/>

¹⁹² Statistik der Bundesagentur für Arbeit [Statistics of the Federal Employment Agency], "Berichte: Blickpunkt Arbeitsmarkt - MINT-Berufe [Reports: Focus on the labor market - STEM professions]," 2019, 21, https://statistik.arbeitsagentur.de/DE/Statischer-Content/Statistiken/Themen-im-Fokus/Berufe/Generische-Publikationen/Broschuere-MINT.pdf?_blob=publicationFile

¹⁹³ Axel Plünnecke, "MINT-Berufe: Immer mehr IT-Fachkräfte fehlen [STEM professions: Increasing shortage of IT specialists]," 2019, <https://www.iwd.de/artikel/mint-berufe-immer-mehr-it-fachkraefte-fehlen-433188/>

technological advancements.¹⁹⁴ The COVID-19 pandemic had a significant impact on the German industry, leading to a decrease in the need for workers; the skills gap in STEM was approximately 54% smaller in 2020 than from 2014 to 2019.¹⁹⁵ Nevertheless, the shortage of experts in this field has only reduced about 30%, demonstrating a continuous demand for qualified employees.¹⁹⁶ IT experts are in especially high demand for local businesses, where the number of occupations rose almost 88% until the first half of 2020. This shows by far the largest growth rate of all STEM professions.¹⁹⁷

Women in STEM field

In Germany, different initiatives have been created over the years to improve gender equality and close the gender gap in the STEM field, albeit they have only been partially successful.¹⁹⁸ While the number of students in STEM subjects has risen, the share of women studying and working in STEM is still low in comparison to other branches: 29.3% and 15.4% in 2019, respectively.¹⁹⁹ Although Germany ranks 10th on the WEF's 2020 Global Gender Gap Index, gender gaps are still visible; for example, in 2020, the gender wage gap amounted to 18%.²⁰⁰ In Germany, women are often employed in economic branches that are not as high-paying and do not hold senior management positions. There are also more female part-time workers than men, in order to fulfill familial responsibilities.²⁰¹

¹⁹⁴ Statistik der Bundesagentur für Arbeit [Statistics of the Federal Employment Agency], "Berichte: Blickpunkt Arbeitsmarkt - MINT-Berufe [Reports: Focus on the labor market - STEM professions]," 2019, 21, <https://statistik.arbeitsagentur.de/DE/Statischer-Content/Statistiken/Themen-im-Fokus/Berufe/Generische-Publikationen/Broschuere-MINT.pdf?blob=publicationFile>

¹⁹⁵ Axel Plünnecke, "Fachkräftemangel bleibt für Unternehmen akut [Shortage of skilled workers remains acute for companies]," 2020, <https://www.iwd.de/artikel/fachkraeftemangel-bleibt-fuer-unternehmen-akut-491758/>

¹⁹⁶ Axel Plünnecke, "Fachkräftemangel bleibt für Unternehmen akut [Shortage of skilled workers remains acute for companies]," 2020, <https://www.iwd.de/artikel/fachkraeftemangel-bleibt-fuer-unternehmen-akut-491758/>

¹⁹⁷ Axel Plünnecke, "Fachkräftemangel bleibt für Unternehmen akut [Shortage of skilled workers remains acute for companies]," 2020, <https://www.iwd.de/artikel/fachkraeftemangel-bleibt-fuer-unternehmen-akut-491758/>

¹⁹⁸ Kathinka L. Best, Ulrike Sanwald, Susanne Ihlen, and Angela Ittel, "Gender and STEM in Germany: Policies Enhancing Women's Participation in Academia," *International journal of gender, science and technology* 5, no. 3 (2013): 292–304, 292

¹⁹⁹ Statistik der Bundesagentur für Arbeit [Statistics of the Federal Employment Agency], "Berichte: Blickpunkt Arbeitsmarkt - MINT-Berufe [Reports: Focus on the labor market - STEM professions]," 2019, 22, <https://statistik.arbeitsagentur.de/DE/Statischer-Content/Statistiken/Themen-im-Fokus/Berufe/Generische-Publikationen/Broschuere-MINT.pdf?blob=publicationFile>

²⁰⁰ World Economic Forum, "Global Gender Gap Report 2022", 2022, 9, https://www3.weforum.org/docs/WEF_GGGR_2022.pdf

²⁰¹ Statistisches Bundesamt [Federal Statistical Office], "Gender Pay Gap 2020: Frauen verdienten 18% weniger als Männer [Gender Pay Gap 2020: Women earned 18% less than men]," March 9, 2021, https://www.destatis.de/DE/Presse/Pressemitteilungen/2021/03/PD21_106_621.html.

Gender gaps are more likely in sectors that require disruptive technical skills.²⁰² In Cloud Computing, for example, women make up 14% of the workforce, in engineering, 20% and in Data and AI, 32%”.²⁰³ In the German STEM sector, more women are employed as experts than as workers. Only 5% of all mechanical engineers and 7% of all electrical engineers are female.²⁰⁴ The share of women in industrial engineering was at 21% and in R&D at 56% in 2019.²⁰⁵ Most women are employed in the science sector, where they make up around 37.5% of all employees.²⁰⁶ A 2019 survey showed that women are more likely apply to creative and business-related professions in the STEM sector.²⁰⁷

Differences in STEM employment among women in Germany can also be attributed to different regional economic structures. The cities of Hamburg and Berlin, for example, show a share of 19.2% and 21.7% female employees in this sector respectively, a higher share than in rural areas. Statistics also reflect differences in female STEM employment between East and West Germany. Due to a higher employment rate of women in STEM jobs in the former German Democratic Republic (GDR), the share of women in this sector is still higher in Eastern Germany.²⁰⁸ Although women earn a larger percentage of engineering degrees in East Germany, West Germany has shown some improvements in opportunities and better pay in the engineering labour market.²⁰⁹

²⁰² World Economic Forum, “Global Gender Gap Report 2022”, 2022, 38, https://www3.weforum.org/docs/WEF_GGGR_2022.pdf

²⁰³ World Economic Forum, “Global Gender Gap Report 2022”, 2022, 39, https://www3.weforum.org/docs/WEF_GGGR_2022.pdf

²⁰⁴ Frauke Suhr, “Frau Elektrikerin hat fast nur männliche Kollegen [Woman electrician has almost only male colleagues],” April 4, 2019, <https://de.statista.com/infografik/17595/frauenanteil-in-mint-berufen/>

²⁰⁵ Frauke Suhr, “Frau Elektrikerin hat fast nur männliche Kollegen [Woman electrician has almost only male colleagues],” April 4, 2019, <https://de.statista.com/infografik/17595/frauenanteil-in-mint-berufen/>

²⁰⁶ Statistik der Bundesagentur für Arbeit [Statistics of the Federal Employment Agency], “Berichte: Blickpunkt Arbeitsmarkt - MINT-Berufe [Reports: Focus on the labor market - STEM professions],” 2019, 20, https://statistik.arbeitsagentur.de/DE/Statischer-Content/Statistiken/Themen-im-Fokus/Berufe/Generische-Publikationen/Broschuere-MINT.pdf?__blob=publicationFile

²⁰⁷ Frauke Suhr, “Frau Elektrikerin hat fast nur männliche Kollegen [Woman electrician has almost only male colleagues],” April 4, 2019, <https://de.statista.com/infografik/17595/frauenanteil-in-mint-berufen/>

²⁰⁸ Statistik der Bundesagentur für Arbeit [Statistics of the Federal Employment Agency], “Berichte: Blickpunkt Arbeitsmarkt - MINT-Berufe [Reports: Focus on the labor market - STEM professions],” 2019, 22, https://statistik.arbeitsagentur.de/DE/Statischer-Content/Statistiken/Themen-im-Fokus/Berufe/Generische-Publikationen/Broschuere-MINT.pdf?__blob=publicationFile

²⁰⁹ Jennifer Dusal and Frank Fernandez, “Examining Gender (In)Equality in German Engineering: Considering the Importance of Interest, Perceptions, and Choice,” in *Gender Equity in STEM in Higher Education: International Perspectives on Policy, Institutional Culture, and Individual Choice*, ed. Hyun Kyoung Ro, Frank Fernández, and Elizabeth Ramon (New York: Routledge, 2021) 121-139, 122.

III. Global Talent Recruitment and Retention

With an ageing society and a demand for skilled employees across different economic branches, Germany is now in a situation that requires a reconsideration of global talent recruitment. By 2060, if Germany does not allow immigration, there would be up to 16 million fewer people working in the industry.²¹⁰ A 2017 estimate shows that if the country wants to sustain current levels, about 400,000 more people would have to immigrate to Germany.²¹¹ As the situation has become more urgent, the recruitment of skilled workers from non-EU countries is now being considered more seriously than before. Recruitment programs and new immigration policies have been designed in recent years to promote and raise interest in Germany as a destination country for highly skilled professionals.

For a long time, Germany was not considered as an immigration country but rather as a labour recruiting nation.²¹² Or, rather, as some argue, though the country has been an immigration country since the nineteenth century, political discourse and practice have long denied this claim.²¹³ Until the early 1990s, German immigration policy was driven by complex and separate legal provisions without comprehensive migration and integration legislation, as the government viewed guestworker migration as an economically motivated, and thus temporary, political measure.²¹⁴ Meanwhile, since the 2000s, Germany has been incentivizing immigrants to stay in the country permanently.²¹⁵ In 2021, there were approximately 11.8 million foreigners living in Germany, and 22.3 million people, around 27.2% of the population, had a

²¹⁰ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Fachkräfte für Deutschland [Skilled workers for Germany],” 2021, <https://www.bmwi.de/Redaktion/DE/Dossier/fachkraeftesicherung.html>

²¹¹ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Fachkräfte für Deutschland [Skilled workers for Germany],” 2021, <https://www.bmwi.de/Redaktion/DE/Dossier/fachkraeftesicherung.html>

²¹² Jenny Gesley. “The development of migration and citizenship law in postwar Germany,” *Library of Congress*, 2017, 1, <https://www.loc.gov/law/help/migration-citizenship/migration-citizenship-law-postwar-germany.pdf>

²¹³ Wilfried Zoungana. “Introduction,” in *No Country for Migrants?: Critical Perspectives on Asylum, Immigration, and Integration in Germany* (Leiden :: Brill, 2020), 7

²¹⁴ Zimmermann, Klaus F, Holger Bonin, René Fahr, and Holger Hinte, “The Migration Issue in Germany,” in *Immigration Policy and the Labor Market: The German Experience and Lessons for Europe*. (Aufl. Berlin, Heidelberg: Springer-Verlag, 2007), 7-44, 9

²¹⁵ Andreas Ette, Barbara Heß, and Lenore Sauer, “Tackling Germany’s Demographic Skills Shortage: Permanent Settlement Intentions of the Recent Wave of Labour Migrants from Non-European Countries,” *Journal of international migration and integration* 17, no. 2 (2016): 429–448, 430

migrant background.²¹⁶²¹⁷ While migration flows slowed down significantly after the COVID-19 pandemic, Germany reported the largest total number of immigrants in the EU in 2020, 728,600, followed by Spain (467,900), France (283,200), and Italy (247,500).²¹⁸

While emigration has long exceeded immigration rates in German history, this trend began to slowly change as the Industrial Revolution created more work opportunities. From then on, more people started to migrate to different regions, especially those with coal and steel industries, such as the Ruhr area in North-Rhine Westfalia.²¹⁹ A more formal agreement to recruit foreign workers took place after World War II. During the economic recovery and the economic boom of the 1960s, labour shortages led to agreements between West Germany and other countries (*“Abkommen über Anwerbung und Vermittlung von Arbeitskräften”*) to mitigate labour shortages in the industry, beginning with Italy in 1955, and later with Greece, Spain, Turkey, Morocco, Tunisia, Portugal, and Yugoslavia.²²⁰ The recruitment of foreign workers during this period mainly concentrated on low- or medium-skilled employees.²²¹ These migrant workers generally assumed unskilled positions with minimal training requirements with high physical stress, health burdens, and wage conditions that many locals were no longer willing to accept.²²² Given that these workers were seen as “guest workers”, it was assumed that they would not settle in Germany, but would instead return to their home countries after a while. As a result, they were not given specific training, language courses, or

²¹⁶ Statistisches Bundesamt [Federal Statistical Office], “Foreign population by Land,” April 2022, <https://www.destatis.de/EN/Themes/Society-Environment/Population/Migration-Integration/Tables/foreign-population-laender.html>

²¹⁷ Statistisches Bundesamt [Federal Statistical Office], “Well over one in four people in Germany had a migrant background in 2021,” April 2022, https://www.destatis.de/EN/Press/2022/04/PE22_162_125.html

²¹⁸ Eurostat, “Migration and migrant population statistics,” March 2022, [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Migration_and_migrant_population_statistics#:~:text=Germany%20reported%20the%20largest%20total,and%20Poland%20\(161%20700\)](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Migration_and_migrant_population_statistics#:~:text=Germany%20reported%20the%20largest%20total,and%20Poland%20(161%20700))

²¹⁹ Dokumentationszentrum und Museum über die Migration in Deutschland e.V. [Documentation Center and Museum on Migration in Germany e.V.], “Migrationsgeschichte in Deutschland [Migration history in Germany],” n.d., <https://www.domid.org/angebot/aufsaeetze/essay-migrationsgeschichte-in-deutschland>

²²⁰ Anke Brodmerkel, “Einwanderungsland Deutschland [Immigration country Germany],” May 1, 2017, <https://www.bpb.de/politik/innenpolitik/demografischer-wandel/196652/einwanderungsland-deutschland>

²²¹ Klaudia Tietze, “Migration von Hochqualifizierten im Kontext der Entwicklung der Einwanderungskonzepte deutscher Parteien [Migration of Highly Qualified Persons in the Context of the Development of Immigration Concepts of German Political Parties],” 2008 In: *Hunger, Uwe, C. M. Aybek, A. Ette, & I. Michalowski (Eds.), Migrations- und Integrationsprozesse in Europa* (pp. 35–50), 2008, *VS Verlag für Sozialwissenschaften*, 35

²²² Vera Hanewinkel and Jochen Oltmer, “Historical and Current Development of Migration to and from Germany,” Bundeszentrale für politische Bildung [Federal Agency for Civic Education], November 1, 2018, <https://www.bpb.de/themen/migration-integration/laenderprofile/english-version-country-profiles/262758/historical-and-current-development-of-migration-to-and-from-germany/#node-content-title-3>

acknowledgement of foreign certifications.²²³ During the oil and economic crisis in 1973, this period of recruitment ended after the government eventually issued a recruitment ban on foreign workers.²²⁴ Apart from being regarded as an inevitable response to economic crisis, it was a reaction to the dramatic increase of immigration in the country.²²⁵ From the late 1950s until the suspension of labor recruitment in 1973, roughly 14 million foreign workers came to Germany, of whom 11 million stayed temporarily and eventually returned to their home countries.²²⁶

While the recruitment ban severely limited labour immigration, policymakers gradually lifted restrictions and created a series of exceptions in the face of impending labor shortages, particularly in agriculture.²²⁷ During the 1990s, the opening of the "Iron Curtain", transformation of the political systems in the former states of the Eastern Bloc and the collapse of East Germany in 1989/90, saw the number of asylum seekers from Eastern, Central Eastern and Southern Europe rise significantly.²²⁸ Immigration into Germany reached its historic peak in 1992, counting approximately 1.5 million people.²²⁹ This accounted for roughly 60% of all immigrants and refugees in the EU at the time.²³⁰ Since the German economy was experiencing a crisis with a high unemployment rate right in the years prior, the government published another recruitment ban

²²³ Dokumentationszentrum und Museum über die Migration in Deutschland e.V. [Documentation Center and Museum on Migration in Germany e.V.], "Migrationsgeschichte in Deutschland [Migration history in Germany]," n.d., <https://www.domid.org/angebot/aufsaeetze/essay-migrationsgeschichte-in-deutschland>

²²⁴ Anke Brodmerkel, "Einwanderungsland Deutschland [Immigration country Germany]," May 1, 2017, <https://www.bpb.de/politik/innenpolitik/demografischer-wandel/196652/einwanderungsland-deutschland>

²²⁵ Zimmermann, Klaus F, Holger Bonin, René Fahr, and Holger Hinte, "The Migration Issue in Germany," in *Immigration Policy and the Labor Market: The German Experience and Lessons for Europe*. (Aufl. Berlin, Heidelberg: Springer-Verlag, 2007), 7-44, 9-10

²²⁶ Vera Hanewinkel and Jochen Oltmer, "Historical and Current Development of Migration to and from Germany," Bundeszentrale für politische Bildung [Federal Agency for Civic Education], November 1, 2018, <https://www.bpb.de/themen/migration-integration/laenderprofile/english-version-country-profiles/262758/historical-and-current-development-of-migration-to-and-from-germany/#node-content-title-3>

²²⁷ Zimmermann, Klaus F, Holger Bonin, René Fahr, and Holger Hinte, "The Migration Issue in Germany," in *Immigration Policy and the Labor Market: The German Experience and Lessons for Europe*. (Aufl. Berlin, Heidelberg: Springer-Verlag, 2007), 7-44, 11

²²⁸ Vera Hanewinkel and Jochen Oltmer, "Historical and Current Development of Migration to and from Germany," Bundeszentrale für politische Bildung [Federal Agency for Civic Education], November 1, 2018, <https://www.bpb.de/themen/migration-integration/laenderprofile/english-version-country-profiles/262758/historical-and-current-development-of-migration-to-and-from-germany/#node-content-title-3>

²²⁹ Zimmermann, Klaus F, Holger Bonin, René Fahr, and Holger Hinte, "The Migration Issue in Germany," in *Immigration Policy and the Labor Market: The German Experience and Lessons for Europe*. (Aufl. Berlin, Heidelberg: Springer-Verlag, 2007), 7-44, 21

²³⁰ Zimmermann, Klaus F, Holger Bonin, René Fahr, and Holger Hinte, "The Migration Issue in Germany," in *Immigration Policy and the Labor Market: The German Experience and Lessons for Europe*. (Aufl. Berlin, Heidelberg: Springer-Verlag, 2007), 7-44, 21

in 1990 with exceptions to highly skilled or scientific researchers.²³¹ Policymakers passed drastic legal amendments on immigration in order to limit the inflows of asylum seekers and Eastern European immigrants of German origin.²³²

With the turn of the millennium, questions surrounding the regulation of immigration, especially concerning migration from non-EU countries, started being debated more openly again. Immigration was more or less connected to development policies rather than considered as an economic strategy,²³³ now regulated immigration was treated as an essential condition to receive highly qualified workers in the country.²³⁴ From 2000 to 2004, the German Green Card scheme was put in place in order to bring foreign skilled workers in the ICT field without going through the bureaucratic process.²³⁵ The idea of introducing a Green Card was initially met with skepticism as more than half of Germany's population rejected the initiative.²³⁶ Despite assuring the right to settle in the country, since it required an annual gross salary of over 51,000 euros and work permits were only granted for a maximum of five years, the scheme was met with severe criticism from business associations and immigrant groups for being too ambitious.²³⁷ The number of Green Cards

²³¹ Isabel Klingert, "Zuwanderung zur Fachkräftesicherung: Welches Potential können wir erwarten? [Immigration for Skilled Workforce Retention: What potential can we expect?]," In *Fachkräftemangel: Ein neues, demografisch bedingtes Phänomen? [Skills shortage: A new, demographically induced phenomenon?]*, ed. Bundesinstitut Für Bau-, Stadt- Und Raumforschung (BBSR) Im Bundesamt Für Bauwesen Und Raumordnung (BBR) [Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) at the Federal Office for Building and Regional Planning (BBR)], (BBSR-Online-Publikation [BBSR online publication], November 2012), 78, <https://d-nb.info/1028554869/34>

²³² Zimmermann, Klaus F, Holger Bonin, René Fahr, and Holger Hinte, "The Migration Issue in Germany," in *Immigration Policy and the Labor Market: The German Experience and Lessons for Europe*. (Aufl. Berlin, Heidelberg: Springer-Verlag, 2007), 7-44, 10

²³³ Uwe Hunger and Holger Kolb, "Die deutsche "Green Card: Migration von Hochqualifizierten in theoretischer und empirischer Perspektive [The German "Green Card: Migration of Highly Qualified Persons in Theoretical and Empirical Perspective]," *Institut Für Migrationsforschung Und Interkulturelle Studien (IMIS) Der Universität Osnabrück*, 2003, 7-13, https://osnadoes.ub.uni-osnabrueck.de/bitstream/urn:nbn:de:gbv:700-201001304846/1/ELibD80_imis22.pdf

²³⁴ Isabel Klingert, "Zuwanderung zur Fachkräftesicherung: Welches Potential können wir erwarten? [Immigration for Skilled Workforce Retention: What potential can we expect?]," In *Fachkräftemangel: Ein neues, demografisch bedingtes Phänomen? [Skills shortage: A new, demographically induced phenomenon?]*, ed. Bundesinstitut Für Bau-, Stadt- Und Raumforschung (BBSR) Im Bundesamt Für Bauwesen Und Raumordnung (BBR) [Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) at the Federal Office for Building and Regional Planning (BBR)], (BBSR-Online-Publikation [BBSR online publication], November 2012), 78-90, <https://d-nb.info/1028554869/34>

²³⁵ Bundeszentrale für politische Bildung [Federal Agency for Civic Education], "The German "Green Card," November 2005, <https://www.bpb.de/themen/migration-integration/kurzdossiers/58174/the-german-green-card/>

²³⁶ Uwe Hunger and Holger Kolb, "Die deutsche "Green Card: Migration von Hochqualifizierten in theoretischer und empirischer Perspektive [The German "Green Card: Migration of Highly Qualified Persons in Theoretical and Empirical Perspective]," *Institut Für Migrationsforschung Und Interkulturelle Studien (IMIS) Der Universität Osnabrück*, 2003, 9, https://osnadoes.ub.uni-osnabrueck.de/bitstream/urn:nbn:de:gbv:700-201001304846/1/ELibD80_imis22.pdf

²³⁷ Claudia Finotelli and Holger Kolb, "'The Good, the Bad and the Ugly' Reconsidered: A Comparison of German, Canadian and Spanish Labour Migration Policies," *Journal of comparative policy analysis* 19, no. 1 (2017): 72-86, 80-81

issued was significantly lower than expected, especially considering the initial urgent demand brought by German employers. The conclusion therefore drawn at that time in the public, politics, and media that the Green Card programme had missed its target and was generally viewed as a failure.²³⁸ Meanwhile, public opinion started to change as the government managed to present the immigration debate differently; the image of the “foreign guest worker at the refuse collection” changed to one of the expert in the IT field.²³⁹ Given that this programme pioneered the Immigration Act of 2005, it should be regarded as a starting point of Germany’s legal endeavour to retain skilled workers as it constituted a significant liberalization of employer-based and occupation-driven labour migration system.²⁴⁰

In 2005, Germany’s immigration policy marked an important turning point when the country reformed the Immigration Act, in which the federal government reduced requirements for all immigrants, as well as lowered barriers for highly skilled workers and self-employed immigrants to apply for permanent residence.²⁴¹ It replaced the “law on foreigners” and simplified various regulations on residence permits to a mere two permits: the temporary and permanent residence permits.²⁴² Highly skilled immigrants with a certain amount of salary were given a permanent settlement permit immediately upon arrival, and their family members were qualified to take up paid employment.²⁴³ The Act also included regulations on self-employed immigrants which promised permanent residency after 3 years if they had received a certain amount of investment with at least ten new jobs and a business plan underlined by the local chamber of industry and trade.²⁴⁴ The requirements for immigrants were successively reduced during the following

²³⁸ Martin Wrobel, “Determinants of Successful Labour Market Integration as Exemplified by the German Green Card Programme,” *Journal of ethnic and migration studies* 47, no. 17 (2021): 4135–4154, 4135

²³⁹ Meier-Braun, Karl-Heinz, *Deutschland, Einwanderungsland*, Suhrkamp Verlag: Frankfurt am Main, 2022, 93

²⁴⁰ Claudia Finotelli and Holger Kolb, “‘The Good, the Bad and the Ugly’ Reconsidered: A Comparison of German, Canadian and Spanish Labour Migration Policies,” *Journal of comparative policy analysis* 19, no. 1 (2017): 72–86, 76–77

²⁴¹ Andreas Ette, Barbara Heß, and Lenore Sauer, “Tackling Germany’s Demographic Skills Shortage: Permanent Settlement Intentions of the Recent Wave of Labour Migrants from Non-European Countries,” *Journal of international migration and integration* 17, no. 2 (2016): 429–448., 432

²⁴² Jan Schneider, “Rückblick: Zuwanderungsgesetz 2005 [Review: Immigration Act 2005],“ 2007, <https://www.bpb.de/gesellschaft/migration/dossier-migration-ALT/56351/zuwanderungsgesetz-2005>

²⁴³ Andreas Ette, Barbara Heß, and Lenore Sauer, “Tackling Germany’s Demographic Skills Shortage: Permanent Settlement Intentions of the Recent Wave of Labour Migrants from Non-European Countries,” *Journal of international migration and integration* 17, no. 2 (2016): 429–448, 432

²⁴⁴ Andreas Ette, Barbara Heß, and Lenore Sauer, “Tackling Germany’s Demographic Skills Shortage: Permanent Settlement Intentions of the Recent Wave of Labour Migrants from Non-European Countries,” *Journal of international migration and integration* 17, no. 2 (2016): 429–448, 432

years, additionally enhancing the rights for skilled and highly skilled foreign workers.²⁴⁵ The Immigration Act signaled another step towards a regulated immigration and recruitment of global talents, and in 2008, a law for controlled labour migration was passed by the government in order to regulate the migration of highly qualified workers and monitor demand in different economic sectors.²⁴⁶ As of 2009, 45% of all job offers accepted by foreign skilled workers were in the STEM sector.²⁴⁷

The success of the government's efforts is evidenced in a 2018 study conducted by the OECD which revealed that Germany has the second highest number of economic migrants among OECD countries, behind the US, with most migrants coming from Romania, Poland, or Bulgaria.²⁴⁸²⁴⁹ As of 2019, Germany was considered a particularly attractive destination for students and entrepreneurs, ranking among the top three and six OECD countries respectively.²⁵⁰

On the other hand, several factors indicate that Germany seemed to be only moderately interesting for well-educated global talents.²⁵¹ According to the OECD, out of 35 surveyed countries, Germany is in 12th place

²⁴⁵ Andreas Ette, Barbara Heß, and Lenore Sauer, "Tackling Germany's Demographic Skills Shortage: Permanent Settlement Intentions of the Recent Wave of Labour Migrants from Non-European Countries," *Journal of international migration and integration* 17, no. 2 (2016): 429–448, 432

²⁴⁶ Grit Grigoleit "Auf der Suche nach den 'besten Köpfen': hochqualifizierte Zuwanderinnen am deutschen Arbeitsmarkt [In Search of the 'Best Minds': Highly Qualified Immigrant Women in the German Labor Market]," in *Fachkräftemangel: Ein neues, demografisch bedingtes Phänomen? [Skills shortage: A new, demographically induced phenomenon?]*, ed. Bundesinstitut Für Bau-, Stadt- Und Raumforschung (BBSR) Im Bundesamt Für Bauwesen Und Raumordnung (BBR) [Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) at the Federal Office for Building and Regional Planning (BBR)], (BBSR-Online-Publikation [BBSR online publication], November 2012), 92, <https://d-nb.info/1028554869/34>

²⁴⁷ Isabel Klingert, "Zuwanderung zur Fachkräftesicherung: Welches Potential können wir erwarten? [Immigration for Skilled Workforce Retention: What potential can we expect?]," in *Fachkräftemangel: Ein neues, demografisch bedingtes Phänomen? [Skills shortage: A new, demographically induced phenomenon?]*, ed. Bundesinstitut Für Bau-, Stadt- Und Raumforschung (BBSR) Im Bundesamt Für Bauwesen Und Raumordnung (BBR) [Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) at the Federal Office for Building and Regional Planning (BBR)], (BBSR-Online-Publikation [BBSR online publication], November 2012), 83, <https://d-nb.info/1028554869/34>

²⁴⁸ Schuster, Ulrike (2018, June 20), "Deutschland ist das beliebteste Einwanderungsland Europas", <https://www.sueddeutsche.de/politik/oecd-bericht-deutschland-ist-das-beliebteste-einwanderungsland-europas-1.4025413>.

²⁴⁹ Mediendienst Integration [Integration media service], "Arbeitsmarkt: wie viele Ausländer arbeiten in Deutschland? [Labor market: how many foreigners work in Germany?]," <https://mediendienst-integration.de/integration/arbeitsmarkt.html>

²⁵⁰ OECD, "Deutschland ist für ausländische Fachkräfte nur mäßig attraktiv [Germany is only moderately attractive for foreign specialists]," May 29, 2019, <https://www.oecd.org/berlin/presse/talent-attractiveness-29052019.htm>

²⁵¹ Grit Grigoleit "Auf der Suche nach den 'besten Köpfen': hochqualifizierte Zuwanderinnen am deutschen Arbeitsmarkt [In Search of the 'Best Minds': Highly Qualified Immigrant Women in the German Labor Market]," in *Fachkräftemangel: Ein neues, demografisch bedingtes Phänomen? [Skills shortage: A new, demographically induced phenomenon?]*, ed. Bundesinstitut Für Bau-, Stadt- Und Raumforschung (BBSR) Im Bundesamt Für Bauwesen Und Raumordnung (BBR) [Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) at the Federal Office for Building and Regional Planning (BBR)], (BBSR-Online-Publikation [BBSR online publication], November 2012), 92, <https://d-nb.info/1028554869/34>

concerning attractiveness for academics with at least one master title.²⁵² Despite a positive labour market situation, the country seems to have considerable difficulties in valuing the competencies of foreign academics. Foreign academic degrees are often devalued and 27% of all foreign academics are overqualified for their current jobs.²⁵³ This particularly applies to those who have obtained their degree outside of Germany and originate from non-EU countries; in this group, less than four in ten people are employed according to their skill level.²⁵⁴ In addition to language barriers and discrimination, past immigration laws required an exact degree equivalence – a requirement which posed a hurdle in the migration process and a competitive disadvantage in the attraction of global talents in comparison to other countries where no formal degree recognition is required apart from regulated occupations (e.g., health sector).²⁵⁵ It is believed that a facilitated recognition of foreign qualifications and job-related language courses could help value global talents and their qualifications.²⁵⁶ According to a 2022 survey of almost 30,000 international professionals conducted by OECD, 3 out of 5 professionals showed a willingness to learn German before immigrating to Germany, while others would be willing to learn if the range and number of course offerings was improved and the costs were reduced.²⁵⁷

Germany's lack of national schemes to recruit highly skilled workers from non-EU countries has been frequently discussed. Existing programs were not aimed at recruiting talents specifically third countries, but

²⁵² Matthias M. Mayer and Thomas Liebig, "Wie attraktiv ist Deutschland für ausländische Fachkräfte? [How attractive is Germany for foreign skilled workers?]," *OECD*, 3, https://www.bertelsmann-stiftung.de/fileadmin/files/Projekte/Migration_fair_gestalten/IB_Policy_Brief_Wie_attraktiv_ist_Deutschland_122019.pdf

²⁵³ Matthias M. Mayer and Thomas Liebig, "Wie attraktiv ist Deutschland für ausländische Fachkräfte? [How attractive is Germany for foreign skilled workers?]," *OECD*, 3-4, https://www.bertelsmann-stiftung.de/fileadmin/files/Projekte/Migration_fair_gestalten/IB_Policy_Brief_Wie_attraktiv_ist_Deutschland_122019.pdf

²⁵⁴ Matthias M. Mayer and Thomas Liebig, "Wie attraktiv ist Deutschland für ausländische Fachkräfte? [How attractive is Germany for foreign skilled workers?]," *OECD*, 4, https://www.bertelsmann-stiftung.de/fileadmin/files/Projekte/Migration_fair_gestalten/IB_Policy_Brief_Wie_attraktiv_ist_Deutschland_122019.pdf

²⁵⁵ Matthias M. Mayer and Thomas Liebig, "Wie attraktiv ist Deutschland für ausländische Fachkräfte? [How attractive is Germany for foreign skilled workers?]," *OECD*, 4, https://www.bertelsmann-stiftung.de/fileadmin/files/Projekte/Migration_fair_gestalten/IB_Policy_Brief_Wie_attraktiv_ist_Deutschland_122019.pdf

²⁵⁶ Matthias M. Mayer and Thomas Liebig, "Wie attraktiv ist Deutschland für ausländische Fachkräfte? [How attractive is Germany for foreign skilled workers?]," *OECD*, 5-6, https://www.bertelsmann-stiftung.de/fileadmin/files/Projekte/Migration_fair_gestalten/IB_Policy_Brief_Wie_attraktiv_ist_Deutschland_122019.pdf

²⁵⁷ Steffen Angenendt, Nadine Knapp, David Kipp, "Deutschland sucht Arbeitskräfte: Wie die Arbeitskräfteanwerbung entwicklungsorientiert, nachhaltig und fair gestaltet werden kann [Germany is looking for workers How labour recruitment can be made development-oriented, sustainable and fair]," *Stiftung Wissenschaft und Politik [Science and Politics Foundation]*, January 2023, <https://www.swp-berlin.org/publikation/deutschland-sucht-arbeitskraefte#hd-d45705e323>

were instead open to all nationalities, yet Germany was still relying on EU citizens for their labour force.²⁵⁸ Insecurity surrounding the recruitment of foreign skilled workers also comes from companies themselves. Decision-makers in companies view language, foreign credential recognition, and bureaucratic hurdles as barriers to hiring global talents. Companies in Germany tend to rely on skilled workers from countries that are either geographically or culturally close to Germany or through which recruitment networks or multilateral agreements already exist.²⁵⁹ Since other EU countries are facing similar demographic challenges and shortages of skilled labour migrants,²⁶⁰ there is an urge to begin attracting global talents from non-EU countries as well. On the other hand, recent data shows that immigration from non-EU countries already accounts for the largest share of immigration to Germany, as the migration balance within the EU has been stagnating for several years.²⁶¹ Foreign workers from third countries will progressively play an important role in meeting the growing demand for talent in the future national labour market.²⁶²

German immigration programs – An overview

a) The Skilled Workers Immigration Act

As part of a skilled labor strategy, the government has started to develop different measures to attract more global talents. While previously focusing on immigration from EU countries, the government is turning towards a new strategy by establishing networks in demographically strong non-EU countries such as

²⁵⁸ Barbara Heß and Lenore Sauer, “Conditions of Entry and Residence of Third Country Highly Qualified and Highly Skilled Workers: The Situation in Germany,” *Bundesamt für Migration und Flüchtlinge [Federal Office for Migration and Refugees]*, 2007, <https://www.bamf.de/SharedDocs/Anlagen/EN/EMN/Studien/wp09-emn-niederlassung-hochqualifizierte-small-scale-3.html?nn=282388>

²⁵⁹ Matthias Mayer und Marius Clemens, “Fachkräftemigrationsmonitor: Fachkräfteengpässe von Unternehmen in Deutschland, Trends zum Zuzug ausländischer Fachkräfte und die Situation ausländischer Erwerbstätiger am deutschen Arbeitsmarkt [Skilled Worker Migration Monitor: Skilled Worker Shortages of Companies in Germany, Trends on the Influx of Foreign Skilled Workers and the Situation of Foreign Workers in the German Labor Market],” 2021, 13, <https://doi.org/10.11586/2020082>

²⁶⁰ Johann Fuchs, Alexander Kubis, and Lutz Schneider, “Die deutsche Wirtschaft braucht künftig mehr Fachkräfte aus Drittstaaten [The German economy will need more skilled workers from third countries in the future],” 2018, <https://www.iab-forum.de/die-deutsche-wirtschaft-braucht-kuenftig-mehr-fachkraefte-aus-drittstaaten/>

²⁶¹ Steffen Angenendt, Nadine Knapp, David Kipp, “Deutschland sucht Arbeitskräfte: Wie die Arbeitskräfteanwerbung entwicklungsorientiert, nachhaltig und fair gestaltet werden kann [Germany is looking for workers How labour recruitment can be made development-oriented, sustainable and fair],” *Stiftung Wissenschaft und Politik [Science and Politics Foundation]*, January 2023, <https://www.swp-berlin.org/publikation/deutschland-sucht-arbeitskraefte#hd-d45705e323>

²⁶² Steffen Angenendt, Nadine Knapp, David Kipp, “Deutschland sucht Arbeitskräfte: Wie die Arbeitskräfteanwerbung entwicklungsorientiert, nachhaltig und fair gestaltet werden kann [Germany is looking for workers How labour recruitment can be made development-oriented, sustainable and fair],” *Stiftung Wissenschaft und Politik [Science and Politics Foundation]*, January 2023, <https://www.swp-berlin.org/publikation/deutschland-sucht-arbeitskraefte#hd-d45705e323>

India.²⁶³ In order to respond to the growing demand for talent and to facilitate the process of highly skilled migration to Germany, the government introduced the Skilled Labor Immigration Act in March 2020. The Act focuses on workers who have completed quality vocational training and are now eligible to enter Germany to find apprenticeships as well as employment.²⁶⁴ Moreover, skilled migration is no longer restricted to bottleneck occupations and there are no priority regulations concerning domestic and EU citizens.²⁶⁵ A remaining hurdle could be the bureaucratic procedure, mainly the recognition of foreign qualifications and long waiting periods at German embassies abroad.²⁶⁶ The Central Service Point for Vocational Recognition (ZSBA) in Bonn was established to provide skilled workers applying from abroad better support in getting the credentials recognized.²⁶⁷ A permanent residence permit for highly skilled migrants is now also available after four years instead of five. Companies in Germany are able to initiate an accelerated procedure at the responsible immigration authority by coming to an agreement with the authority and the skilled employee.²⁶⁸ In spite of the COVID-19 pandemic, Germany issued almost 30,000 visas to qualified skilled workers and trainers from non-EU countries from March to December 2020, within 9 months of the Act coming into effect.²⁶⁹

²⁶³ Johann Fuchs, Alexander Kubis, and Lutz Schneider, “Die deutsche Wirtschaft braucht künftig mehr Fachkräfte aus Drittstaaten [The German economy will need more skilled workers from third countries in the future],” 2018, <https://www.iab-forum.de/die-deutsche-wirtschaft-braucht-kuenftig-mehr-fachkraefte-aus-drittstaaten/>

²⁶⁴ Die Bundesregierung [Federal Ministry for Economic Affairs and Climate Action], “The Skilled Immigration Act: one year on,” *Securing of Skilled Labour*, February 26, 2021, <https://www.bmwk.de/Redaktion/EN/Pressemitteilungen/2021/02/20210226-the-skilled-immigration-act-one-year-on.html>

²⁶⁵ Deutschland.de, “Skilled personnel welcome: Since 2020 the Skilled Immigration Act has made migration to Germany easier for skilled workers,” September 26, 2022, <https://www.deutschland.de/en/topic/business/the-skilled-labour-immigration-act-working-in-germany>

²⁶⁶ Johann Fuchs, Alexander Kubis, and Lutz Schneider, “Die deutsche Wirtschaft braucht künftig mehr Fachkräfte aus Drittstaaten [The German economy will need more skilled workers from third countries in the future],” 2018, <https://www.iab-forum.de/die-deutsche-wirtschaft-braucht-kuenftig-mehr-fachkraefte-aus-drittstaaten/>

²⁶⁷ Anerkennung in Deutschland [Recognition in Germany], “Service Center for Professional Recognition,” n.d., <https://www.anerkennung-in-deutschland.de/html/en/pro/service-center.php#>

²⁶⁸ Die Bundesregierung [The federal government], “Das Fachkräfteeinwanderungsgesetz auf einen Blick [The Skilled Worker Immigration Act at a glance],” 2022, <https://www.make-it-in-germany.com/de/visum/fachkraefteeinwanderungsgesetz>

²⁶⁹ Die Bundesregierung [The federal government], “The Skilled Immigration Act: one year on,” *Securing of Skilled Labour*, February 26, 2021, <https://www.bmwk.de/Redaktion/EN/Pressemitteilungen/2021/02/20210226-the-skilled-immigration-act-one-year-on.html>

b) The “Blue Card EU” and the work visa for global IT specialists

In 2012, the law of the EU’s Blue Card Directive entered into force.²⁷⁰ It is the most important residence permit for labour migration, which almost a third of all labour migrants used in 2021.²⁷¹ Eligible international talents are able to receive the “Blue Card EU” if they have a concrete job offer from a company in Germany and their annual gross income is at least €56,400 or €43,992 for STEM sector as of 2022.²⁷² Further exceptions are made for specialists in the IT sector; for example, a recognized degree is not needed if the specialist has worked in the field for at least three of the last seven years.²⁷³ After a period of 33 months, or 21 months if the person obtains sufficient German language skills, a permanent residence permit can be issued, which also enables family reunification without any proof of German language skills for the family members.²⁷⁴

In recent years, the number of foreign professional workers in Germany has continuously risen. The number of recognized qualifications has risen from 7,980 in 2012 to 34,695 in 2019.²⁷⁵ Regarding highly skilled academics, 31,220 immigrants have received a Blue Card EU, marking a 14.6% increase compared to the previous year.²⁷⁶ Since the introduction of the Blue Card EU, more than 82% have been granted in Germany, making it the clear leader among EU countries.²⁷⁷ In 2019, roughly a quarter of all Blue Cards were given

²⁷⁰ German Missions in Canada, “Germany’s Blue Card,” 2023, <https://canada.diplo.de/ca-en/consular-services/visa/blue-card/1308194#:~:text=On%20August%201%2C%202012%2C%20the,for%20skilled%20professionals%20from%20abroad.>

²⁷¹ Steffen Angenendt, Nadine Knapp, David Kipp, “Deutschland sucht Arbeitskräfte: Wie die Arbeitskräfteanwerbung entwicklungsorientiert, nachhaltig und fair gestaltet werden kann [Germany is looking for workers How labour recruitment can be made development-oriented, sustainable and fair],” *Stiftung Wissenschaft und Politik [Science and Politics Foundation]*, January 2023, <https://www.swp-berlin.org/publikation/deutschland-sucht-arbeitskraefte#hd-d45705e323>

²⁷² The Federal Government, “EU Blue Card,” *Make it in Germany*, 2022, <https://www.make-it-in-germany.com/en/visa-residence/types/eu-blue-card>

²⁷³ Federal Foreign Office, “Visa Navigator”, 2021, https://visa.diplo.de/en/index.html#/vib/infoseite?infoseiteUrl=visum_arbeitsaufnahme_it

²⁷⁴ Bundesamt für Migration und Flüchtlinge [Federal Office for Migration and Refugee], “Als Hochschulabsolvent nach Deutschland [As a university graduate to Germany],” January 15, 2021, <https://www.bamf.de/DE/Themen/MigrationAufenthalt/ZuwandererDrittstaaten/Arbeit/Hochschulabsolvent/hochschulabsolvent-node.html>.

²⁷⁵ Die Bundesregierung [The federal government], “Immigration”, 2022 <https://www.make-it-in-germany.com/en/living-in-germany/discover-germany/immigration>.

²⁷⁶ Bundesamt für Migration und Flüchtlinge [Federal Office for Migration and Refugee], “Zuwanderung von Hochqualifizierten: Mehr erteilte Blaue Karten EU im Jahr 2019 [Immigration of highly skilled workers: More EU Blue Cards issued in 2019],” July 24, 2020, <https://www.bamf.de/SharedDocs/Pressemitteilungen/DE/2020/20200720-bamf-zuwanderung-hochqualifizierte.html?nn=282388>

²⁷⁷ Bundesamt für Migration und Flüchtlinge [Federal Office for Migration and Refugee], “Zuwanderung von Hochqualifizierten: Mehr erteilte Blaue Karten EU im Jahr 2019 [Immigration of highly skilled workers: More EU Blue Cards issued in 2019],” July

to Indian citizens, followed by Chinese, Russian, and Turkish citizens. The number of Blue Cards granted varies by region as well: most of them were granted in Bavaria (21.3%), followed by Baden- Wuerttemberg (16.2%), North Rhine-Westfalia (15.8%), and Berlin (14.7%).²⁷⁸

c) Other work and study visas

When immigrating to Germany for the purposes of work or study, there are different visa options that need to be considered. Apart from the Blue Card visa, skilled professionals can also receive a work visa, given that their qualification is recognized in Germany with a contract with a German employer.²⁷⁹ If their qualification is not fully recognized, they also have the opportunity to receive additional qualifications in Germany while working in order to have it fully recognized. A “residence permit to work and qualify” is generally issued for 18 months, after which it is possible to receive a residence permit to work.²⁸⁰ Since the new *Skilled Workers Act* was passed, eligible individuals can now migrate to Germany to search for a job. Job seeker visas are issued for a period of six months if the applicants’ qualifications are recognized, and they have a German language level of B1.²⁸¹ Student and research visas are issued if an admission to a university or a research cooperation contract exists. Furthermore, eligible individuals are also allowed to come to Germany to apply for university, provided they have sufficient financial savings to support their stay.²⁸² The granting of research visas has risen in the past years as well. From 2018 to 2019, the number of

24, 2020, <https://www.bamf.de/SharedDocs/Pressemitteilungen/DE/2020/20200720-bamf-zuwanderung-hochqualifizierte.html?nn=282388>

²⁷⁸ Bundesamt für Migration und Flüchtlinge [Federal Office for Migration and Refugee], “Zuwanderung von Hochqualifizierten: Mehr erteilte Blaue Karten EU im Jahr 2019 [Immigration of highly skilled workers: More EU Blue Cards issued in 2019],” July 24, 2020, <https://www.bamf.de/SharedDocs/Pressemitteilungen/DE/2020/20200720-bamf-zuwanderung-hochqualifizierte.html?nn=282388>

²⁷⁹ Federal Foreign Office, “Visa Navigator”, 2021, https://visa.diplo.de/en/index.html#/vib/infoseite?infoseiteUrl=visum_arbeitsaufnahme_it

²⁸⁰ Federal Foreign Office, “Visa Navigator”, 2021, https://visa.diplo.de/en/index.html#/vib/infoseite?infoseiteUrl=visum_arbeitsaufnahme_it

²⁸¹ Council of Europe, “The CEFR Levels,” 2022, <https://www.coe.int/en/web/common-european-framework-reference-languages/level-descriptions>

²⁸² Federal Foreign Office, “Visa Navigator”, 2021, https://visa.diplo.de/en/index.html#/vib/infoseite?infoseiteUrl=visum_arbeitsaufnahme_it

visas granted increased by 51.9% to 3,338 Student visas also rose by 3.7% from 2018 to 2019, with most students coming from China, India, and the United States.²⁸³

d) Supporting programs

In order to facilitate access to the German labour market, an official online platform called “*Make it in Germany*” was implemented in 2012. It functions as the government’s central platform for international professionals, students, and academics who want to live and work in Germany. The website offers information and consultation on the topics of visas, credential recognition, and life in Germany.²⁸⁴ In addition to this platform, there is a “*Hotline working and living in Germany*” for personalized information and advice and “*welcome services for qualified professionals and their families*” available in each federal German state.²⁸⁵ Since the recognition of foreign credentials is an important factor in the process of taking up work in Germany, the German government has also implemented various platforms and networks to enable and accelerate this process. In consideration of local companies, the “*bq-portal*” was launched by the Federal Ministry for Economic Affairs and Energy in 2011. This information portal enables companies to check whether a job application with a foreign professional qualification is equivalent or to estimate how long the credential recognition process of the applicant’s documents would take.²⁸⁶ Furthermore, the KOFA (Competence Center for Securing Skilled labour) supports and coaches SMEs in recruiting skilled employees and remaining competitive.²⁸⁷ For questions regarding the credential recognition of foreign skilled employees, the government’s information portal “*Recognition in Germany*” is available.²⁸⁸ Since

²⁸³ Bundesamt für Migration und Flüchtlinge [Federal Office for Migration and Refugee], “Zuwanderung von Hochqualifizierten: Mehr erteilte Blaue Karten EU im Jahr 2019 [Immigration of highly skilled workers: More EU Blue Cards issued in 2019],” July 24, 2020, <https://www.bamf.de/SharedDocs/Pressemitteilungen/DE/2020/20200720-bamf-zuwanderung-hochqualifizierte.html?nn=282388>

²⁸⁴ Die Bundesregierung, “Make it in Germany: Das Informationsportal der Bundesregierung für Fachkräfte aus dem Ausland [Make it in Germany: The Federal Government's Information Portal for Skilled Workers from Abroad],” 2022, <https://www.make-it-in-germany.com/de/ueber-das-portal/make-it-in-germany>

²⁸⁵ Die Bundesregierung, “Welcome Services for qualified professionals and their families,” 2022, <https://www.make-it-in-germany.com/en/living-in-germany/advisory/welcome-services>

²⁸⁶ Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy], “Companies & recognition”, n.d., <https://www.bq-portal.de/en/Companies-and-recognition>

²⁸⁷ Kompetenzzentrum Fachkräftesicherung (KOFA) [Competence Center for Skilled Workers], “Das KOFA [The KOFA],” 2022, <https://www.kofa.de/ueber-uns/das-kofa>

²⁸⁸ Bundesministerium für Bildung und Forschung [Federal Ministry of Education and Research] “Recognition in Germany,” 2022, <https://www.anerkennung-in-deutschland.de/html/en/index.php>

2005, the development program “*Integration through qualification (IQ)*”, supported and supervised by the Federal Ministry of Labour and Social Affairs and the European Social Fund, has been in charge of improving labour market opportunities for people with a migration background. The program offers consultations related to professional recognition, qualifications for migrants in Germany, as well as intercultural training and consultations for central labour market administrations such as employment agencies, municipal administrations, or SMEs. In the latest funding period from 2019-2022, a new focus point has been created: the establishment and expansion of regional networks for foreign skilled workers. The program has been implemented in all 16 federal states with about 400 projects.²⁸⁹ Since Germany is federally organized, the implementation of such offers and measures is mostly directed by each federal state.

²⁸⁹ IQ Multiplikatorenprojekt Transfer [IQ Multiplier Project Transfer], “Förderprogramm ‘Integration durch Qualifizierung (IQ)’ [‘Integration through Qualification (IQ)’ funding program],” n.d., <https://www.netzwerk-iq.de/foerderprogramm-iq/programmuebersicht>

IV. Stakeholder Viewpoints

The following chapter is a summary of key themes and recommendations based on a variety of sources, such as industry reports, policy statements, and media coverage on skilled foreign workers, as well as interviews with pertinent stakeholders. Interviews were conducted in 2022 with stakeholders from different parts of Germany and were carried out via phone and video-conferencing technologies (Zoom). Those were held in the format of semi-structured interviews guided by a series of questions, leaving room for individual answers and open discussion. The interviews focused on three of the regions mentioned in chapter I: Karlsruhe, Berlin, and Cologne/Düsseldorf. All stakeholders worked in STEM or skilled immigration related areas and shared relevant insights and viewpoints on the topic. Stakeholders included welcome centres, companies in the STEM sector, city departments, business development agencies, and chambers of industry and commerce. The viewpoints and insights are individual and were therefore anonymized in the following. Answers are not representative of the situation and experience of all other stakeholders in different parts of Germany.

(1) Stakeholders broadly recognize a constant lack of high-skilled foreign workers countrywide.

The government and businesses should continue their efforts to attract and retain talents.

The rising demand for foreign talents in the STEM sector in Germany was underlined by all stakeholders during the interviews. Whether it concerns the global “war for talents” in which Germany has to position itself as the Industrie- und Handelskammer (IHK) Berlin mentioned,²⁹⁰ or the “demographic club that will hit harder” as the IHK Düsseldorf mentioned²⁹¹ - stakeholders across different regions in Germany reacted in a similar way to the lack of skilled employees in their respective regions. The Berlin Business Partners observes that the salaries offered to specialized professionals have risen in recent years as companies have trouble finding those talents for 6 to 7 months in the global competition for those professionals.²⁹² They report that more and more businesses are recruiting foreign talents from abroad using English and that more

²⁹⁰ Stakeholder interview, IHK Berlin.

²⁹¹ Stakeholder interview, IHK Düsseldorf.

²⁹² Stakeholder interview, Berlin Business Partners, Berlin.

than half of new workers who come to Berlin are from overseas.²⁹³ Although Zixio GmbH in Berlin finds that as people's lives return to the pre-pandemic period with less remote work, compensations for IT specialists seem to have decreased again.²⁹⁴ There are still STEM labour shortages throughout the nation where companies need to put effort to attract more foreign experts. The biggest challenge for them is that the IT market has been finding it difficult to meet the demand for quality.²⁹⁵ There is a lack of people in the IT sector with enough qualifications and knowledge.²⁹⁶ Most IT professionals only completed a bachelor instead of a master, and furthermore, people who have only completed boot camp are often hired without sufficient skills or education.²⁹⁷ On top of that, a lot of non-profit start-ups hire many skilled professionals, as they are often able to offer higher salaries due to their subsidies.²⁹⁸

On the federal level, all stakeholders have observed positive changes that were taking place. By implementing the skilled immigration law, many aspects of immigration to Germany have changed for the better. There were also positive reactions concerning the international interest and rising willingness of companies and stakeholders in different regions to open the labour market to foreign skilled workers. Improvement of the bureaucratic process for foreign employees is also linked to increased retention and post-graduate opportunities for international students. Currently, university graduates are able to stay and seek employment for up to 18 months or to initiate self-employment after having completed their studies in Germany, which heightens foreign students' interest in staying in Germany.²⁹⁹

On the other hand, Startup migrants UG finds that businesses' ability to successfully attract and retain talents may depend on municipal governments.³⁰⁰ Cities where municipal networks, including welcome

²⁹³ Stakeholder interview, Berlin Business Partners, Berlin.

²⁹⁴ Stakeholder interview, Zixio GmbH, Berlin.

²⁹⁵ Stakeholder interview, Zixio GmbH, Berlin.

²⁹⁶ Stakeholder interview, Zixio GmbH, Berlin.

²⁹⁷ Stakeholder interview, Zixio GmbH, Berlin.

²⁹⁸ Stakeholder interview, Zixio GmbH, Berlin.

²⁹⁹ Stakeholder interview, IHK Berlin.

³⁰⁰ Stakeholder interview, startup migrants UG, Berlin.

centers, companies and regional work agencies, are more established and work together to bind talents appear to be more successful in attracting skilled foreign workers.³⁰¹ The difference is especially noticeable between the north and south. Startup Migrants that while international students in the south stay there and find employment, many students in northern Germany leave the country following their studies because they do not feel included and welcome in the labour market.³⁰² They describe that it is fundamentally important to directly bind talents to the regions by connecting people to local SMEs and start-ups.³⁰³ Government institutions have been aware of the skilled labour shortage and binding talents for a long time in Baden-Württemberg and Bayern, and there are also networking programs that involve start-ups in cities such as Munich.³⁰⁴

Meanwhile, many stakeholders list the country's bureaucratic culture as its weakness. A lot of agencies across different regions complain that the immigration process is very complicated and has extremely long waiting periods. German authorities tend to create hurdles for themselves by publishing more complicated processes.³⁰⁵ Berlin Business Partners describes that the problem is not the immigration laws themselves, but rather overcomplicated bureaucratic practices.³⁰⁶ Firms require additional help from the public sector in order to gain talents from abroad as the process to hire foreign workers is very time-consuming.³⁰⁷ Stakeholders agree that the government should simplify the process of immigration. IHK Berlin argues that the government should be more customer-friendly and should radically reduce bureaucratic processes for German companies and potential international employees.³⁰⁸ On top of that, there is concern over the lack of staff at embassies to process immigration applications³⁰⁹, as well as the lack of employees who speak

³⁰¹ Stakeholder interview, startup migrants UG, Berlin.

³⁰² Stakeholder interview, Startup Migrants (<https://startupmigrants.com>).

³⁰³ Stakeholder interview, Startup Migrants (<https://startupmigrants.com>).

³⁰⁴ Stakeholder interview, Startup Migrants (<https://startupmigrants.com>).

³⁰⁵ Stakeholder interview, IHK Berlin.

³⁰⁶ Stakeholder interview, Berlin Business Partners, Berlin.

³⁰⁷ Stakeholder interview, Wirtschaftsförderung/Köln Business GmbH.

³⁰⁸ Stakeholder interview, IHK Berlin.

³⁰⁹ Stakeholder interview, IQ-Anerkennungsberatung NRW.

English,³¹⁰ and communication channels between the people involved.³¹¹ Berlin Business Immigration Service also points out that German authorities typically require original copies or in-person processes and suggests that they should start adopting digital procedures like other countries, such as Estonia.³¹² IHK Berlin warns that if the government cannot solve this processing issue, there are enough chances that skilled immigrants may choose to go to other countries.³¹³

Even though there have been improvements in administrative procedures to attract and retain high-skilled foreign workers, companies in Germany still suffer from a shortage of skilled professionals. The businesses should continue to voice their needs and concerns, while the federal and municipal governments need to improve the immigration system in order to attract and retain foreign experts.

(2) The networks among different branches including businesses, universities, and public agencies are crucial to connect international talents and German companies.

Building networks among stakeholders and companies to the regions is a crucial factor to attract and retain international talents. Although stakeholders such as IHK or Handwerkskammer (HWK) do not recruit talents themselves, they strongly emphasize the importance of exchanges between member companies of the chambers and other stakeholders. In Berlin, cooperating partners, including the business immigration service, employment agency, the state office for immigration, and chamber of crafts, meet twice a year to discuss firsthand experiences and trends in the foreign talent recruitment.³¹⁴ The cooperation between the different stakeholders in Berlin has existed since around 2007 with the aim of supporting employers in obtaining residence permits and visas for skilled workers.³¹⁵ One of their main tasks is to process such requests and to provide training to companies and provide them with the basic knowledge needed when

³¹⁰ Stakeholder interview, Berlin Business Immigration Service.

³¹¹ Stakeholder interview, IHK Berlin.

³¹² Stakeholder interview, Berlin Business Immigration Service.

³¹³ Stakeholder interview, IHK Berlin.

³¹⁴ Stakeholder interview, IHK Berlin.

³¹⁵ Stakeholder interview, Berlin Partner für Wirtschaft und Technologie.

employing immigrant workers.³¹⁶ The Berlin Partner für Wirtschaft und Technologie calls this “brand Berlin” and states that they provide newsletters and a matchmaking system using their huge personnel network with head-hunters and agencies.³¹⁷

Other regions also have similar networks and cooperations. The Ministry of Economics, the German Federal Employment Agency, and the Association of German Chambers of Commerce and Industry (DIHK) promote a project called “*Hand in Hand for International Talents*” in five different regions across the country in cooperation with other agencies, specifically targeting talents from Vietnam, Brazil, and India.³¹⁸ As a part of the project, it also aims to help companies receive better insights into the skilled labour immigration law.³¹⁹

Cooperations with universities in the different regions are also very common. In Cologne, universities are linking up with agencies and other partners, encouraging international students and potential skilled workers from the STEM sector to connect to the region. Recently, local agencies and an increasing number of companies are starting to get involved in order to directly find talents.³²⁰ This is also the case in the city of Karlsruhe which has a strong focus on the education of international students in the IT sector. Karlsruhe Institute of Technology (KIT) Studienkolleg notes that it is fundamentally important to give international students a prospect for staying.³²¹ In Karlsruhe, the Welcome Centre is also in close contact with important universities in the regions and encourage local universities to facilitate master theses and internships with regional companies.³²²

³¹⁶ Stakeholder interview, Berlin Partner für Wirtschaft und Technologie.

³¹⁷ Stakeholder interview, Berlin Partner für Wirtschaft und Technologie.

³¹⁸ Die Bundesregierung [The federal Cabinet of Germany], “Pilotprojekt „Hand in Hand for International Talents“ bringt Unternehmen und Fachkräfte zusammen [*Pilot project "Hand in Hand for International Talents" brings companies and specialists together*], *Make it in Germany*, October 12, 2020, <https://www.make-it-in-germany.com/de/pilotprojekt-hand-in-hand-for-international-talents-bringt-unternehmen-und-fachkraefte-zusammen>

³¹⁹ Stakeholder interview, IHK Düsseldorf.

³²⁰ Stakeholder interview, Wirtschaftsförderung Köln.

³²¹ Stakeholder interview, KIT Studienkolleg

³²² Stakeholder interview, Welcome Center Karlsruhe.

(3) There are various factors that determine how well immigrants can get socially integrated into the country. Firms should take a lead in providing a welcoming environment and offering supports for foreign workers.

The German language was identified as both a challenge and an important aspect of successful integration to life and work in Germany. Views differed slightly on the level of the German language that should be required, however, with the exception of the IT sector, most interviewees saw a strong need for basic German knowledge to work in Germany and to participate and “integrate into the social world”.³²³ IQ-Anerkennungsberatung North Rhine-Westphalia (NRW) asserts that language barriers continue to present a challenge in the recruitment process when German language skills are required for the job.³²⁴ Since many people see the German language as the “key to inclusion”, the importance of supporting programs for foreign talents to learn the language should be highlighted.³²⁵ Preliminary and job-related language courses were suggested to counter the initial difficulties when starting to work in Germany, however, smaller cities and companies in certain rural regions experience more difficulties attracting and retaining skilled workers from abroad.³²⁶ Most foreign workers are interested in working in larger cities that have more cultural and linguistic diversity.³²⁷

Berlin Business Partners also recognizes the importance of professional training of the employee’s spouse in the context of dual career service. For many employees, it is crucial that their partners find a good job as well, which remains an area of improvement in the immigration supporting service.³²⁸

Challenges concerning integration are broad, such as housing shortages, high costs of living, and long bureaucratic procedures, as well as the German culture itself. Wirtschaftsförderung, Köln Business GmbH

³²³ Stakeholder interview, IHK Düsseldorf

³²⁴ Stakeholder interview, Welcome Center Karlsruhe.

³²⁵ Stakeholder interview, Welcome Center Karlsruhe.

³²⁶ Stakeholder interview, IQ-Anerkennungsberatung NRW.

³²⁷ Stakeholder interview, IQ-Anerkennungsberatung NRW.

³²⁸ Stakeholder interview, Berlin Business Partners, Berlin.

states that culture and mentality play a significant role for foreign professionals, as they need to see if their living or work environments are comfortable for them.³²⁹ They believe that Germans are very strict and straightforward which is unfamiliar for many people. It is also criticized that Germany lacks intercultural competence and does not have a real “welcome culture”.³³⁰ All chambers and companies, as well as society in general, are required to make an effort to change this. Right-wing radicalism and xenophobia are also a significant challenge.³³¹

Meanwhile, Germany also has a positive reputation abroad in terms of security and thoroughness which can be aspects that people from abroad appreciate.³³² Berlin Business Partners also argues that two of the most important points for foreign expats to come to Berlin are the cultural diversity in Berlin and the health care system.³³³ Wirtschaftsförderung, Köln Business GmbH observes that skilled workers are well informed about job opportunities, promotions, payment, and family relocation possibilities when choosing a job in a foreign country, and cities should therefore focus on various factors for the living environment and maintaining a high reputation for each factor.³³⁴

Furthermore, individual consultations with companies and foreign talents should be valued to integrate foreign professionals into German society. In Karlsruhe, a social event with impulse lectures from foreign professionals, “*international get together*”, and the tandem program, “*welcome guide*”, are very well received.³³⁵ Companies also have opportunities to receive a shortlist with FAQs which discuss unique considerations when working with internationals in one’s own company.³³⁶ In Düsseldorf, the Chamber of Industry and Commerce has established an “*Expat Service Desk*” with other project sponsors, where a liaison addresses executives and professionals, mainly from the Chinese and Japanese community as they

³²⁹ Stakeholder interview, Wirtschaftsförderung, Köln Business GmbH, Köln.

³³⁰ Stakeholder interview, Wirtschaftsförderung Karlsruhe.

³³¹ Stakeholder interview, IHK Düsseldorf.

³³² Stakeholder interview, IHK Düsseldorf.

³³³ Stakeholder interview, Berlin Business Partners, Berlin.

³³⁴ Stakeholder interview, Wirtschaftsförderung, Köln Business GmbH, Köln.

³³⁵ Stakeholder Interview, Welcome Center Karlsruhe.

³³⁶ Stakeholder Interview, Welcome Center Karlsruhe.

are very present in the region, on the subject of living and working in Germany.³³⁷ Integration counseling has also been funded by the project sponsors since 2017.³³⁸ Companies themselves are also figuring out ways to support foreign professionals to adapt to German society. Zixio GmbH considers that companies should support their employees in different situations, for instance by helping them navigate bureaucratic immigration processes.³³⁹ Since troubles being abroad can be a huge vulnerability for foreign workers, companies' support can be particularly meaningful.³⁴⁰ Employers' openness, trust, diversity, and favorable attitude towards foreign talents are important attributes to attract them.³⁴¹

In addition to employment, there are other various elements that affect skilled foreign workers' decisions to immigrate. In order to retain high-skilled talents overseas, cities and businesses need to promote diversity and an open-environment with a broad scope.

(4) In order to respond to the urgent need for highly skilled workers, Germany should become more flexible in terms of recognition of qualification of foreign talents, especially in language and education.

Language is one of the fundamental factors to improve when discussing the qualifications of skilled workers in the country. Some stakeholders point out that many skilled foreign talents are not fairly evaluated because of their language skills in German. Wirtschaftsförderung Karlsruhe claims that the area of Karlsruhe has difficulties in finding highly qualified workers (or those studying in the field) as they often do not have a high level of German language proficiency, yet companies in Karlsruhe and its surrounding region, hardly employ workers who are unable to communicate in German.³⁴² The Welcome Center in Karlsruhe also states that although Karlsruhe has a diversified business landscape with many medium-sized companies that are urgently looking for skilled employees and that the local economy is dependent on international STEM

³³⁷ Stakeholder interview, IHK Düsseldorf.

³³⁸ Stakeholder interview, IHK Düsseldorf.

³³⁹ Stakeholder interview, Zixio GmbH, Berlin.

³⁴⁰ Stakeholder interview, Zixio GmbH, Berlin.

³⁴¹ Stakeholder interview, Zixio GmbH, Berlin.

³⁴² Stakeholder Interview, Wirtschaftsförderung Karlsruhe.

experts , they are often not flexible and open enough to hire them if they have a German language level lower than B2.³⁴³ In light of talent shortages, job responsibilities in the technology sector, such as data processing, are being outsourced to India rather than recruiting people to work on-site in Germany.³⁴⁴

Others suggest that German firms should take skills into account on top of a university degree. Even though an educational degree is useful to measure a person's skills, some agree that the recognition of non-formal education is also a crucial element to meet the current demand for high-skilled workers. Berlin Business Partners explains that people can be very well educated and hold the necessary knowledge without a university degree. They note some companies in Berlin are already focusing on skills, for example if candidates have received training from a specific coding school, rather than a university qualification.³⁴⁵ Berlin Business Immigration Service also comments that while Germany tends to formalize everything, there are people who are knowledgeable and whose skills are self-taught, but cannot be recognized specialists under the German authority system.³⁴⁶ The administrative recognition process is also too complicated as they have to verify whether both the university and the degree are formally recognized in the government's database operated by Kultus-Ministerkonferenz.³⁴⁷ Improving these situations surrounding trained workers should be seen as a top priority considering the shortage of skilled workers.³⁴⁸

As the country continues to face a severe shortage of skilled professionals, the German government and businesses need to be more open to international employees' eligibility conditions. Although straightforward qualifications such as language level and university degree are crucial filters to measure experts' ability, Germany needs to focus on attracting talents with in-demand skills to support the national economy.

³⁴³ Stakeholder interview, Welcome Centre Karlsruhe

³⁴⁴ Stakeholder Interview, Wirtschaftsförderung Karlsruhe.

³⁴⁵ Stakeholder interview, Berlin Business Partners, Berlin.

³⁴⁶ Stakeholder interview, Berlin Business Partners, Berlin.

³⁴⁷ Stakeholder interview, Berlin Business Partners, Berlin.

³⁴⁸ Stakeholder interview, Berlin Business Partners, Berlin.

Conclusions and Recommendations

Germany has maintained a strong economy throughout decades grounded on SMEs in heavy industry. In the meantime, it is widely recognized by both public and private sectors that the country has been facing a severe shortage of skilled migrants, especially in the STEM sector. This issue has been predominant throughout the country due to its declining population and the growing demand for digitalization. As Germany is experiencing one of the highest global rates of economic old-age dependency, establishing an efficient law framework and a welcoming environment to attract and retain foreign professionals is urgently required.

In recent years, Germany's attitude and legal structure have changed in response to national labour shortages even though the country has not officially accepted immigrants for a long time in its history. Especially after the 2000s, the federal government marked a turning point in improving their policy to accept immigrants to stay, instead of temporary workers. The Immigration Act has been reformed and improved over time where the government reduced barriers for foreigners both to enter and stay in the country. Political procedures as well as various grassroots support programs that help immigrants successfully integrate into the local society are provided in different regions.

Many point out that the current biggest issue can be seen in the bureaucratic process rather than in the immigration policy framework itself. There is a strong demand for a more simplified legal process regarding immigration applications. Partially due to Germany's bureaucratic culture, it is said that the application process is slow and overly complicated. Prolonged waiting periods may detract foreign talents from selecting Germany as their destination country. The government should therefore provide effective solutions to this administrative structure to prevent losing potential global talents who would be willing to live and work to Germany.

Language is considered one of the most fundamental elements to attract and retain immigrant workers by both the authorities and businesses. While there are different kinds of language requirements for the visa

eligibility, local language supports are provided for further social integration for immigrants across the country. Yet, many firms are hesitant to hire foreign workers who do not have enough language skills in spite of their technical skills. In order to attract and retain highly skilled foreign experts, further support in language programs as well as support from companies are required.

At the municipal level, local networks also play an important role in connecting skilled workers from abroad with businesses that are looking for qualified personnel. Especially in cities with large existing immigration populations, there are strong networking communities between local immigration agencies, municipal authorities, and local firms. Not only do they connect employers and employees, but they also provide knowledge and strategies to retain and support foreign workers. This effort should be expanded and enhanced in different regions.

Overall, as a strong economy, Germany has been successful in accepting more skilled immigrants over the years through attempts to improve immigration policies. The country should continue showing its effort to attract foreign workers to counter its labour shortage, and to attract highly skilled foreign workers. The inefficient administrative process is the most crucial issue that the federal government is required to reform. Local governments and communities should also continue to develop micro-leveled assistants for international professionals who would contribute to German economy.