The Electronics and Microtechnology Industry in Germany

Issue 2012/2013
Germany - Where Expanding Markets and Next Generation Technologies Meet

With EUR 2.8 trillion market volume in 2011, the global market for electrical and electronic products and systems is the world’s biggest commodities market. The German market is Europe’s biggest market and the fourth largest worldwide with EUR 110 billion market volume in the same year.

Employing a workforce of almost 1.5 million both at home and abroad, Germany’s electrical and electronics firms manufacture more than 100 thousand different products and systems ranging from microelectronic components to electrical household appliances, automation systems, lamps and luminaires, electronic medical equipment, and automotive electronics.

Germany is globally recognized for its excellence in manufacturing and as being one of the world’s best-performing and stable economies. As such, Germany satisfies the essential conditions for market success in one of the world’s most dynamic industry sectors.
The Industry in Numbers

Germany’s electronics industry generated turnover of EUR 178 billion (USD 224 billion) in 2011, of which EUR 84 billion was secured in foreign markets. Total industry turnover is forecast to grow to EUR 180 billion in 2012.

Seventy eight percent of all revenue is generated from investment goods, 12 percent from intermediate goods (semiconductors in particular), and 10 percent from consumer goods. The sector has enjoyed a robust recovery from the global financial downturn of 2008/2009, growing turnover of EUR 145 billion to 178 billion in just two years. Export volume of EUR 155 billion (including re-exports) in 2011 helped record an all-time high.

In terms of per capita microelectronics consumption, Germany dominates the European market and occupies the second position in the world (behind Japan and ahead of the USA and China).

Electronics and microtechnology in Germany is exemplified by its innovativeness: EUR 13 billion is invested in R&D annually - creating a market landscape in which more than 40 percent of electronics and microtechnology products are less than three years old. A further EUR 6 billion is spent on capital investment, with EUR 2 billion set aside for training and further education.

The electronics and microtechnology sector represents the second largest industry segment in Germany in manpower terms. A workforce of over 800,000 is active on the ground in Germany, with a further 600,000 plus employed overseas. In Germany, an electronics and microtechnology R&D workforce of more than 76,000 ensures that the sector occupies one in four of all German industry-related R&D positions.
Germany’s Semiconductor Industry

Germany is the beating heart of the European semiconductor industry, ranking among the top five locations worldwide. Microelectronics is one of Germany’s fastest-growing industry sectors. The country boasts an unparalleled density of world-leading device manufacturers and suppliers for materials, components, and equipment across the value chain. Investment opportunities are numerous - both in design and manufacturing as well as applications. Despite strong competition from Europe and further afield, German semiconductor companies remain the European leaders in terms of revenue, enjoying global share of 4.8 percent in 2011. Across Europe, automotive and industrial semiconductors are the segments with the strongest annual growth rates (7.3 percent and 5.2 percent respectively). German demand is a key driver in both segments.

Semiconductor Applications: Automotive Industry

Germany dominates the market for automotive semiconductors with more than a third of global market share. In 2011, the auto industry accounted for 39.6 percent of all semiconductor revenue in Germany. Between 2000 and 2011 the German semiconductor automotive segment grew by 163 percent, and is forecast to keep growing by 43 percent for the period 2011 to 2016. Highly qualified engineering personnel and close proximity to customers are the keys to this success. Germany is a highly attractive location for automotive electronics research and investment thanks to constant growth in the global automotive market allied to increasing demand for German-made high-quality vehicles (particularly from emerging countries). German car manufacturer output is expected to increase continuously over the next years, reaching an annual output level of 6.7 million vehicles in 2016.

Semiconductor Applications: Industry and Power Semiconductors

The second largest microelectronics segment in Germany is industrial electronics, with over 25 percent share of the domestic semiconductor industry. Strong growth rates originating from a diversified domestic and international industrial base consolidate Germany’s globally leading technological development position. The German microelectronics market for industrial applications will grow by more than 10 percent annually through 2015. Historically the largest segments are building technology, automation, and electronic payment systems (combined share of nearly 50 percent), followed by smaller but promising application areas including power semiconductors.

The German power semiconductor market provides a number of different market opportunities in the years ahead. Abandoning nuclear energy in 2022 and switching to renewable energy sources will require an enormous research effort and investment in high-performance power semiconductors; especially metal oxide semiconductor field effect transistors (MOSFET) and insulated gate bipolar transistors (IGBT). Because they are applied in the high-voltage segment, IGBTs are encroaching into MOSFET territory and gradually increasing their market share.

Within the automotive sector, the current power semiconductor share (25 percent) of the total automobile cost is likely to increase to approximately 30 percent by 2015. While the North American market is very much in the mature stage, Europe and Germany are likely to drive market demand for power semiconductors.
Printed Electronics: Rolling out Applications of the Future

Handheld electronic books, batteries, and solar cells – all of which can be printed like paper – are just some of the technological innovations currently being developed in Germany.

Germany’s expertise in electronic device production, printing processes, and chemicals – all essential elements to printed electronics – make it a leading location for investment in this area.

Activities are bundled in two clusters, an industry association, and two government research funding programs. The city of Dresden boasts Europe’s largest microelectronics cluster; around which a dynamic printed and organic electronics ecosystem has sprung up. In Heidelberg on the other hand, industrial giants such as BASF, Heidelberger Druckmaschinen, Merck, SAP, and others are working on commercializing the printed electronics of the future.

Organic Photovoltaics
Germany is the world’s largest PV market with 25 percent of global new installations in 2011 and 35.6 percent of cumulated installations. Organic solar cells offer a thinner, more flexible, and potentially cheaper alternative to silicon cells thanks to the fact that these cells can be printed just like paper.

Germany offers ideal conditions for pilot and large-scale production, conditions which convinced organic photovoltaics (OPV) market leader Heliatek to open the world’s very first roll-to-roll manufacturing line for organic solar panels with vacuum deposition at low temperatures in Dresden in 2012. The German Ministry for Education and Research (BMBF) has created the “Innovation Alliance OPV” which bundles research activities and is endowed with EUR 360 million.

Organic Light-Emitting Diodes (OLEDs)
With industrial giants like OSRAM and Philips choosing the country for their OLED lighting production facilities and important players such as Novaled also on the ground, Germany is poised to lead the way to the lighting of the future. But it doesn’t stop there; specialized applications such as displays for medical purposes, automotive entertainment systems, and automotive lighting are also being developed in Germany right now. The BMBF has also created a program (“OLED Initiative 2015”) aimed specifically at meeting the needs of next-generation lighting. The initiative is endowed with close to EUR 1 billion.
Industry Overview 2012

Microsystems Technology: Taking Advantage of Germany’s Research Landscape

Germany’s global market share in Microsystems technology (MST) is forecast to increase to an impressive 21 percent in 2020. Compound annual growth rate (CAGR) for the coming decade is estimated at nine percent, with turnover increasing from EUR 100 billion in 2010 to EUR 235 billion in 2020. The number of employees in the industry is expected to increase from 750,000 to over 964,000.

This market growth is being supported by the BMBF which currently provides around 500 projects with EUR 184 million worth of funding. Another factor is the healthy climate of cooperation between SMEs and innovative research institutes such as the internationally renowned Fraunhofer Society. This has helped Germany become a global leader in microsystems technology, making the country the most important target market for European MST part suppliers and an ideal location for MST business European headquarters. The sector is cross-technology in nature, allowing an impressively wide range of applications to be developed and synergies to be won.

Medical Applications

Germany is home to Europe’s largest health care market. Leading German R&D institutes and companies are playing a major role in developing ever smaller therapeutic implant applications [such as cardiac pacemakers and glucose MEMS sensors that pump insulin into the bloodstream when needed]. In combination with modern “lab-on-a-chip” (LOC) diagnosis techniques which deliver quick and reliable analyses, these new devices can monitor and prevent diseases – all without having to admit the patient to hospital. Drugs specifically prescribed based on highly accurate testing make for more efficient and successful treatment of widespread diseases such as Alzheimer’s and cardiovascular diseases. Further underlining its high standing as a globally leading industry, Germany’s medical MST community generated turnover of EUR 12.9 billion in 2010 – this figure is forecast to double by 2015.

Mobility with MST

MST is also revolutionizing mobility - in Germany as elsewhere. In the world of logistics, innovations such as RFID labels allow goods data to be easily transmitted, read and stored using radio signals. Advanced driver assistance systems help avoid collisions on the road; thus reducing traffic accident rates and easing transportation for millions of people. Germany’s internationally renowned automotive industry and its domestic and international suppliers are already integrating these systems into their products. Automotive MST has a current market volume of EUR 30 billion in Germany – a figure that is forecast to triple by 2020.

Industrial Applications

Industry is another important MST application segment. The importance of micro process engineering and functional systems for sectors such as machinery and equipment, chemistry and pharmaceuticals, and nanotechnology cannot be underestimated. In Germany, microsystems technology turnover for industry applications will reach EUR 47.1 billion in 2020, almost three times 2010 turnover of EUR 17.2 billion.

Production Value of MST-based Products in Application Industries

<table>
<thead>
<tr>
<th>Industry Type</th>
<th>2005</th>
<th>2010</th>
<th>2015*</th>
<th>2020*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machinery &amp; Equipment</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
</tr>
<tr>
<td>Electronics/Consumer Electronics</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
</tr>
<tr>
<td>Automation (MSR)</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
</tr>
<tr>
<td>Optics/Photonics</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
</tr>
<tr>
<td>Automotive Industry</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
</tr>
<tr>
<td>Aerospace &amp; Defense</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
</tr>
<tr>
<td>Life Science &amp; Pharmaceutical Industry</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
</tr>
<tr>
<td>Information &amp; Communications Technology</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
</tr>
<tr>
<td>Textile Industry</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
</tr>
<tr>
<td>Chemical Industry</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
</tr>
<tr>
<td>Others</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
<td>EUR 0</td>
</tr>
</tbody>
</table>

Source: Prognos 2011

*Forecast
Energy-Efficient Lighting

The German market for energy-efficient lighting is being driven by a number of factors; one being EU legislation from 2009 which has phased out the selling of incandescent lamps as of September 2012. Soaring energy prices, increased consumer awareness of all matters energy efficiency related, and environmentally friendly products are pushing rapid innovation in the market. The goal of governments and companies alike is a reduction of the 19 percent lighting global electricity consumption share through the introduction of energy-efficient lighting solutions.

Growth Prospects

While the compact fluorescent lamps (CFL) market has reached a somewhat saturated level with a revenue volume of EUR 168 million and growth rates in the lower single-digit range, semiconductor-based light-emitting diodes (LED) will play an increasingly important role in the lighting market (domestically as well as internationally): the German LED lamp market is forecast to grow by an average of 27 percent per annum between 2008 and 2018. Analyses predict that worldwide every third light source will be an LED by 2025. While investment opportunities can be found right along the value chain – for material and equipment providers, packaging providers, chip makers, and even more vertically integrated players – street lighting will be among the most attractive application areas for LED in Germany.

LED Street Lighting

Germany must decrease its energy consumption significantly in order to achieve a 40 percent reduction in CO₂ emissions target by 2020. There are a number of obvious starting points: approximately one in three German street lighting points is more than 30 years old, inefficient, and needs to be replaced. But even though the average German city pays half of its electricity costs on lighting, the current annual lamp replacement rate is just three percent. While electricity is the most expensive factor in conventional street lighting, costs for maintenance and repair account for an average 25 percent of total operating expenses. Operative inflexibility is also an issue: 75 percent of the nine million street lighting points in Germany are not individually addressable and have no dimming mode. In other words: the German street lighting market is at a turning point.

Innovation in the LED technology is making prices fall. Thanks to pilot projects in smaller to mid-sized cities, German municipalities have started realizing the savings potential of LED in terms of energy consumption and electricity costs. This means that now is a good time to enter the German LED street lighting market for companies providing high-quality products at reasonable prices.

Development of LED Lamps Revenues in Germany 2008-2018

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue in USD million</th>
<th>Annual growth in percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>13.1</td>
<td>42.3</td>
</tr>
<tr>
<td>2009</td>
<td>16.5</td>
<td>42.3</td>
</tr>
<tr>
<td>2010</td>
<td>24.1</td>
<td>33.7</td>
</tr>
<tr>
<td>2011</td>
<td>33.7</td>
<td>24.1</td>
</tr>
<tr>
<td>2012</td>
<td>42.3</td>
<td>16.5</td>
</tr>
<tr>
<td>2013</td>
<td>52.4</td>
<td>16.5</td>
</tr>
<tr>
<td>2014</td>
<td>65.5</td>
<td>13.1</td>
</tr>
<tr>
<td>2015</td>
<td>81.3</td>
<td>24.1</td>
</tr>
<tr>
<td>2016</td>
<td>99.2</td>
<td>24.1</td>
</tr>
<tr>
<td>2017</td>
<td>119.6</td>
<td>24.1</td>
</tr>
<tr>
<td>2018</td>
<td>142.6</td>
<td>24.1</td>
</tr>
</tbody>
</table>

Source: Frost & Sullivan 2012
Optics and Photonics Revolution

The 21st century is the “century of the photon.” With market and technology leaders, strong domestic demand and excellent trade relations, Germany is playing an instrumental role in shaping photonic developments. In 2010, around one thousand companies in the photonics sector generated annual turnover of EUR 25.6 billion – equivalent to 16 percent growth on the previous year’s results. The industry employs approximately 135,000 people. For 2012, German industry association SPECTARIS predicts additional growth of 10 percent (28.3 billion domestic annual turnover). In keeping with German excellence in manufacturing, the lion’s share of turnover comes from production and power engineering with imaging, medical technology, and optical components also constituting strong industry segments.

Serving World Markets from Germany

An optics and photonics export ratio of around 70 percent exemplifies Germany’s strong connection with world markets. Germany holds an impressive world market share in submarkets like industrial lasers (40 percent) and lithography optics (60 percent). Not only is Germany the ideal location to serve the European market (with a total market share of 40 percent), but its two biggest export destinations are the USA and China. In addition to China, there are five other Asian countries among the top 15 export destination countries, showing that, even in Asian markets, German products are highly cost-competitive.

Exports to Poland and Russia also continue to grow. As such, Germany is the ideal gateway to the European market and an excellent base to serve international markets.

Associations & Networks

The German optics and photonics industry is concentrated within several clusters and industry associations. Regional clusters are organized in OptecNet Deutschland - the association of the German regional Competence Networks for Optical Technologies. Founded in 2000 as an initiative of the Federal Ministry of Education and Research (BMBF), OptecNet Deutschland is the supra-regional association of the nine regional competence networks. OptecNet’s mission is to support the optical technologies as key technologies for Germany.

Research & Development

Germany is known throughout the world for its high concentration of research and technology institutes. The BMBF provides a unique opportunity for companies active in the photonics sector. From 2012 through 2015 it will make EUR 419 million in funding available for photonics R&D. Small and medium-sized enterprises can obtain a 10 percent bonus on top of normal incentive rates. The photonics industry is also a significant investor in R&D, ploughing 10 percent of revenue straight back into research.
Electronic Manufacturing Services

The European electronic manufacturing services (EMS) provider market is expected to record CAGR of 10.1 percent for the period 2011 to 2017. Raised demand for cost reductions will increase the role of EMS providers in the electronics market. Germany hosts the entire EMS value chain, with Europe’s largest electronics industry accounting for EUR 178 billion turnover in 2011. German EMS accounts for 20 percent of the European EMS market. Growth drivers include the automotive, industrial, medical electronics, and renewable energy sectors.

Automotive Electronics
Automotive electronics is the biggest German electronics industry segment with 39.6 percent market share. Microelectronics value per vehicle is expected to grow from USD 155 in 2000 to USD 400 in 2020. A low EMS provider penetration rate (less than 12 percent), and the growth in electronic products are attractive factors for EMS providers in the automotive electronics segment.

Industrial Electronics
Industrial electronics account for 25.1 percent of German electronics turnover. Revenue grew 146 percent for the period 2000 to 2011 and constitutes 50 percent of the European market. Germany’s strength in industrial electronics creates opportunities for EMS providers specialized in this field.

Electromedical Technologies
The electromedical industry in Germany has an annual turnover of around EUR 1.5 billion. Medical technologies are one of the key areas of the federal government’s High-Tech Strategy. The combination of medical and information technologies ensure EMS providers with strong positions: contractors will benefit from product trends such as increasing virtualization, mobile applications, real-time communication, and diagnostics.

Renewable Energy
Forecasts predict that renewable energy will account for 36 percent of electricity generated in Germany by 2020. Gaining cost benefits from EMS providers’ improved process control and manufacturing expertise will remain a primary driver for increasing the EMS role in the global renewable energy and smart grid markets. Participation in the renewable energy industry necessitates significant R&D investment.

German EMS Industry Landscape
Germany hosts approximately 350 to 400 EMS companies. Eighty percent of them are small enterprises with annual turnover of EUR 10 million or less. Large companies (those companies with annual turnover of EUR 50 million or more) continue to generate around 50 percent of industry turnover.

Around 35 EMS providers drawn from Germany, Austria and Switzerland are organized within the Zentralverband Elektrotechnik- und Elektronikindustrie (ZVEI – “Central Association of the German Electrical and Electronics Industry”) “Services in EMS” initiative.
Research, Development, Innovation

The High-Tech Strategy
In launching the “High-Tech Strategy” in 2006, Germany’s federal government created a national concept to bring key innovation and technology stakeholders together in a common purpose of advancing new technologies. The stated objective of the High-Tech Strategy is to create lead markets, intensify cooperation between science and industry, and continue to improve the general conditions for innovation. This initiative combines the innovation-bound resources of all ministries, committing approximately EUR 4 billion annually to the development of cutting-edge technologies via generous R&D grants and other forms of financing.

The objectives set out in the High-Tech Strategy were continued and extended within the framework of the “High-Tech Strategy 2020” launched in July 2010. High-Tech Strategy 2020 aims to establish Germany as a lead provider of science and technology-based solutions in the fields of:

- Climate/Energy
- Health/Nutrition
- Mobility
- Security
- Communication

Projects supported by these funds pursue specific objectives related to scientific and technological development over longer periods. Strategies for innovation are being developed and steps towards their realization planned in concrete cases. Examples of projects in line with the government’s research and innovation policy include:

- CO₂-neutral cities
- Intelligent energy supply systems
- Renewable energy resources
- Effective treating of illnesses through individualized medicine
- Electric vehicles
- Communication networks security
- Digital availability of global knowledge

Electronics as Central Innovator
The German government has recognized the importance of electronics to establishing Germany’s credentials as a leading innovator. Three out of the eight key technologies defined in the High-Tech Strategy are directly or closely related to electronics.

- Microsystems Technology (see page six)

With expected CAGR of nine percent over the next decade and close cooperation between innovative institutes and strong application industries, Microsystems technology is a cross-technology sector in which Germany is expected to play a leading role and reach a global market share of 21 percent by 2020.

- Optics (see page eight)

Germany is a world market leader in several optics-related fields. For example, global market share in high-performance lasers for materials processing stands at 40 percent. In LED lighting, Germany enjoys international market share of 12 percent and, thanks to a strong value chain, is well-prepared for the rapid market developments ahead.

- Micro- and Nanotechnology

Nanotechnologies are applicable in a wide range of industries and hold great technological and economic potential for Germany. Global nanotechnology market volume is forecast to reach EUR 1 billion by 2015, with Germany ranking third internationally in terms of commercialization of nanotechnology-based research. Almost one thousand companies make up and contribute to the domestic nanotechnology value chain. German state support for nanotechnology research is unparalleled in Europe, with EUR 370 million set aside as part of the country’s High-Tech Strategy.

What are the most attractive countries in Europe in the next 3 years?

<table>
<thead>
<tr>
<th>Country</th>
<th>Attractiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>35%</td>
</tr>
<tr>
<td>Poland</td>
<td>10%</td>
</tr>
<tr>
<td>UK</td>
<td>8%</td>
</tr>
<tr>
<td>Russia</td>
<td>7%</td>
</tr>
<tr>
<td>France</td>
<td>4%</td>
</tr>
<tr>
<td>Romania</td>
<td>3%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>3%</td>
</tr>
<tr>
<td>Turkey</td>
<td>2%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>2%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2%</td>
</tr>
<tr>
<td>Italy</td>
<td>2%</td>
</tr>
<tr>
<td>Spain</td>
<td>2%</td>
</tr>
<tr>
<td>Sweden</td>
<td>2%</td>
</tr>
<tr>
<td>Can’t say</td>
<td>3%</td>
</tr>
</tbody>
</table>

Source: Ernst & Young’s European Attractiveness Survey 2012
Total respondents: 840. Countries with attractiveness <2% are not listed.
Foreign Direct Investment Opportunities

First Choice Business Location
A recent study conducted by the American Chamber of Commerce highlights the positive regard in which the German business environment is held by US companies. Invited to indicate their main medium-term investment focus within the EU, 73 percent of participating American companies named Germany as their first choice; followed by Eastern Europe (57 percent), and Western Europe (33 percent) respectively.

Ernst & Young’s “European Attractiveness Survey 2012” confirms Germany’s reputation as one of the most attractive business locations in the world. International decision makers ranked Germany first within the European Union, and sixth worldwide in the “most attractive business location” category.

Free and Open Markets
Germany has a welcoming attitude towards foreign direct investment (FDI). The German market is open for investment in practically all industry sectors, and business activities are free from regulations restricting day-to-day business. German law makes no distinction between Germans and foreign nationals regarding investments or the establishment of companies. The legal framework for FDI in Germany favors the principle of freedom of foreign trade and payment. There are no restrictions or barriers to capital transactions or currency transfers, real estate purchases, repatriation of profits, or access to foreign exchanges.

FDI in the German Electronics Industry
- With 71 new projects in 2011 alone, Germany is the top destination for investments in the electronics industry within the European Union.
- A total of 263 new investment projects in the electronics industry were recorded in the last five years, making Germany the third most attractive electronics FDI destination worldwide after China and the USA. The majority of these projects came from the USA (64 projects), China (56 projects), Japan (27 projects) as well as Switzerland and Canada (14 and 12 projects respectively).
- The number of investment projects from China has grown considerably in the last five years (from two projects in 2007 to a total of 20 projects in 2011), making China the number one source country for electronics industry FDI projects in 2011.
- Almost one quarter of all FDI projects within the last five years established a manufacturing site in Germany. In these terms, Germany ranks sixth worldwide.

Sound and Secure Legal Framework
According to the World Economic Forum (WEF), Germany is one of the world’s best locations in terms of planning and operating security. Germany is one of the world’s leading nations in terms of intellectual property protection. The German legal system also counts as one of the world’s most efficient and independent. Social, economic, and political stability provide a solid base for corporate investment projects.

Number of FDI Projects in Europe in the Electronics Industry by Destination Country

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>37</td>
<td>44</td>
<td>49</td>
<td>62</td>
<td>71</td>
<td>263</td>
</tr>
<tr>
<td>UK</td>
<td>35</td>
<td>34</td>
<td>40</td>
<td>49</td>
<td>42</td>
<td>200</td>
</tr>
<tr>
<td>France</td>
<td>27</td>
<td>34</td>
<td>22</td>
<td>21</td>
<td>16</td>
<td>120</td>
</tr>
<tr>
<td>Spain</td>
<td>26</td>
<td>28</td>
<td>17</td>
<td>20</td>
<td>26</td>
<td>117</td>
</tr>
<tr>
<td>Poland</td>
<td>20</td>
<td>19</td>
<td>7</td>
<td>19</td>
<td>16</td>
<td>81</td>
</tr>
<tr>
<td>Russia</td>
<td>9</td>
<td>17</td>
<td>12</td>
<td>23</td>
<td>14</td>
<td>75</td>
</tr>
</tbody>
</table>

Source: (FDi) markets 2012
Cost Effectiveness

High Productivity
Measured in unit labor costs, Germany experienced a major increase in productivity the past decade. In marked contrast to other European countries which have experienced an overall increase in unit labor costs, Germany’s unit labor costs decreased by a yearly average of 0.4 percent for the period 2004-2011. This made the economy more competitive – particularly manufacturing.

Competitive Labor Costs
At the same time, the labor cost gap between Germany and its eastern European neighbors has been significantly reduced. In fact, Germany has gained the labor-cost edge in recent years. Since 2002, wages have risen in most European countries [EU-27], with the growth rate averaging 3.1 percent. While some countries – particularly those in eastern Europe – experienced a rise of more than seven percent, Germany recorded the lowest labor cost growth within the EU at just 1.6 percent. This has been another decisive argument in favor of Germany as a premium business location.

Excellent Production Standards
Germany’s high productivity is also closely linked to its excellent production process standards. This has been confirmed by a study of international executives conducted by the World Economic Forum (WEF). According to the study findings, Germany is seen as a country where the best and most efficient process technology is applied.

Highly Skilled Workforce
Germany’s excellent workforce is decisive to the country’s high productivity rates. It comprises over 40 million people – making it the largest pool of ready labor in the EU. Germany’s world-class education system ensures that the highest standards are always met. More than 80 percent of the German workforce has received formal vocational training or is in possession of an academic degree.

Labor Cost Growth in Total Economy 2002-2011
(annual average growth in percent)

<table>
<thead>
<tr>
<th>Country</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>1.6%</td>
</tr>
<tr>
<td>France</td>
<td>2.4%</td>
</tr>
<tr>
<td>Austria</td>
<td>3.0%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>3.1%</td>
</tr>
<tr>
<td>Spain</td>
<td>3.3%</td>
</tr>
<tr>
<td>UK</td>
<td>3.7%</td>
</tr>
<tr>
<td>Czech Rep.</td>
<td>5.7%</td>
</tr>
<tr>
<td>Poland</td>
<td>5.8%</td>
</tr>
<tr>
<td>Hungary</td>
<td>7.2%</td>
</tr>
<tr>
<td>Slovak Rep.</td>
<td>7.5%</td>
</tr>
</tbody>
</table>

Source: Eurostat 2012

Engineering Excellence
According to the OECD, Germany has an excellent standard in higher education. In 2011, some 517,000 students – at more than 420 universities – embarked on a course of academic study. Technical fields of study experienced an undergraduate enrollment level increase of more than eight percent. Germany’s share of university students in the sciences, mathematics, computer sciences, and engineering is the third highest in the EU, with 31 percent of all students. German universities have introduced masters and bachelor degrees for improved international acceptance and comparison. In addition, the country can be proud of one of the highest rates of graduates with a doctoral degree. With 311 PhD graduates per million inhabitants, it ranks second in a comparison of EU countries.
Financing & Incentives

In Germany, investment projects can receive financial assistance through a number of different instruments. These instruments may come from private sources or consist of public incentives programs available to all companies – regardless of country of provenance. They fit the needs of diverse economic activities at different stages of the investment process.

Early Stage Investment Project Financing

Technologically innovative start-ups in particular have to rely solely on financing through equity such as venture capital (VC). In Germany, appropriate VC partners can be found through the Bundesverband Deutscher Kapitalbeteiligungs- gesellschaften e.V. (BVK – “German Private Equity and Venture Capital Association”). Special conferences and events like the Deutsches Eigenkapitalforum (“German Equity Forum”) provide another opportunity for young enterprises to come into direct contact with potential VC partners. Public institutions such as development banks (publicly owned and organized banks which exist at the national and state level) and public VC companies may also offer partnership programs at this development stage.

Later Stage Investment Project Financing

Debt financing is a central financing resource and the classic supplement to equity financing in Germany. It is available to established companies with a continuous cash flow. Loans can be borrowed for day-to-day business (working capital loans), can help bridge temporary financial gaps (bridge loans) or finance long-term investments (investment loans). Besides offers from commercial banks, investors can access publicly subsidized loan programs in Germany. These programs usually offer loans at attractive interest rates in combination with repayment-free start-up years, in particular for small and medium-sized companies. These loans are provided by the state-owned KfW development bank and also by regional development banks.

Cash Incentives for Investment Projects

When it comes to setting up production or service facilities, investors can count on a number of different public funding programs. These programs complement the financing of an investment project. Most important are cash incentives provided in the form of non-repayable grants applicable to co-finance investment-related expenditures such as new buildings, equipment or machinery. In Eastern Germany, investment grants are complemented by an investment allowance (Investitionszulage IZ), which is usually allotted in the form of a tax credit but which can also be provided in the form of a tax-free cash payment.

Labor-related Incentives and R&D Project Grants

After the location-based investment has been initiated, companies can receive further subsidies for building up a workforce or the implementation of R&D projects. Labor-related incentives play a significant role in reducing the operational costs incurred by new businesses. The range of programs offered can be classified into three main groups: programs focusing on recruitment support, training support, and wage subsidies respectively. R&D project funding is made available through a number of different incentives programs targeted at reducing the operating costs of R&D projects. Programs operate at the regional, national, and European level and are wholly independent from investment incentives. At the national level, all R&D project funding has been concentrated in the so-called High-Tech-Strategy to push the development of cutting-edge technologies. Substantial annual funding budgets are available for diverse R&D projects.

Types of Incentives in Germany

<table>
<thead>
<tr>
<th>Investment Incentives Package</th>
<th>Operational Incentives Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash Incentives</td>
<td>Labor-related Incentives</td>
</tr>
<tr>
<td>GRW (Investment Grants)</td>
<td>R&amp;D Incentives</td>
</tr>
<tr>
<td>IZ (Investment Allowance)</td>
<td>Recruitment Support</td>
</tr>
<tr>
<td>State Development Bank Loans</td>
<td>Training Support</td>
</tr>
<tr>
<td>Public Guarantees</td>
<td>Wage Subsidies</td>
</tr>
<tr>
<td>KfW Loans (National Level)</td>
<td>Silent/ Direct Partnership</td>
</tr>
<tr>
<td>Combined State/ Federal Guarantees</td>
<td></td>
</tr>
</tbody>
</table>

1 only in Eastern Germany
Germany Trade & Invest Helps You

Germany Trade & Invest’s teams of industry experts will assist you in setting up your operations in Germany. We support your project management activities from the earliest stages of your expansion strategy.

We provide you with all of the industry information you need – covering everything from key markets and related supply and application sectors to the R&D landscape. Foreign companies profit from our rich experience in identifying the business locations which best meet their specific investment criteria. We help turn your requirements into concrete investment site proposals; providing consulting services to ensure you make the right location decision. We coordinate site visits, meetings with potential partners, universities, and other institutes active in the industry. Our team of consultants is at hand to provide you with the relevant background information on Germany’s tax and legal system, industry regulations, and the domestic labor market. Germany Trade & Invest’s experts help you create the appropriate financial package for your investment and put you in contact with suitable financial partners. Incentives specialists provide you with detailed information about available incentives, support you with the application process, and arrange contacts with local economic development corporations.

All of our investor-related services are treated with the utmost confidentiality and provided free of charge.

---

Strategy | Evaluation | Decision & Investment

### Project Management Assistance

- Business opportunity analysis and market research
- Market entry strategy support
- Project partner identification and contact
- Joint project management with regional development agency
- Coordination and support of negotiations with local authorities

### Location Consulting/Site Evaluation

- Identification of project-specific location factors
- Cost factor analysis
- Site preselection
- Site visit organization
- Final site decision support

### Support Services

- Identification of relevant tax and legal issues
- Project-related financing and incentives consultancy
- Organization of meetings with legal advisors and financial partners
- Administrative affairs support
- Accompanying incentives application and establishment formalities
Contact
About Us

Germany Trade & Invest is the foreign trade and inward investment agency of the Federal Republic of Germany. The organization advises and supports foreign companies seeking to expand into the German market, and assists companies established in Germany looking to enter foreign markets.

All inquiries relating to Germany as a business location are treated confidentially. All investment services and related publications are free of charge.