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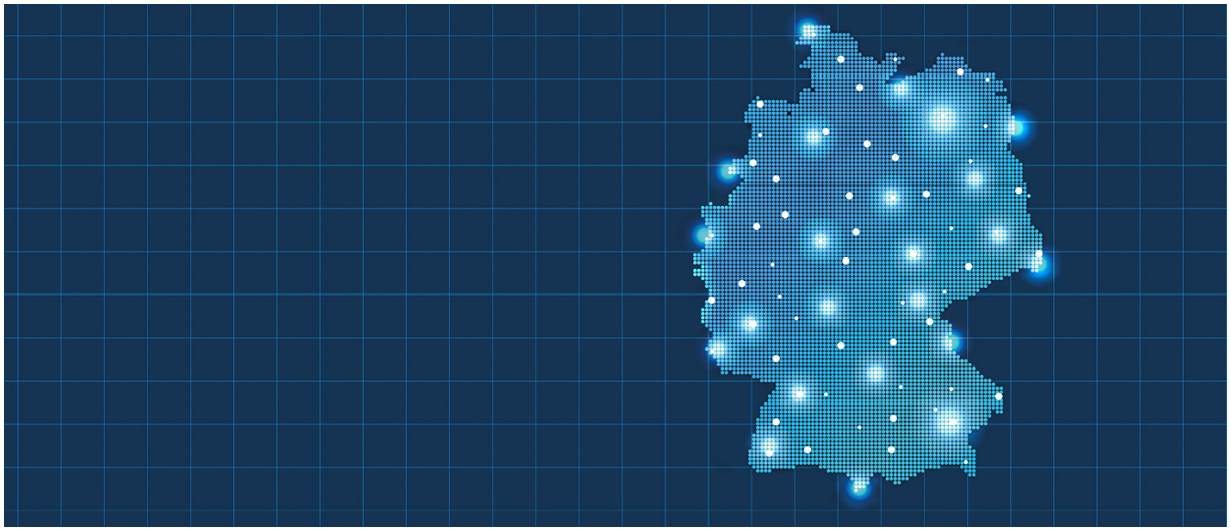
Why digitisation affects some German federal states more than others

30. July 2020 | Gabriele Wydra-Somaggio



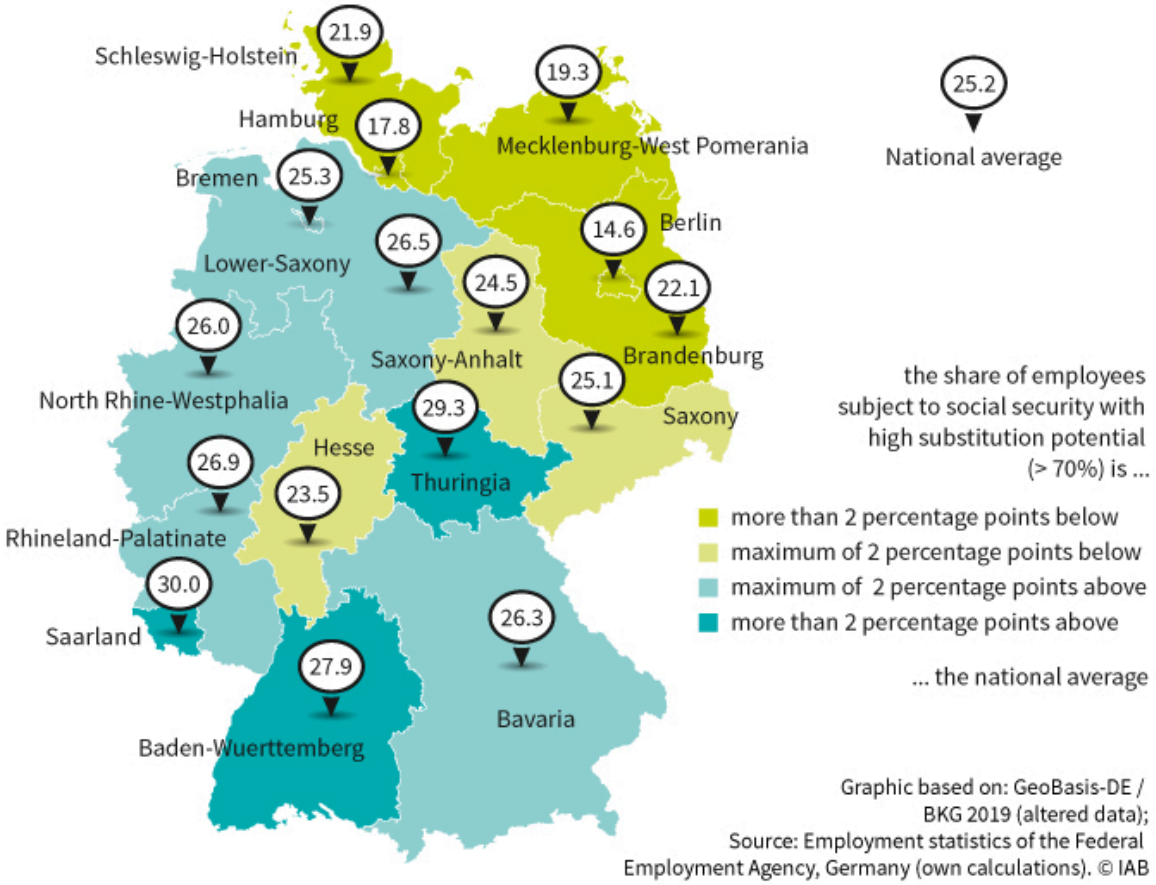
The number of jobs in a German federal state (Bundesland) which could be replaced by digital technologies largely depends on the sectoral and occupational structures within this region. In this article, selected occupational segments are analysed to show that the federal states differ greatly in this regard.

In the coming years, digitisation will fundamentally change the German economy – and the labour market – in both positive and negative ways: some jobs will be lost, some will be created, and many job-profiles will change. However, the effects of digitisation are likely to vary greatly from region to region, because their respective economic and occupational structures also differ. These are the findings of an IAB Kurzbericht 9/2018, in which the effects of digitisation on the German labour market up to 2035 were examined.

The German federal states differ considerably in terms of the “substitution potential” of employees, i.e. the share of activities that could be replaced by computers or computer-controlled programmes. The share of employees for whom at least 70 percent of the tasks within an occupation could be automated varies between 14.6 percent in Berlin to 30 percent in Saarland (see Figure 1).

Figure 1: Share of employees with high substitution potential, by federal state, 2016

in percent



Of course, this does not mean that these activities are actually being substituted: technical feasibility is a necessary, but not the only prerequisite for the replacement of human activities by computers. Thus, substitution potential does not mean job loss.

The differences between the federal states are not only determined by the regional sectoral structure, but also by the occupational composition of the individual sectors (read also the IAB Kurzbericht 22/2018).

The substitution potential in a federal state is therefore influenced by two factors: the share of employees who work in a specific segment , and the occupational composition within that segment, i.e. the share of employees within an occupational segment who work in occupations with high

substitution potential.

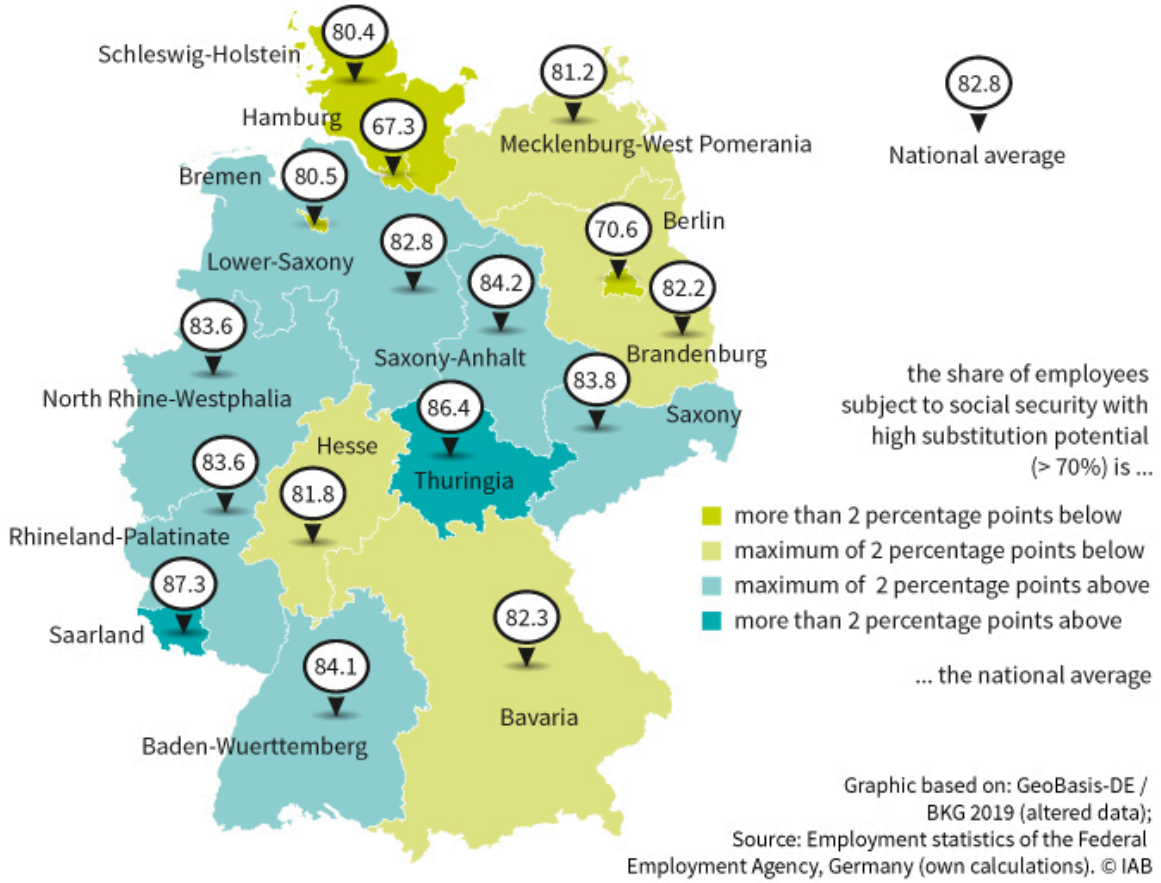
Both factors – in combination or individually – can contribute to an above- or below-average substitution potential. Usually, a high substitution potential in a federal state is linked to a high share of employees both in the respective occupational segments and a high share of employees in occupation with a high substitution potential. In the following analysis, this will be examined in more detail using the example of selected occupational segments.

On average, the substitution potential in manufacturing is very high

Manufacturing occupations are among the occupational segments in which the substitution potential is on average very high. It is therefore no coincidence that in Thuringia and Saarland, where the share of employees with high substitution potential is greatest, the highest share of employees in manufacturing professions can be found, at 11.1 and 10.3 percent respectively (see Figure 2).

Figure 2: Share of employees with high substitution potential within manufacturing occupations, by federal state, 2016

in percent



These federal states also have the highest shares of employees with high job-specific substitution potential within the manufacturing professions: they are more than two percentage points above the national average. In both Thuringia and Saarland, for example, employees often work as specialists in metalworking, specialists and helpers in plastics and rubber production or as specialists in tool technology and metal construction – all occupations that have a high potential for substitution.

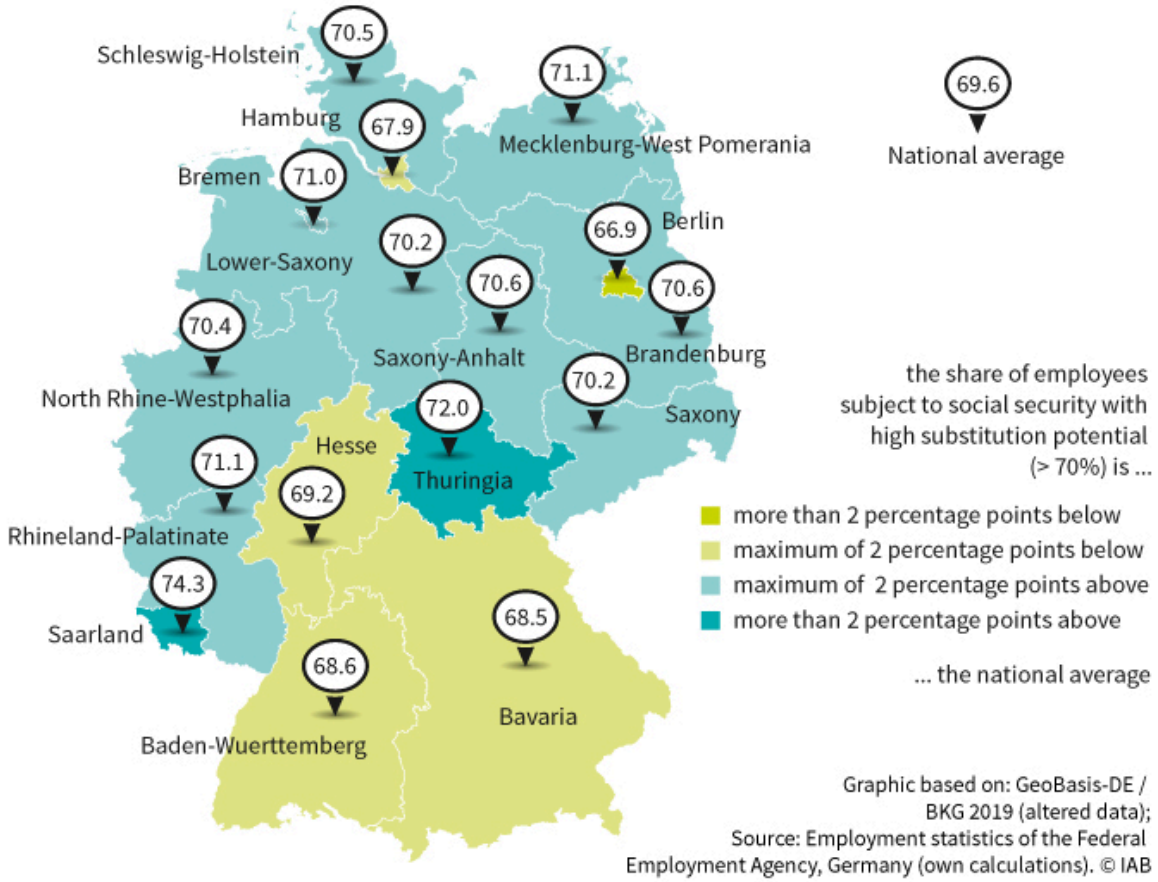
The situation is very different in the city-states of Berlin and Hamburg. Here, the occupational structure is less characterized by manufacturing occupations than in the larger regional federal states. In addition, the few employees who do work in this segment have jobs with a low or medium substitution potential. For example, technical media design plays an important role within the manufacturing occupation in Hamburg. In Berlin, industry has already gone through a modernisation process. Therefore, the manufacturing professions located there are now highly digitised. This means that the potential for substitution has already largely been exhausted, for example in the electrical-, the chemical-, and pharmaceutical industries, and in mechanical engineering.

The manufacturing-related technical occupations also have a high substitution potential

Saarland and Thuringia also occupy the top positions in terms of substitution potential and the share of employees in the manufacturing-related technical occupations (see Figure 3). In Saarland, the great importance of mechanical engineering for the employment of skilled workers could play a role, since it has a very high substitution potential. In Thuringia, specialists such as machine and device assemblers and helpers in mechanical engineering and industrial engineering are particularly strongly represented as occupations with high substitution potential.

Figure 3: Share of employees with high substitution potential within manufacturing-related technical occupations, by federal state, 2016

in percent



Graphic based on: GeoBasis-DE / BKG 2019 (altered data);
Source: Employment statistics of the Federal Employment Agency, Germany (own calculations). © IAB

It is noteworthy that in federal states with slightly above-average occupation-specific substitution potential in the manufacturing-related occupations, a below-average number of employees work in such occupations. This is especially true for Mecklenburg-Western Pomerania, Saxony-Anhalt, Brandenburg and Schleswig-Holstein. The increased substitution potential results from the fact that the few employees in manufacturing engineering occupations are concentrated within occupations with a high substitution potential.

In Mecklenburg-Western Pomerania, specialists in vehicle technology and construction electronics – both occupations with high substitution potential – dominate the occupational segment. In Brandenburg, employees with high substitution potential work relatively frequently as automotive technicians and mechanical engineers.

It is striking that Baden-Wuerttemberg has the highest share of employees in manufacturing engineering occupations at 16 percent, but the substitution potential is somewhat below the national average. This is due to the fact that a disproportionately high share of the employees

within the segment work in technical development, design and production-control, i.e. in occupations with only medium substitution potential.

The substitution potential within business-related service-occupations has risen faster than average

According to the latest calculations by Katharina Dengler and Britta Matthes, published in the IAB Kurzbericht 4/2018, the potential for substitution within business-related service occupations as well as in the transport- and logistics-professions increased at an above-average rate between 2013 and 2016 by 19 and 20 percentage points respectively. Potential applications of new technologies in these occupations have increased without the activity structure within the occupations having changed significantly.

In business-related service occupations, the substitution potential averages 60 percent. Rhineland-Palatinate, Lower Saxony and Schleswig-Holstein tend to have a below average number of employees in this area, but at the same time a considerable share of employees with high substitution potential in this occupational segment (see Figure 4). These work more frequently than average in occupations that have changed particularly significantly in the past few years as a result of digitisation, such as tax consultants (especially Lower Saxony), public administration occupations (especially Rhineland-Palatinate) and insurance and bank clerks (especially Lower Saxony and Rhineland Pfalz).

In Berlin, where a relatively large number of employees work in this segment, but the share of employees with high substitution potential is below average, the advertising industry and management consultancy dominate. They offer higher-quality services with activities that cannot be replaced or the substitution potential is already largely exhausted through the increased use and application of digital technologies. As a result, the job profiles in these occupations have changed so that today the employees are primarily entrusted with tasks that can only be automated to a limited extent.

A similar picture emerges for Hamburg, where despite the importance of company-related services, relatively few employees continue to work in professions with high substitution potential.

Many jobs in transport and logistics now also have a high substitution potential

Bremen is a central logistics hub. There, many employees work in logistics occupations with high substitution potential, such as specialists in technical shipping operations and in goods and goods-handling; and assistants in warehousing (see Figure 5). In other regions, such as Baden-Wuerttemberg, the substitution potential is high, although relatively few employees work in the transport and logistics occupations because they concentrate on professions with high substitution potential.

Conversely, in Brandenburg and Saxony-Anhalt there is little potential for substitution and a relatively high level of employment in the transport and logistics occupations. Many employees work there as professional drivers in freight transport.

Substitution potential has decreased in the IT- and scientific service-segment

The substitution potential in the IT- and scientific service-segment has decreased because replaceable activities have ceased to exist due to technological innovations and have therefore become less important for the occuaption. Conversely, new activities which are not replaceable by technology have become more important. As a result, the share of employees with high substitution potential in these occupational segments has dropped to an average of 39 percent.

Nevertheless, there are federal states such as Saxony-Anhalt, Brandenburg, Rhineland-Palatinate or North Rhine-Westphalia, in which the share of employees with high substitution potential remains very high within this occupational segment (see Figure 6).

In Saxony-Anhalt and Rhineland-Palatinate, the share of employees in these occupations is (slightly) below average. In particular, the specialist and assistant activities in pharmaceutical technology, which in the meantime could largely be replaced by digital technologies, play an important role in these two federal states. However, the technological opportunities do not seem to have changed these job structures, which is why the substitution potential in these occupations remains high.

In Hamburg, Baden-Wuerttemberg and Bavaria, as well as in Hesse, a relatively large number of employees work in IT- and scientific service-occupations. While the IT occupations are likely to be of great importance in Hesse, it is particularly research-intensive professions that characterize this segment in Hamburg.

In Baden-Wuerttemberg and Bavaria, on the other hand, research and development occupations dominate in relation to the automotive industry as well as in numerous research institutes in the natural sciences and in the IT sector: these all have low substitution potential.

Conclusion

The regional share of employees with high substitution potential largely depends on the specific sectoral and professional structure in a federal state. These regional disparities can intensify or become more entrenched if companies have the necessary infrastructure (e.g. internet-broadband)

to use digital technologies. High-tech companies prefer to settle in these regions, which in turn attract new companies.

In regions that have a large share of employees with high substitution potential, there is above all a strong need for training and further education offers in order to open up prospects for new and existing occupations to those affected by technological changes. In regions where substitution potentials are low, the upgrading of digital infrastructure (e.g. 5G) is particularly important so that their ongoing technological requirements are met.

In both cases, politics, businesses and the labour-administration have to work together to develop solutions that are tailored to the respective region. A high substitution potential should not only be understood as a risk, but also as an opportunity for innovation and progress.

You can find more information about the federal states in our IAB-Regional publication series: Bavaria, Berlin-Brandenburg, Hesse, Hamburg, Schleswig-Holstein, Mecklenburg-West Pomerania, North Rhine-Westphalia, Saxony, Saxony-Anhalt, Thuringia.

A detailed table on the sector-specific substitution potential (in German) can be found on the IAB homepage under „Aktuelle Daten und Indikatoren“.

Literature

Dengler, Katharina; Matthes, Britta (2018): Substituierbarkeitspotenziale von Berufen: Wenige Berufsbilder halten mit der Digitalisierung Schritt. IAB-Kurzbericht No 4.

Dengler, Katharina; Matthes, Britta; Wydra-Somaggio, Gabriele (2018): Digitalisierung in den Bundesländern: Regionale Branchen- und Berufsstrukturen prägen die Substituierbarkeitspotenziale. Kurzbericht No 22.

Matthes, Britta; Meinken, Holger; Neuhauser, Petra (2015):. Methodenbericht der Statistik der BA, Nuremberg.

Zika, Gerd; Helmrich, Robert; Maier, Tobias; Weber, Enzo; Wolter, Marc I. (2018): Arbeitsmarkteffekte der Digitalisierung bis 2035: Regionale Branchenstruktur spielt eine wichtige Rolle. IAB-Kurzbericht No 9.

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Zitationshinweis

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