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**287 Report** by Thilo Kroeger

## Germany's Labor Market: Increasingly Service-Oriented and Highly Skilled

- The labor market changes; not only between sectors, but also across occupations and qualifications
- Service provision and higher qualifications are increasingly important
- Policy must be oriented toward activities and qualification levels as well as industries or occupations



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AT A GLANCE

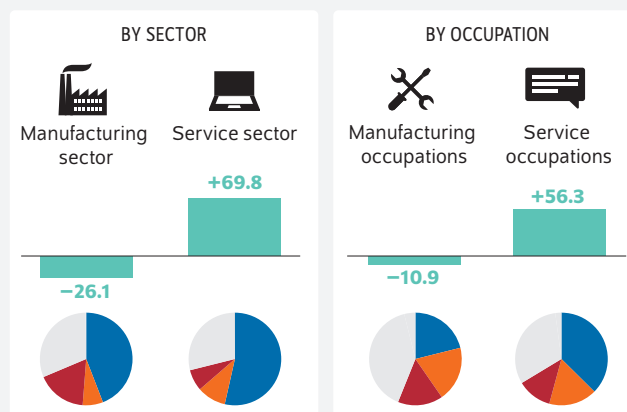
# Germany's Labor Market: Increasingly Service-Oriented and Highly Skilled

By Thilo Kroeger

- The labor market in Germany is undergoing profound change; not only between sectors, but also across occupations and qualifications
- Not only is service provision increasingly important, but higher qualifications are also increasingly relevant
- Only two-thirds of job losses in the industrial sector are due to structural change; changes in tasks and qualifications are also relevant
- Looking at job titles is no longer sufficient to understand changes in the labor market; knowledge of specific tasks and skills is crucial
- Labor market policy must be differentiated regionally and oriented toward activities and qualification levels as well as industries or occupations

Changes in the labor market are driven not only by structural change but also by shifts in occupations and rising qualification levels

EMPLOYMENT TRENDS  
in Western Germany between 1975 and 2017  
In percent



- TRENDS
- Structural change**  
Shift from manufacturing to the service sector
  - Servitization**  
Increase in the share of services within an occupation
  - Skill-biased change**  
Higher demand for skilled workers

Note: The grey areas in the pie charts represent time trends and remaining, non-identifiable effects.  
Source: Establishment History Panel (BHP) of the IAB; own calculations.

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## FROM THE AUTHOR

"Employment trends are affected by various developments, some of which overlap and some of which offset each other. For labor market policy, this means that labor market dynamics must be considered comprehensively and across various dimensions."

— Thilo Kroeger —

## MEDIA



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# Germany's Labor Market: Increasingly Service-Oriented and Highly Skilled

By Thilo Kroeger

## ABSTRACT

The German labor market has undergone profound changes over the last decades. For a long time, the debate on structural change focused on the shift from manufacturing industries to services. This Weekly Report highlights that labor market changes are attributable to three developments: In addition to structural change, i.e., sectoral shifts, key drivers are an occupational shift toward service-related activities (known as servitization) and the increasing demand for higher-skilled workers (known as skill-biased change). Based on administrative data for the years 1975 to 2017, it can be shown that only about two-thirds of the decline in employment in the manufacturing sector can be attributed to traditional structural change. A significant proportion is attributable to servitization and skill-biased change. Further, to capture labor market changes, a sectoral analysis alone is not enough. Concrete job profiles and skills, especially analytical and interactive abilities, are crucial. Labor market and continuing education policies should therefore have a greater orientation towards job profiles and regional conditions to accompany the transformation in a socially acceptable manner.

The German labor market has undergone profound changes in recent decades. Various trends overlap, making it difficult to clearly analyze the challenges facing labor market and economic policy. Not only is employment shifting between sectors, but the demand for occupations is also changing: services are increasingly important across economic sectors, and also the need for higher-skilled workers is growing. These developments do not occur in isolation; rather they are interlinked—with consequences for labor market policy, qualification strategies, and regional development.

Thus, consideration must be given to these individually and jointly. Based on long-term employment data, this study breaks down how structural change, the shift toward service activities, and qualification-related change have shaped employment trends from 1975 to 2017,<sup>1</sup> highlighting key aspects of the changes.

This Weekly Report presents these findings and serves as a basis for a differentiated labor market and structural policy, to proactively shape the transition, rather than reacting to it or overestimating it.<sup>2</sup>

## Three trends are shaping labor market development

An analysis of German labor market developments identifies three central, overlapping trends: sectoral structural change, a shift toward service activities—servitization—, and the shift in qualification requirements, i.e., skill-biased change (Box 1). Although these developments occur in parallel, they differ in intensity and dynamics (Figure 1).

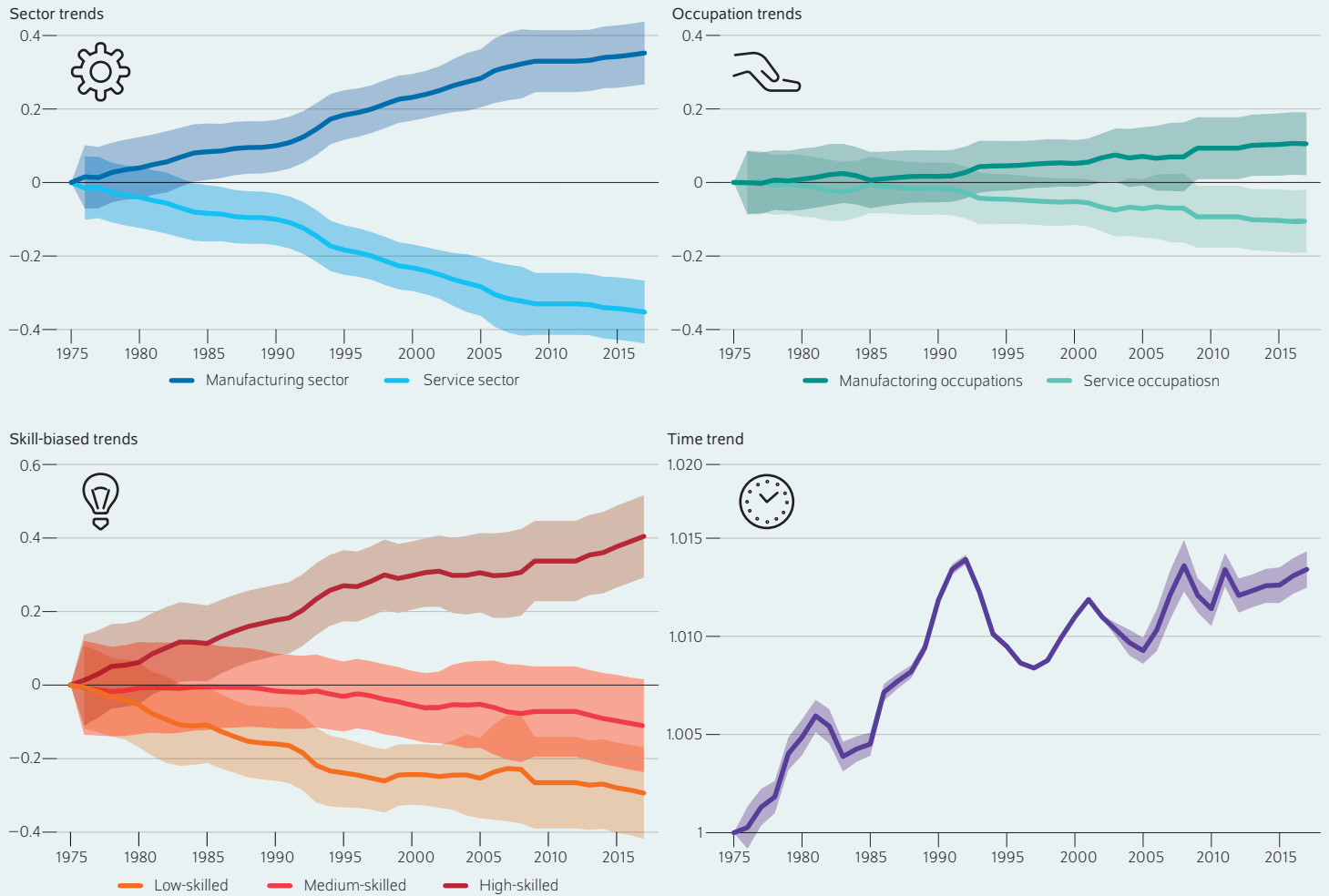
<sup>1</sup> This Weekly Report is based on Dominik Boddin and Thilo Kroeger (2025): Disentangling structural change, servitization, and skill-biased change. *Labour Economics*, 97 (available online; accessed on September 30, 2025). This applies to all online sources in this report, unless otherwise noted).

<sup>2</sup> See German Council of Economic Experts (2025): Spring Report 2025. Wiesbaden; Thilo Kroeger, Claudia Schaffranka, and Monika Schnitzer (2025a): Strukturwandel in den Regionen: Was sich ändert und wie die Politik reagieren sollte. *Wirtschaftsdienst*, 105(8); Thilo Kroeger, Claudia Schaffranka, and Monika Schnitzer (2025b): Structural change in Germany: Challenges for growth and productivity. *Intereconomics*, 60(5).

Figure 1

**Employment trends**

Deviation from overall employment development (1975 = 0) or indexed development (1975 = 1)



Note: Western Germany, 1975–2017. Positive values indicate that employment in the respective group increased more than the average, while negative values indicate below-average developments. The time trend chart is indexed to 1 in 1975 to make changes over time comparable. Shaded areas represent the 95 percent confidence interval, meaning that in 95 percent of cases the actual value lies within this range.

Source: Establishment History Panel (BHP) of the IAB; own calculations.

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Changes by sector, occupation, and qualification are almost linear, but differ in speed and magnitude.

**Structural change: Industry is contracting as services expand**

The traditional structural change, understood as a shift in employment from manufacturing to service industries, is clearly evident: manufacturing is regularly losing jobs, while the service sector is growing (Figure 1). Although this trend is visible throughout the entire observation period, it has been flattening since the early 2000s. This suggests that sectoral change had reached an advanced stage in which momentum had slowed.

**Service occupations are gaining significance across all sectors**

Another trend is evident at the occupational level (Figure 1): service occupations are steadily gaining significance across all sectors, while traditional skilled trades and industrial occupations are losing relevance. This process reflects increasing demand for jobs with a high service component—such as in customer service, sales, or IT—which is also growing in companies of the manufacturing sector.<sup>3</sup> Unlike structural change, this trend is not slowing down, but is developing almost linearly over the entire period.

<sup>3</sup> Dominik Boddin and Thilo Kroeger (2022): Servitization, Inequality, and Wages. *Labour Economics*, 77 (available online).

## Box 1

**The data and our method**

First, a decomposition analysis is used to differentiate three key trends: structural change (relocation between economic sectors), servitization (relocation between occupational activities), and skill-biased change (shifts at qualification level). The analysis is based on individual and establishment administrative data from the Institute for Employment Research (IAB) covering 1975 through 2017 for Western Germany, but can also be applied to Germany as a whole.<sup>1</sup>

The data allows the classification of employees into sectors (manufacturing industries and services; the primary sector is not considered here), occupation types (service-related and production-related), and qualifications (low, medium, high).

The contributions of structural change, servitization, and skill-biased change are identified using a log-linearized regression decomposition. The dependent variable is the number of employees  $N_{ijst}$  in a specific combination of occupation  $i$ , skill  $s$ , sector  $j$ , and year  $t$ . The regression equation is as follows:

<sup>1</sup> Two datasets are used: the Establishment History Panel (BHP)—a business dataset with information on employee numbers by occupation, qualification, and industry at the level of establishments (50 percent sample)—and the Sample of Integrated Labour Market Biographies (SIAB)—a panel of individuals with longitudinal information on employment histories, occupations, and educational qualifications (2 percent sample of total employment with social security reports). See Manfred Antoni et al. (2019): Sample of integrated labour market biographies (SIAB) 1975–2017. FDZ-Datenreport 02. and Andreas Ganzer et al. (2018): Betriebs-Historik-Panel (BHP) – Version 7517 v1. DOI: 0.5164/IAB.SIAB7517.de.en.v1 and 10.5164/IAB.BHP7517.de.en.v1

$$\log N_{ijst} = \alpha_{isj} + \beta_{it} + \zeta_{st} + \gamma_{jt} + \delta_t + \varepsilon_{ijst}$$

The components are:

- $\alpha_{isj}$ : Fixed effects for the initial distribution (base year 1975) by occupation, qualification, and sector.
- $\beta_{it}$ : Time-varying fixed effects at occupation level → measures servitization.
- $\zeta_{st}$ : Time-varying fixed effects at qualification level → measures skill-biased change.
- $\gamma_{jt}$ : Time-varying fixed effects at the sector level → measures structural change.
- $\delta_t$ : Time trend (macroeconomic effects, e.g., business cycle, growth in labor market participation).
- $\varepsilon_{ijst}$ : Residual variance, e.g., interaction effects.

In order to identify trends relative to macroeconomic employment trends, further restrictions on the fixed effects are necessary. They are normalized to zero in the base year, and the sum across all groups within a time-varying fixed effect is also normalized to zero per year ( $\sum_i \beta_{it} = 0 \forall t$ ,  $\sum_s \zeta_{st} = 0 \forall t$ ,  $\sum_j \gamma_{jt} = 0 \forall t$ ). This allows hypothetical employment levels to be calculated in which individual trends are eliminated or considered in isolation (e.g., structural change only). This methodology allows the observed employment developments to be clearly attributed to the three central trends.

**Skill-biased change: Requirements are rising noticeably**

The increase in the share of highly skilled workers is particularly obvious (Figure 1). While this skill-biased change began in the 1980s, it has accelerated since the turn of the millennium. At the same time, the share of low-skilled workers has been declining; the share of medium-skilled workers has remained stable for a long time but has also been declining since the mid-1990s. The upward trend among highly skilled workers appeared starting in 2013. This development supports the thesis of technology-driven structural change, which is replacing simple and standardized tasks with more complex, knowledge-intensive tasks or outsourcing them.

The general time trend shows steady growth in total employment, driven by rising labor force participation rates—for example, due to higher female employment—and economic growth (Figure 1). Short-term slumps, such as those caused by the dot-com crisis in 2000 or the financial crisis in 2009, are also visible.

**Trends affect respective employee groups differently**

The three identified trends develop simultaneously, but differ regarding their momentum and social impact. They can reinforce or dampen each other for individual employee

groups, thereby promoting or slowing employment growth depending on the constellation.

To better understand the respective significance of these developments, the relative contributions of the three trends can be quantified based on the decomposition. This makes the respective effects on the labor market visible. The following section presents the extent to which structural change, increasing servitization, and skill-biased change have influenced the employment dynamics of individual groups in recent decades.

**Structural change is not the only factor explaining job losses in the manufacturing industries**

Employment in the manufacturing industries fell by around 26 percent between 1975 and 2017. The main cause is structural change, accounting for 30 percentage points of the decline. However, almost a third of the losses can be attributed to servitization and skill-biased change, together accounting for around –17 percentage points. The positive general trend over time, which reflects the growing economy, can only partially offset this decline with a contribution of around 21 percentage points. Thus, a significant portion of the decline in manufacturing employment is the result of changing occupation and qualification requirements within the industry and not exclusively due to sectoral shifts (Figure 2).

In the service sector, employment rose by 70 percent over the same period. The main driver was structural change (44 percentage points), followed by the general employment trend (+24 percentage points). Servitization contributed 8 percentage points, while skill-biased change had a slightly dampening effect (-6 percentage points). The latter can be explained by the high share of low- to medium-skilled jobs in many service industries.

### Service occupations are growing as industrial occupations shrink

This increasing role for service activities is particularly evident at the occupational level. Employment in production-related occupations is declining by 11 percent, with servitization and structural change making roughly equal negative contributions. The only countervailing factor is the general time trend. The number of service occupations, on the other hand, is growing by over 56 percent, with structural change and servitization jointly accounting for around 40 percentage points of the growth.

### Highly skilled workers benefit, low-skilled workers lose out

The skill-biased change has a particularly strong impact on highly qualified workers: their figure increases by 128 percent, more than half of which is due to the transition in qualification requirements (+57 percentage points). Low-skilled workers, on the other hand, lose five percent, which is entirely attributable to skill-biased change. Although structural change and the general time trend have opposite effects, they cannot completely offset the decline.

The picture for medium-skilled workers is mixed: although this group recorded an increase of 29 percent, the qualification-related transition reduced this by about ten percentage points. However, structural change and the general time trend more than offset this effect.

The changes observed in the labor market are the result of an interplay between structural change, servitization, and skill-biased change. No trend acts in isolation, and no employment group is affected by a single trend alone. The dynamics show that a unilateral focus on individual trends does not do justice to the complexity of the labor market.

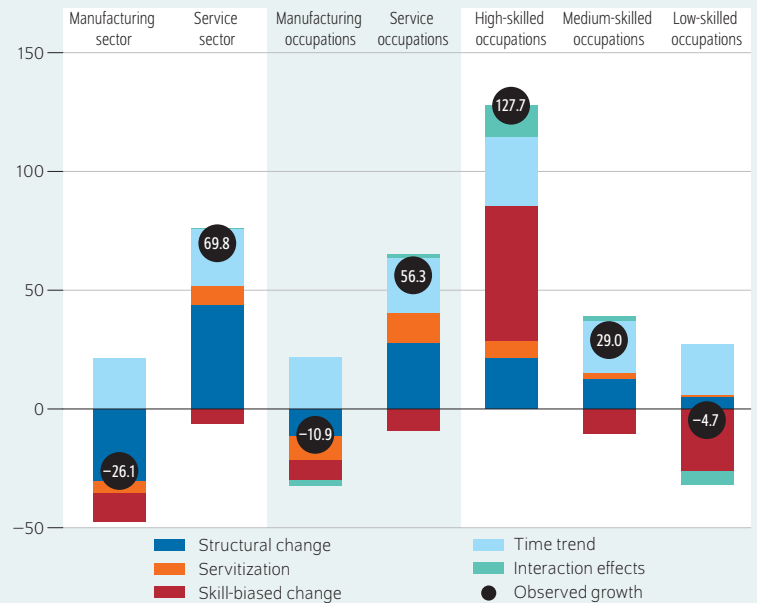
### Sectoral differentiation: Knowledge-intensive industries are growing

The distinction between manufacturing industries and the service sector allows us to understand structural change in general terms, but it cannot reflect the heterogeneity within the sectors. A more detailed analysis based on knowledge and technology intensity reveals a more nuanced picture.<sup>4</sup>

<sup>4</sup> The classification of economic sectors is based on Andreas Beerli et al. (2021): The abolition of immigration restrictions and the performance of firms and workers: Evidence from Switzerland. *American Economic Review*, 111(3), 976–1012.

Figure 2

### Contributions of different trends to employment growth In percentage points



Note: Western Germany, 1975–2017. Contributions are given in percentage points and sum to the observed total growth.

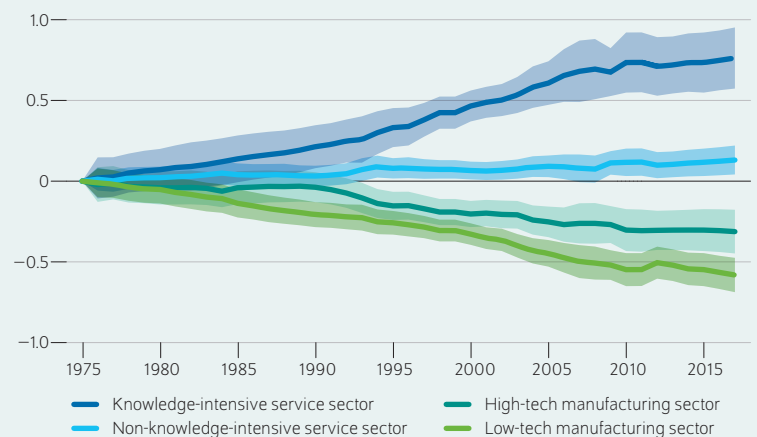
Source: Establishment History Panel (BHP) of the IAB; own calculations.

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The decline in industrial employment is strongly linked to changing occupational and qualification requirements.

Figure 3

### Employment trends by knowledge and technology intensity Deviation from overall employment development (1975 = 0)



Note: Western Germany, 1975–2017. Positive values indicate above-average employment growth compared to the overall economy, while negative values indicate below-average developments. Shaded areas represent the 95 percent confidence interval, meaning that in 95 percent of cases the actual value lies within this range.

Source: Establishment History Panel (BHP) of the IAB; own calculations.

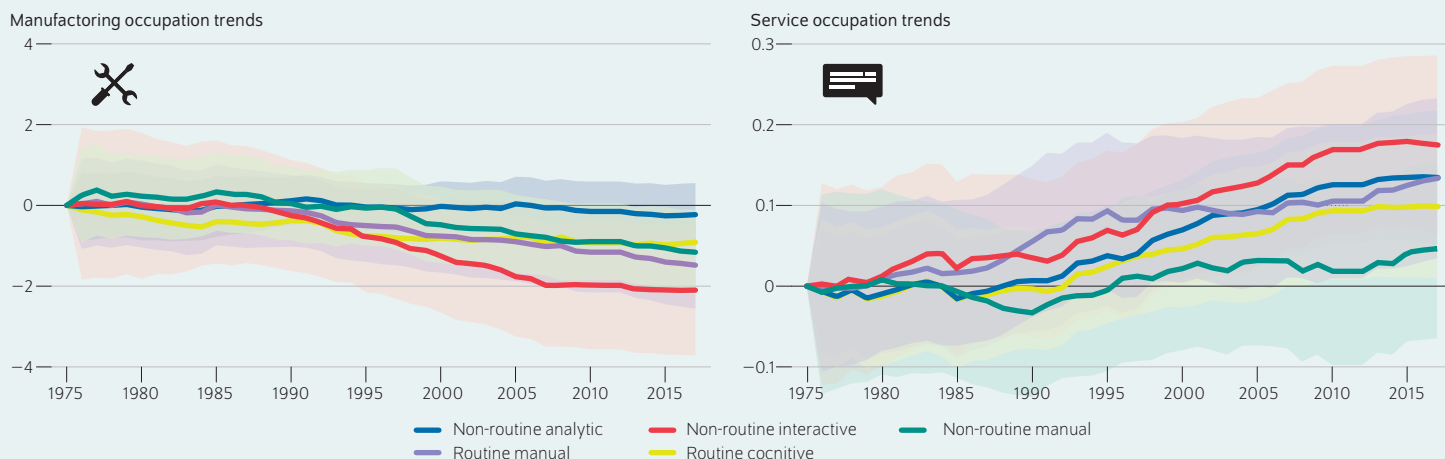
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In manufacturing, employment in high-tech sectors remained largely stable, while it declined significantly in low-tech sectors.

Figure 4

**Shifts in occupational task profiles**

Deviation from overall employment development (1975 = 0)



Note: Western Germany, 1975–2017. Shaded areas represent the 95 percent confidence interval, meaning that in 95 percent of cases the actual value lies within this range.

Source: Sample of Integrated Labour Market Biographies (SIAB); own calculations.

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Analytical and interactive tasks have increased within occupations, while routine tasks have lost importance.

In the manufacturing sector, high-tech industries kept their employment levels relatively stable, while low-tech industries recorded significant losses (Figure 3). This negative trend began in the 1980s and has intensified since the 2000s.

In the service sector, knowledge-intensive industries, such as IT and management consulting, grew significantly faster than non-knowledge-intensive services such as retail, which remained virtually constant. This divergence increased from the mid-1990s and continued until around the financial crisis of 2009.

The outcomes suggest that the stronger growth of technology- and knowledge-intensive industries is driving a transition toward higher skill and task requirements. Despite the expanded analysis, the remaining trends discussed above remain effective and are also evident within these sector groups.<sup>5</sup>

The decline in employment mainly affects industries with low technology or knowledge content, which are often characterized by standardized processes and high international competition. In contrast, complex, knowledge-based services are growing particularly dynamically. Skill-biased shifts and sectoral change run in parallel, reinforcing each other, as the following section shows in more detail.

### Transition in work: It is no longer the occupation that matters, but the task

A more detailed analysis of the activities within occupational groups reveals a deeper pattern of labor market development: it is not only the demand for occupation groups that is changing, but also the demand for the tasks within these groups.

If we expand the dimensionality of the analysis to include the task profiles of occupations, additional patterns emerge (Box 2).

Non-routine tasks of an analytical or interactive nature are increasingly important (Figure 4). They are increasing both in absolute employment numbers and as a share within individual occupations. Analytical activities have increased particularly strongly, reflecting the growing need for problem-solving skills, independence, and digital competence.

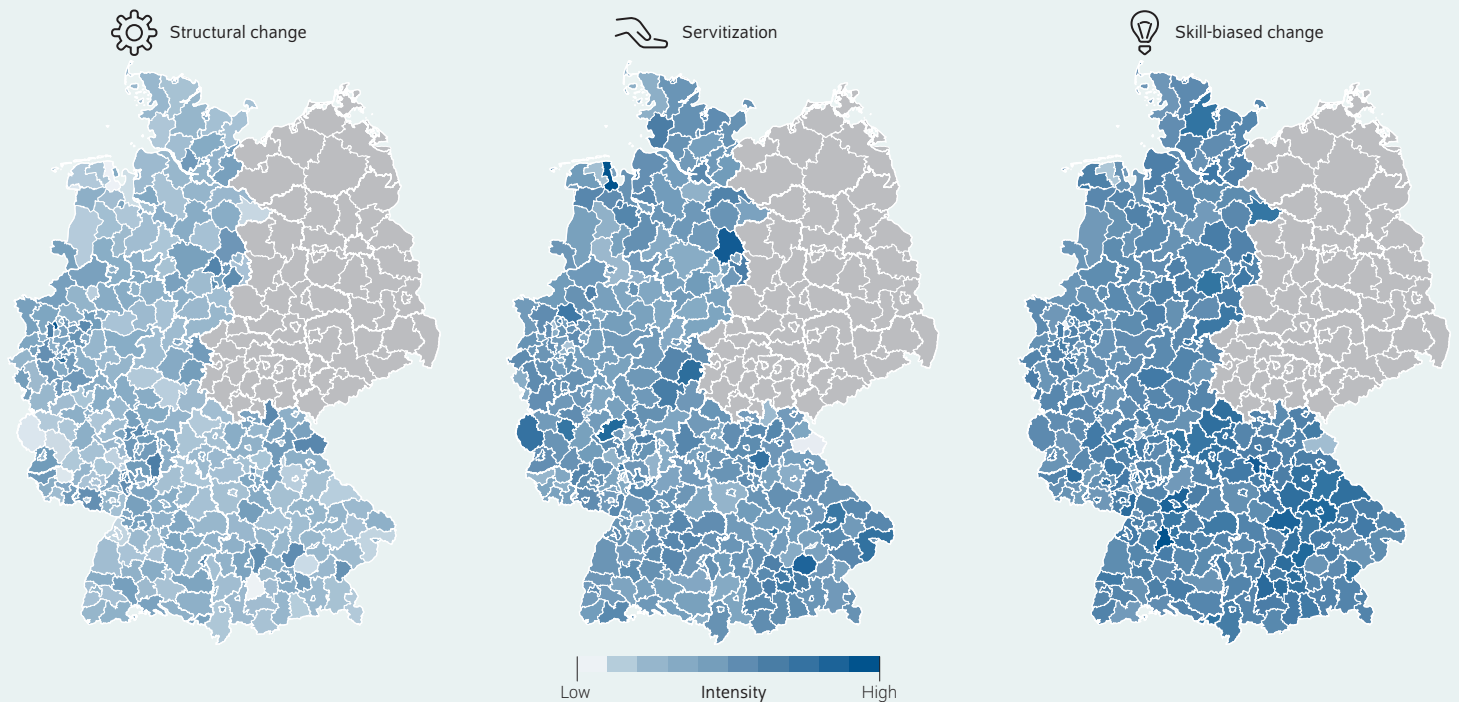
In contrast, routine tasks—whether cognitive or manual—are losing significance in relative terms. These activities are particularly affected by automation and standardization, for example through digitalization, the use of software, or robot-assisted manufacturing. Technological advances in the service sector have also led to a decline in such tasks.

Non-routine manual activities, such as in nursing or skilled trades, remain stable or develop slightly positively, in contrast, as they are difficult to automate. This makes it clear that it is not only the job title but also the task structure that is increasingly crucial for employees' development

<sup>5</sup> See Boddin and Kroeger (2025), *ibid.*

Figure 5

## Regional intensity of key labor market trends



Note: Shown are the rescaled coefficients indicating the intensity of these trends across 324 counties in western Germany, 1975–2017. The colors are comparable within each map but not across maps—identical colors do not automatically indicate the same intensity across different trends.

Source: Establishment History Panel (BHP) of the IAB; own calculations.

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Servitization is evident across all of Germany, particularly in parts of northern Germany and Bavaria—even outside major service hubs.

opportunities, their exposure to transformation, and their labor market policy valuation.

### Regional differentiation: Three trends, many regional realities

Labor market dynamics do not develop uniformly across all of Germany. Structural change, servitization, and skill-biased change affect regions to varying degrees. An analysis of western German districts between 1975 and 2017 shows which regions are particularly affected by which trends and offers starting points for differentiated, location-specific policy-making.<sup>6</sup>

Structural change is hitting traditional industrial regions—such as the Ruhr, parts of Saarland, and northern Hesse—particularly hard (Figure 5). Here, manufacturing employment has contracted sharply, while the service sector has grown. In contrast, for some regions, such as around Stuttgart or

in Upper Bavaria, this structural change is less pronounced or is overshadowed by growth stimuli in high technology.

The trend toward service provision is evident across the board, but varies in intensity. It is particularly pronounced in parts of northern Germany and in large parts of Bavaria. Here, service-related activities are increasing even beyond traditional service centers. The labor market in these regions is changing not only in terms of sectors, but also in terms of occupational profiles.

Although skill-biased change is widespread, it varies from region to region. Regions with a strong academic infrastructure, such as Munich, Erlangen, and Heidelberg, as well as centers of knowledge-intensive manufacturing or services, such as Frankfurt and Stuttgart, are experiencing particularly strong growth in high-skilled employment. However, some rural areas with a growing high-tech industry, such as East Württemberg and Southeast Bavaria, are also showing above-average development.

At the same time, there are regions, especially those with a historically high share of low-skilled workers or a high share of non-knowledge intensive services, where the impact of the qualification-related transition is only minor.

<sup>6</sup> The observation period from 1975 to 2017 explains the restriction to western German districts. See German Council of Economic Experts (2025), *ibid.*; Kroeger, Schaffranka and Schnitzer (2025a), *ibid.*; Robert Grundke and Enes Sunel (2025): In Zeiten des Strukturwandels Regionen in Deutschland besser fördern. *Wirtschaftsdienst*, 105(6), 399–433; Jens Südekum and Daniel Posch (2024): Regionale Disparitäten in der Transformation: Braucht es ein Update der deutschen Regionalpolitik? *Wirtschaftsdienst*, 104(7), 457–461.

## Box 2

**Data basis: Linking occupation and task classifications**

For this part of the analysis, we use a link between the SIAB dataset and task data from the German BERUFENET database. Information at the level of 3-digit classification of occupations for the years 2011 to 2013 is used.<sup>1</sup> These are based on expert assessments of the skills and abilities typically required for various occupations. This enables a systematic classification of occupations to five standardized task profiles, as frequently used in economic research.<sup>2</sup> Cognitive routine tasks include rule-based mental ac-

tivities such as data entry, which can be easily digitized. Manual routine tasks refer to standardized physical work, such as assembly line work, which can often be automated. In contrast, cognitive non-routine tasks require complex thinking and judgment, such as in research or design. Manual non-routine tasks require physical dexterity and situational adaptation, as needed in nursing or skilled trades, for example. Finally, there are interactive tasks that focus on social skills, communication, and empathy, such as in consulting, teaching, or leadership.

<sup>1</sup> The task profiles for each occupation were determined by Katharina Dengler, Britta Matthes, and Wiebke Paulus (2014): Occupational tasks in the German labour market. FDZ-Methodenreport, 12, 1–36.

<sup>2</sup> E.g. David H. Autor, Frank Levy, and Richard J. Murnane (2003): The skill content of recent technological change: An empirical exploration. *Quarterly Journal of Economics*, 118(4), 1279–1333; Alexandra Spitz-Oener (2006): Technical change, job tasks, and rising educational demands: Looking outside the wage structure. *Journal of Labor Economics*, 24(2), 235–270.

Based on this classification, the proportion of activities within occupations is assigned at the individual level and then aggregated. This makes it possible to determine how many full-time equivalents are effectively working in which task profile, while furthermore continuing to differentiate between service and production occupations.

**Conclusion: Policy must consider evolving job profiles**

The changes in the labor market cannot be explained in a one-dimensional way. Neither sectoral shifts nor occupational or skill-related developments alone explain the momentum of the employment structure. Rather, there is a complex interplay of structural change, servitization, and skill-biased change.

No group of employees is affected exclusively by a single trend. Rather, specific patterns emerge from the overlap of all three forces. For example, job security for medium-skilled workers in industrial occupations may decline due to the decline of the manufacturing sector, the reduced importance of routine manual tasks, and increased qualification requirements.

Thus, labor market policy should take a comprehensive view of employment dynamics. In addition to the economic sector to which they belong, job content, qualification levels, and regional conditions must also be taken into account.<sup>7</sup>

In particular, the findings on changes in occupational task content make it clear that transformation is increasingly taking place within occupational groups. An occupational title today can have completely different requirements than it did 20 years ago. Continuing education policy should address the underlying job profiles and not solely the classification of occupations. Counseling systems and digital labor market platforms should place greater emphasis on job characteristics than on industry affiliation. Non-routine, analytical, and interactive skills are in particular demand, such as

digital problem-solving, communication skills, and the ability to work independently.<sup>8</sup> A more in-depth, accompanying analysis of current developments, such as the current resurgence of job cuts in the manufacturing industries and the increased use of AI, is indispensable. Highly complex activities and service occupations are most susceptible to AI substitutability. However, it is currently uncertain whether this will have a negative effect on future labor demand. In fact, productivity effects could increase demand for such activities and occupations.<sup>9</sup>

Sectoral blanket statements—such as those on the industrial crisis or the service boom—are also proving to be insufficient. A differentiated industrial and structural policy strategy is needed that takes into account the different dynamics within the sectors.

Furthermore, regional analysis shows that structural change is not standardized. It develops differently from place to place. Regions with similar employment trends can be affected to varying degrees in structural terms. Regional labor market policy must be able to respond to local patterns, whether through training initiatives, transformation support, or the targeted expansion of educational infrastructure.

The increasing polarization of the labor market also requires social policy support. Employees with medium-level qualifications are at risk of coming under pressure from digitalization, automation, and skill shifts. This makes incentives for continuing education, mobility, and educational advancement all the more important, for example through individual continuing education accounts, qualification bonuses for establishments, or mobility support in structurally weak regions.

<sup>7</sup> See also Kroeger, Schaffranka, and Schnitzer (2025a), *ibid.* as well as Thilo Kroeger, Benedikt Runschke, and Lenard Simon (2025): Arbeitsmarkt im Wandel: Polarisierung, Fachkräftengpässe und Labour Hoarding. *Wirtschaftsdienst*, 105(10).

<sup>8</sup> See also Maria Guadalupe et al. (2022): Building on Human Capital to Restore Productivity Growth. *Les notes du conseil d'analyse économique*, 75(6), 1–12.

<sup>9</sup> See Kroeger, Runschke, and Simon (2025), *ibid.*

## LABOR MARKET

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