

## »» Weak productivity: different causes require different therapies

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Germany's labour productivity growth has weakened noticeably. The average annual growth rate has been a mere 1% since 2005 – compared with 2% between 1991 and 2004. A breakdown of overall economic productivity illustrates that the shift over time in the structure of employment towards industries with below-average productivity and even declining productivity levels has contributed significantly to this decline. Intra-sectoral productivity boosts have also been much weaker since 2005 – both in manufacturing and services. Both sectors have since recorded a notable concentration in only a few highly productive subsectors. Within the manufacturing sector, the activities with the strongest productivity boosts are the automobile industry and the manufacture of data processing devices, electronics and optical products, while the service industries with the highest productivity gains are information and communication, as well as real estate. The subdued productivity growth in some manufacturing activities is partly due to the weak investment activity of past years. Productivity growth in the service sector has been dampened by the low and sometimes even negative growth contributions of technological progress; this applies in particular to the important business service sector. The diverse, complex causes indicate that important sector-specific measures need to be taken in order to get productivity growth back on track. This is crucial for Germany's future because productivity growth – along with investment – is the key driver of economic prosperity, especially in an ageing society.

### Productivity growth has lost momentum

Increases in productivity are one of the most important foundations of economic growth and prosperity. The weakness in productivity that has persisted for some time has therefore been in the focus of politics, the media and science for good reason. The annual growth rate of labour productivity, measured by price-adjusted gross value added per hour worked, has dropped from an average 2% during the period of 1992 to 2004 to 1% between 2005 and 2016 (Figure 1).

This noticeable decline in the growth rate is not only due to the weak performance in the crisis year 2009, when productivity dropped by some 3%. Several years followed (2012–2015), during which the labour productivity growth rate was below 1%. It was not until the year 2016 that labour productivity rose above the 1 per cent mark again to reach 1.3%.

**Figure 1: Labour productivity in Germany**

Price-adjusted gross value added per hour worked



Source: KfW Research, Destatis

### Presumed causes: Structural change ...

The decline in productivity growth can be observed in many countries, not just in Germany and not just since the financial crisis. The debate over the underlying causes often mentions shifts in the sectoral structure.<sup>1</sup> As the focus of demand shifts to services, a trend that is typical of advanced economies, that sector's share of employment and value added grows. And because many service industries have structurally lower productivity growth rates, this reduces aggregate labour productivity growth.<sup>2</sup>

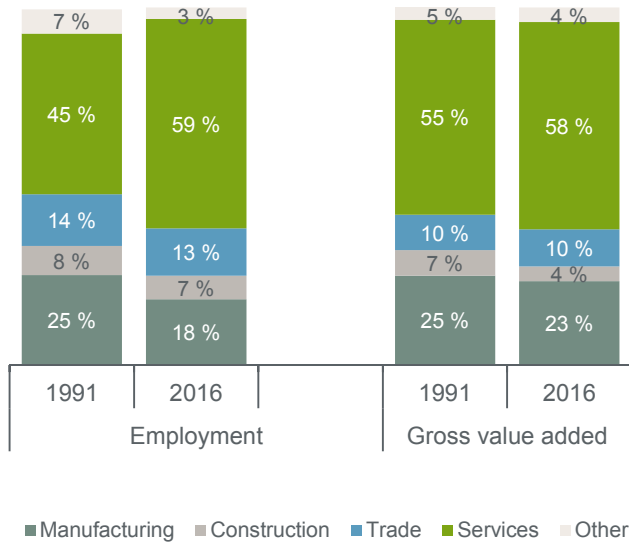
Shifts in sector structure are discernible in Germany as well. Thus, the share of employment in manufacturing as measured by annual hours worked decreased from 25 to 18% between 1991 and 2016 (Figure 2, left). During the same period, the share of employment in services thus defined rose by 14 percentage points – from 45 to 59%.

Within the service sector, business services account for the lion's share of the growth in the number of workers between 1991 and 2016, at around 3.6 million persons. However, the economic sector 'public service providers, education, health, social services' also contributed a significant 2.6 million persons to the total growth of 8.3 million workers in service industries.

Although the service sector has become significantly more important for employment, its share in gross value added has only changed a little. That share has grown by a modest rate of 3 percentage points (Figure 2, right). Thus, the

complementary gross value added share of manufacturing dropped only slightly (23% in 2016 compared with 25% in 1991).

**Figure 2: Services are gaining importance**



Note: Share of employment measured on the basis of annual hours worked.

Sources: KfW Research, Destatis

**... or intra-sectoral factors?**

The high employment growth in the service sector is believed to be a major cause for declining labour productivity growth in Germany. It is also a consequence of the Hartz reforms implemented in the mid-2000s. They were designed to reintegrate long-term unemployed and persons with basic qualifications into the labour market. The integration of (initially) less productive persons into the labour market – especially in the service sector – dampens intra-sectoral productivity growth, at least temporarily.<sup>3</sup> In turn, a decline in productivity growth rates in individual sectors has a negative impact on aggregate productivity growth, ceteris paribus.

**A systematic disaggregated analysis is required**

Behind these considerations lies the following question: How much have structural shifts on the one hand and intra-sectoral productivity gains or losses on the other hand effectively contributed to weakening aggregate productivity growth in Germany? In order to provide a systematic answer, we will analytically decompose aggregate labour productivity growth into three components:<sup>4</sup>

- The **intra-sectoral effect**, which reflects the growth contribution that is based exclusively on intra-sectoral productivity growth.
- The **structural effect**, which measures the contribution to productivity growth resulting from a shift in the employment structure. The effect is positive when sectors with above-average productivity record stronger employment growth than sectors with below-average productivity.

- The **interaction effect** which reflects the growth contribution of a structural shift towards (or away from) sectors with positive (or negative) productivity growth. It is positive when economic sectors with positive productivity growth grow more strongly in terms of employment.

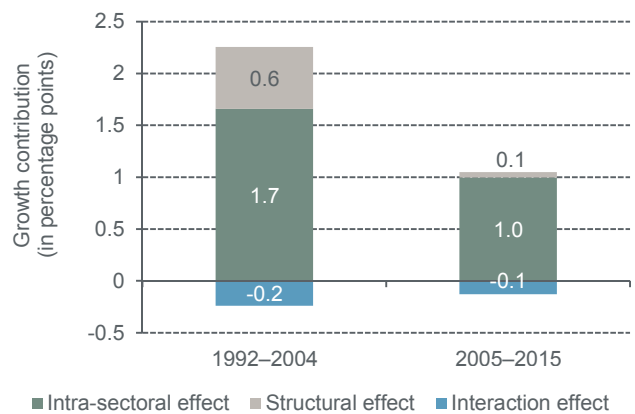
**Intra-sectoral productivity growth is the main driver**

The decomposition clearly shows that overall economic labour productivity growth is driven primarily by productivity gains achieved within the sectors themselves (Figure 3). Growth contributions resulting from structural changes in the sectoral pattern are weaker by comparison but nevertheless noticeable.

The growth boost provided by intra-sectoral productivity gains has weakened significantly since 2005 and fallen from 1.7 to 1.0 percentage points. The weakening of the intra-sectoral effect thus accounts for more than 60% of the 1.1 percentage point decline in aggregate labour productivity growth between 2005 and 2015 compared with the period from 1992 to 2004.

**Figure 3: Intra-sectoral effect predominates**

Decomposition of labour productivity by effect



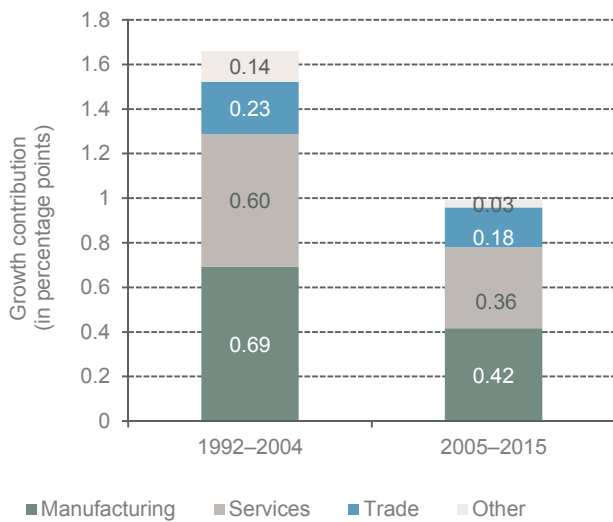
Source: Destatis, own calculations

The previously positive contribution of the structural effect has dissipated since 2005. Between 1992 and 2004, the shift of employment towards relatively more productive sectors raised productivity growth by 0.6 percentage points. Since then, however, employment has increasingly migrated to areas with below-average productivity. The contribution of the structural effect has therefore dropped to almost zero.

The interaction effect was negative in both periods. In other words, employment has increasingly expanded (contracted) in sectors with negative (positive) productivity growth rates since the 1990s. This has dampened aggregate labour productivity growth by 0.2 percentage points between 1992 and 2004 and by 0.1 percentage points between 2005 and 2015.

**Figure 4: Intra-sectoral growth contributions are decreasing**

Intra-sectoral effect by economic sector



Source: Destatis, own calculations

**Intra-sectoral effect: decreases almost everywhere**

The decomposition of the intra-sectoral effect into the contributions of individual sectors shows that productivity boosts are primarily generated by the manufacturing sector (Figure 4). Between 1992 and 2004, the growth contribution of manufacturing was 0.69 percentage points. That means: Although manufacturing contributed less than one quarter to gross value added, it provided some 40 % of the intra-sectoral productivity effect. This underscores the great importance of manufacturing for aggregate economic productivity growth. After 2005, however, that effect dropped to 0.42 percentage points – which is still around 40 % of the total intra-sectoral effect as the other economic sectors have weakened as well.

The intra-sectoral growth contribution of the service sector is noticeably lower – especially in comparison with its gross value added share. Between 1992 and 2004 it was 0.60 percentage points. Since 2005 it has dropped to 0.36 percentage points. Until 2004, productivity gains in trade contributed a total of 0.23 percentage points to productivity growth. Since 2005 that share has dropped to a mere 0.18 percentage points.

During the two periods under review, the construction industry on average did not make any significant contributions to intra-sectoral productivity gains. The growth contribution from intra-sectoral effects of the remaining sectors (among others, agriculture and forestry, fishery, mining, energy and water supply) is also on the decline (1992–2004: 0.14 percentage points 2005–2015: 0.03 percentage points).

Because of the great importance of manufacturing and services for aggregate productivity growth and the remarkably sharp drops in growth contributions, we will take a closer look at the two segments below.

**The bright and dark sides of the service sector**

If we look a level deeper and break the intra-sectoral growth contribution of services down further, we see clear differences in performance. Not every area of the extremely heterogeneous service sector displays productivity weaknesses (Table 1).

The growth contribution of the information and communication industry – which includes publishing and telecommunications, as well as IT and information services – decreased only slightly from 0.20 to 0.18 percentage points. Real estate also provided a similar productivity boost between 2005 and 2015 as between 1992 and 2004 (0.20 vs. 0.16 percentage points). Hospitality and financial and insurance services have succeeded in making their negative contributions positive again since 2005.

**Table 1: Intra-sectoral effect by subsectors of the services sector**

	1992–2004	2005–2015
Transportation and storage	0.16	0.03
Hospitality	-0.03	0.00
Information and communication	0.20	0.18
Financial and insurance services	-0.04	0.05
Real estate	0.20	0.16
Business services	-0.12	-0.15
Public administration, education, health, and social work	0.20	0.09
Other services	0.02	0.00
<b>Total intra-sectoral effect of the service sector</b>	<b>0.60</b>	<b>0.36</b>

Source: Destatis, own calculations

**Table 2: Intra-sectoral effect by subsectors of the manufacturing sector**

	1992–2004	2005–2015
Manufacturers of food and beverages, tobacco processing	-0.01	0.03
Manufacturers of textiles, garments, leather goods and shoes	0.03	0.00
Manufacturers of wood products, paper and printed materials	0.04	0.03
Coking and mineral oil processing	0.01	0.00
Manufacturers of chemical products	0.11	0.01
Manufacturers of pharmaceuticals	0.04	0.01
Manufacturers of rubber, synthetics, glassware, ceramics and similar	0.06	0.02
Metal production and processing, manufacturers of metal products	0.08	0.02
Manufacturers of data processing devices, electronic and optical products	0.12	0.11
Manufacturers of electrical equipment	0.05	0.00
Mechanical engineering	0.07	-0.02
Automotive engineering	0.05	0.19
Manufacturers of furniture and other goods, repair and maintenance of machinery	0.04	0.01
<b>Intra-sectoral effect of manufacturing overall</b>	<b>0.69</b>	<b>0.42</b>

Source: Destatis, own calculations

‘Public administration, education, health, and social work’, for its part, made significantly lower contributions. The sector’s intra-sectoral growth contribution has more than halved from 0.20 to 0.09 percentage points. However, a statistical measuring problem plays a particular role in this area. Often there is no market price for the services provided, so the value added is then frequently measured as input costs (e.g. wages). This might cause productivity in these subsectors to be underestimated, which should not lead to false political conclusions.<sup>5</sup>

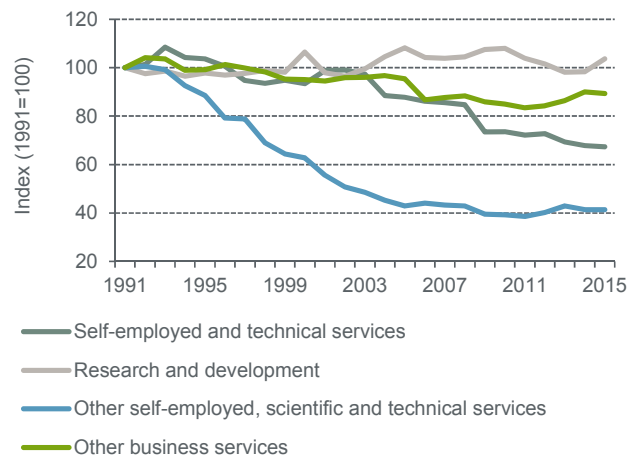
Even more dramatic is the decline in the growth contribution of the subsector ‘transport and storage’. Here, the intra-sectoral effect dropped from 0.16 to a practically negligible 0.03 percentage points.

**A very worrying trend in business services**

The business service sector, which is important for the overall economy, shows alarming signs. Because productivity in this subsector has been falling since the 1990s (Figure 5), the intra-sectoral effect has been consistently negative. The situation has worsened further since 2005 (1992–2004: -0.12 percentage points; 2005–2015: -0.15 percentage points).

The sharpest productivity declines can be seen among ‘Other self-employed, scientific and technical services’. In 2015 their labour productivity was just around 40 % of the level of 1991. Sharp drops can also be observed among ‘Self-employed and technical services’ (such as law firms and tax consultancies, management consulting firms, architects, consulting engineers and similar). Their productivity fell by 33 % between 1991 and 2015.

**Figure 5: Productivity development in business services**



Sources: KfW Research, Destatis

**Manufacturing is now more dependent on automotive engineering**

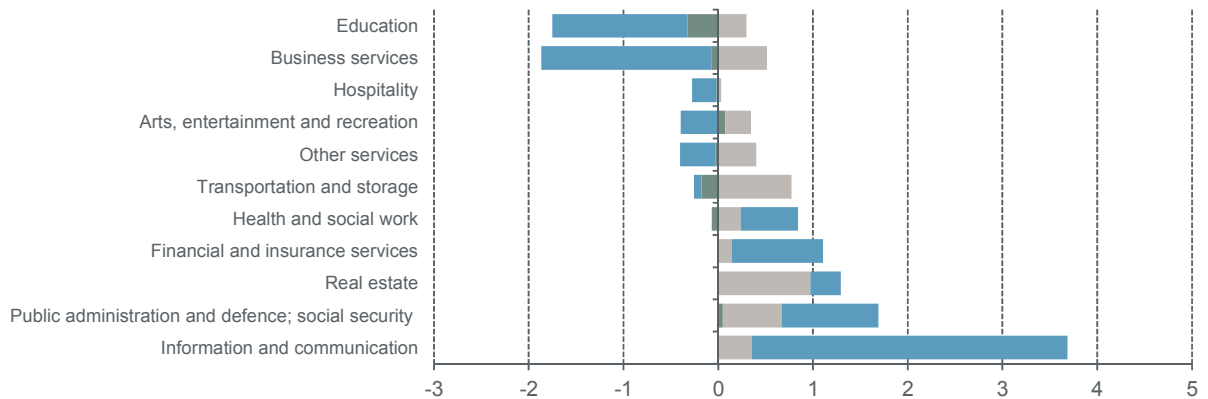
Even though manufacturing is often referred to as the most important driver of productivity, there are nevertheless major differences between its subsectors and a significant decline in growth contributions thanks to intra-sectoral effects in recent years.

Positive productivity boosts were visible across a broad front until 2004 (Table 2). Manufacturers of data processing devices, electronic and optical products contributed the most to productivity growth (+0.12 percentage points), followed by manufacturers of chemical products (0.11 percentage points), metal products (0.08 percentage points) and chemical engineering (0.07 percentage points). Since 2005, however, a decline in growth contributions could be observed in nearly all areas of manufacturing with the exception of the food industry and automotive engineering.

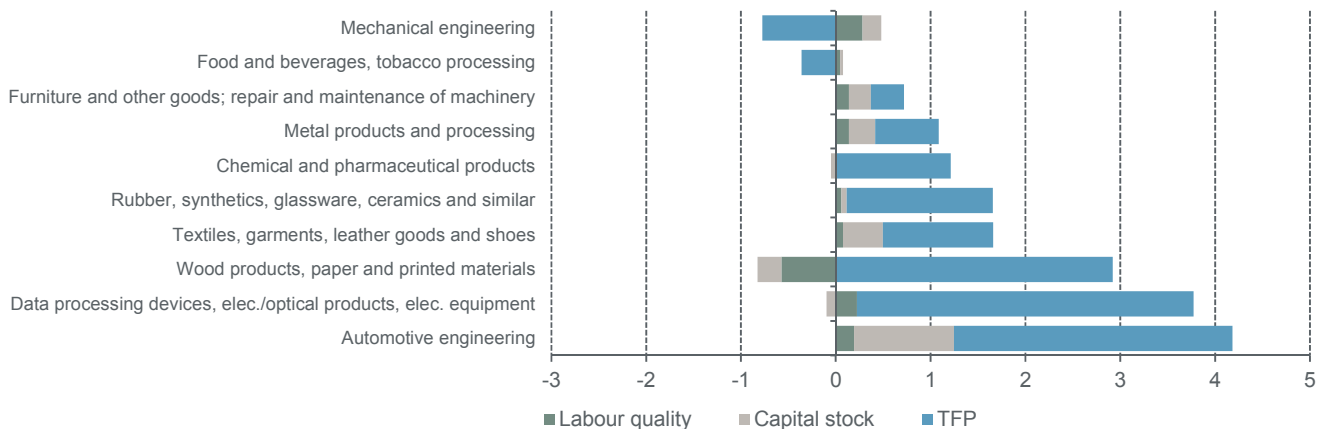
**Figure 6: Productivity weakness has different causes in the services and manufacturing sectors**

Decomposition of labour productivity growth rate by growth contribution (2005–2015)

**Services**



**Manufacturing**



Sources: KfW Research, EU KLEMS

As with services, there is a growing concentration on only a few areas driving productivity. Around half the intra-sectoral effect generated by the manufacturing sector in the current period from 2005 to 2015 came from automotive engineering (0.19 percentage points) and roughly one quarter from manufacturers of data processing devices, electronic and optical products (0.11 percentage points). The contributions of the other subsectors of manufacturing were each a mere 0.03 percentage points or less.

**TFP decline is main cause of weak productivity of services**

The decomposition of productivity growth applied up to this point makes it possible to quantify the contribution of individual economic sectors to the decline in productivity growth but it provides no clues about the underlying causes of performance differences between the sectors. Answers are provided by the growth-accounting method, which ascribes productivity growth to the three drivers ‘capital input’, ‘labour quality’ and ‘total factor productivity’ (TFP).

A glance at the individual areas of the service sector illustrates that the problems here lie not so much in capital input but rather in the generally weak development of total factor productivity (Figure 6, top). Investment in capital stock

made a positive contribution to productivity growth in all areas of the service sector between 2005 and 2015. The quality of labour does not play a very large role, making only slightly positive – sometimes even negative – contributions.

The often very weak productivity growth in the service sector comes to a considerable extent from the TFP. In many parts of the service sector the contribution of TFP to labour productivity growth is low or even acts as a dampener. The negative contribution of TFP is particularly pronounced in business services and in the areas of education and teaching.

However, there are also positive exceptions. Not surprisingly, technical progress and efficiency gains have contributed significantly to productivity growth among ICT service providers. Healthcare and social work, the finance and insurance industry and public administration have all been able to increase their labour productivity through TFP as well.

**Manufacturing: Investment weakness is main reason for low productivity growth**

The situation in the manufacturing sector is different (Figure 6, bottom). With the exception of mechanical engineering and the food industry, the TFP contribution has

been positive in all areas of manufacturing and ranged from just under 0.4 (manufacture of furniture and other goods) to a remarkable 3 percentage points and more (automotive engineering, manufacturer of data processing devices, electronic and optical products). Technical progress is thus the main driver of labour productivity growth in manufacturing.

The contribution of capital input to labour productivity growth, on the other hand, has usually been much lower than in the service sector – a consequence of the long phase of weak investment in manufacturing which became increasingly widespread after the turn of the millennium. Here as well a positive exception is automotive engineering, where investment in capital stock provided a growth contribution of more than one percentage point – a peak value within the manufacturing sector. In a similar way as with services, changes in the quality of labour have only relatively limited effects on productivity growth in manufacturing – at least up to now.

### **Conclusion: a mix of solutions is required**

Our analysis has shown that there is no single cause behind the halving of aggregate labour productivity growth from 2% in the years following German unification from 1991 to 2004 to 1% since 2005 and that consequently a differentiated mix of economic-policy responses is required to get productivity growth back on track. Given the foreseeable decline in the labour force, there is no option but to significantly expand capital stock and raise productivity growth rates again if we want to achieve adequate economic growth rates in the 2020s as well.

Part of the decline in aggregate labour productivity growth is due to shifts in the sectoral structure. As these shifts reflect a

change in consumer preferences – and thus are intended – they do not constitute a suitable starting point for interventions. Rather, the key lies in bringing about increases in overall intra-sectoral productivity growth rates. In the manufacturing sector, this has to start with significant investment increases across the breadth of industries so as to reduce what has turned into high dependence on individual positive exceptions, most notably automotive engineering. The first step has been taken, as corporate investment became much more dynamic in 2017 and is likely to grow significantly this year as well. This positive trend in investment must be consolidated – for example by creating conditions that favour investment – through suitable and adequate financing schemes, particularly for innovative projects and through reforms that strengthen Europe as our most important sales market. A focal area should be the expansion of ICT capital and digitalisation – known as Industry 4.0 in Germany – with complementary training and professional development measures for the workforce. This can be expected to radiate positively on the growth contributions of labour quality and of TFP.

The low and sometimes even negative growth contributions of TFP put the brakes on labour productivity in the service sector. In particular, the economically important area of business services, most notably independent professional and technical services, is characterised by the absence of efficiency increases and lack of technical progress. Innovative products, processes and business ideas must penetrate the market more quickly here.

The heterogeneity of productivity trends across Germany's economic sectors generally requires each area of activity to be examined individually for its particular circumstances. ■

<sup>1</sup> See also e.g. German Council of Economic Experts (2015), annual report 2015/2016, Chapter 7: Productivity.

<sup>2</sup> Baumol, W. J. (1967) 'Macroeconomics of Unbalanced Growth: the Anatomy of Urban Crisis'. In: American Economic Review, Vol. 57, pp. 415–426.

<sup>3</sup> Borger, K. (2016), Weak productivity growth in Germany – is it a problem? Economics in Brief No. 102, KfW Research.

<sup>4</sup> Tang, J. und W. Wang (2004) 'Sources of Aggregate Labour Productivity Growth in Canada and the United States'. In: The Canadian Journal of Economics, Vol. 37(2), pp. 421–444.

<sup>5</sup> In some service industries (such as education and teaching, public administration, financial and insurance services and similar), the measurement of value added must rely on more or less plausible assumptions and is therefore methodologically questionable. In our analysis we assume that the data used reflect the productivity trend with sufficient precision nonetheless. The clarity and breadth in which the slowdown of productivity growth has been documented, including at international level, does not in our view support the hypothesis that it primarily masks measuring problems.