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**Article**

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EconPol Forum

**Provided in Cooperation with:**

Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

*Suggested Citation:* Duernecker, Georg (2024) : Deindustrialization, structural change and the European productivity dilemma: Growth slowdown and the lost decade, EconPol Forum, ISSN 2752-1184, CESifo GmbH, Munich, Vol. 25, Iss. 3, pp. 19-22

This Version is available at:

<https://hdl.handle.net/10419/298819>

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Georg Duernecker

## Deindustrialization, Structural Change and the European Productivity Dilemma\*

### GROWTH SLOWDOWN AND THE LOST DECADE

The slowdown in aggregate productivity growth is currently a major economic challenge for many advanced economies. The European Union (EU) is no exception. While productivity in the EU14 grew rapidly until the mid-1980s, at annual rates well above 2.5 percent, it has slowed significantly in recent decades and has been virtually stagnant in recent years, with no signs of recovery.<sup>1</sup> This pattern is shown by the solid line in Figure 1.<sup>2</sup> As a result of this growth slowdown, the EU is currently on the verge of entering a “lost decade” for productivity.

Low rates of productivity growth are a cause for concern, as sustained productivity improvements are considered a key determinant of economic development and future living standards. As a result, there has been considerable recent interest among policymakers and researchers alike in understanding the roots of Europe’s dismal productivity performance. Some of the most prominent potential explanations that have been put forward in recent research include diminishing returns to R&D and innovation, a decline in business dynamism, a lack of investment in ICT and intangibles, mismeasurement, the slow diffusion of technology and innovation, and regulatory barriers.

Much of the existing work emphasizes the role of the slowdown in traditional engines of growth – such as technological progress and the accumulation of factors of production such as physical, human, and intangible capital. However, a recent strand of the literature emphasizes the importance of changes in the sectoral composition of economies as a key factor behind the observed growth slowdown. This explanation is based on two prominent empirical observations: structural change, and sectoral productivity differences.

Since the work of Kuznets (1966) and later Herrendorf et al. (2014), it is a well-established empirical fact that economies undergo large-scale sectoral reallocations of economic activity as they develop. This process is known as structural change, and it typically results in a secular decline in the relative size of the agricultural and industry sectors and an increase in the services sector.<sup>3</sup> Structural change in the EU14 has led to a significant decline in the rela-

- ### KEY MESSAGES
- **Aggregate productivity growth in the EU14 has slowed significantly in recent decades**
  - **Structural change toward services has contributed significantly to the growth slowdown**
  - **Future growth is projected to decline further due to the rise of sectors with stagnant productivity**
  - **Europe is projected to fall further behind the US in terms of productivity**
  - **R&D tax credits may not cure Europe’s productivity malaise due to negative reallocation effects**

tive size of agriculture and industry over time. The employment shares of these sectors declined from 17 percent to 4 percent and from 38 percent to 22 percent, respectively, between 1970 and 2017. Over the same period, the services sector has expanded massively, increasing its employment share by 30 percentage points from 45 percent in 1970 to 75 percent in 2017. A similar picture emerges when looking at other measures of sectoral economic activity, such as value added or final expenditure. As a result of this evolution, it is fair to say that structural change has led to a pronounced transformation of the structure of European economies, resulting in large-scale deindustrialization and a pronounced expansion of the service economy.

The second important observation concerns the differential productivity performance across sectors. As is well known, both agriculture and industry have traditionally been very dynamic sectors in most advanced economies, characterized by high rates of innovation, capital accumulation, and technological progress, leading to rapid productivity growth in these sectors. In the EU14, agriculture and industry have experienced rapid and sustained productivity growth of 4 percent and 2.5 percent per year, respectively, over the period from 1970 to 2017. In contrast, productivity in services has tended to be sluggish, with growth rates well below those of agriculture and industry. In the EU14, services productivity grew at an annual rate of only 1.2 percent over the period 1970–2017.



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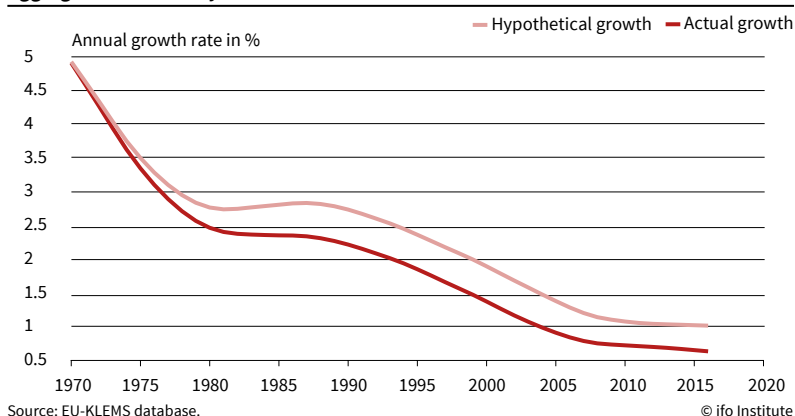
\* This article is based on selected previous work of the author, including Duernecker et al. (2024) and Duernecker and Sanchez-Martinez (2023 and 2024).

<sup>1</sup> In this context, productivity is defined as real value added per hour worked.

<sup>2</sup> The data used in this article come from the EU-KLEMS database.

<sup>3</sup> In low-income countries, the manufacturing sector initially rises with income but then starts to decline for a sufficiently high level of development.

Figure 1  
Aggregate Productivity Growth in the EU14



In some subsectors of services – such as personal services, business services, and education – productivity has stagnated or even declined over the long term.

Taken together, structural change tends to reduce aggregate productivity growth because it leads to a reallocation of economic activity from sectors with high rates of productivity growth – such as agriculture and industry – to the service sector, which is characterized by comparatively low rates of productivity growth. This phenomenon is commonly referred to as cost disease, a term first coined by Baumol (1967). In the EU14, the sectoral reallocation from dynamic to sluggish sectors has led to a significant reduction in aggregate productivity growth over time. The quantitative importance of the cost disease can be illustrated by a simple calculation. In this calculation, a hypothetical series of aggregate labor productivity growth is computed as the weighted sum of sectoral labor productivity growth. Importantly, the weights used in this calculation are held constant at the values of the initial year of observation (here: 1970). By keeping the sectoral weights constant, it is possible to isolate the contribution of structural change to the evolution of aggregate productivity growth. The pink line in Figure 1 shows the resulting series. The difference between the series of hypothetical productivity growth (pink line) and actual productivity growth (red line) represents the contribution of structural change to aggregate productivity growth.

Two important observations emerge from this calculation. First, the pink line is always above the red line throughout the period, implying that structural change has reduced aggregate productivity growth in Europe. The reduction is substantial, amounting to 0.4 percentage points of the annual growth rate. Second, the observed sectoral reallocation toward services has been a major contributor to the growth slowdown in Europe, accounting for almost 20 percent of the reduction in productivity growth between 1970 and 2017. Importantly, the European average masks a high degree of heterogeneity in these results across countries. For some countries, these effects are much

larger; for example, in Germany, the contribution of structural change to the growth slowdown is almost 40 percent.

### WHAT TO EXPECT FOR THE FUTURE?

An important question that arises in this context concerns the future role of structural change in shaping aggregate productivity. Can we expect the growth slowdown to continue in the future and, if so, at what pace? Will it eventually come to a halt or even be reversed? Such questions can be addressed by model-based simulations. These simulations are based on a multi-sector macroeconomic model in which consumers make optimal choices about the consumption of different types of goods, and firms in each sector hire labor from households to produce those goods. In addition, there is technological progress at the sectoral level, which leads to productivity gains. In line with empirical observations, productivity growth is allowed to differ across sectors. Consumers and firms interact in markets where prices adjust to balance supply and demand. In this model economy, structural change is driven by two empirically grounded mechanisms. The first mechanism is based on an income effect induced by the structure of consumer preferences. Preferences imply that some goods are increasingly demanded as income rises (so-called luxury goods), while other goods are less demanded as income rises (necessity goods). As the economy grows, the rise in income induces the consumer to shift consumption expenditures toward luxury goods (typically services) and away from necessity goods (agricultural and manufactured goods).

The second mechanism is governed by a substitution effect. In the model economy, the relative price between two goods is inversely related to the productivity levels of the sectors producing those goods. As a result, uneven growth in sectoral productivity leads to changes in the relative price of goods. For example, if productivity grows faster in agriculture than in services (which is the empirically relevant case), then services become more expensive relative to agricultural goods. In the model, this change in relative prices induces the consumer to adjust the consumption bundle and to spend a larger share of income on services.<sup>4</sup>

The model framework is sufficiently rich to capture some key features in the data, yet simple enough to allow the main mechanisms at work to be studied analytically. Importantly, a calibrated version of the model is able to replicate the historical paths of structural change in employment and value added, as well as the evolution of relative prices and the path of aggregate productivity growth. At the same time, it is

<sup>4</sup> This is because agricultural goods and services are gross complements in preferences (as is the empirically relevant case). If the two goods were gross substitutes, then the consumer would reduce the spending on the more expensive good.

consistent with empirically observed features of consumer demand, such as the direction and magnitude of the income effects described above. The empirical fit of the model economy is reassuring with respect to the applicability of the model for conducting credible simulations.

The calibrated model can be simulated forward in time to predict the future path of structural change and to explore the impact of shifts in sectoral composition on aggregate productivity. These simulations yield a number of results, some of which are expected, others are surprising, yet others are worrying. We start with the expected. Empirically, services are now the dominant sector in most EU countries, accounting for three-quarters or more of total employment and value added. It is therefore not surprising that the model predicts a limited role for future reallocations from agriculture and industry to services. At first glance, this result is good news, as the historically strong expansion of services has been a major drag on aggregate productivity growth in Europe. However, while the size of the services sector is predicted to grow only moderately in the future, the model predicts large reallocations within the services sector. As briefly mentioned above, the subsectors of services are very diverse in terms of productivity growth. Some subsectors – such as trade, transport, and communications – are very dynamic with high rates of productivity growth, sometimes even exceeding those observed in agriculture and industry, while other sectors tend to have stagnating or even declining productivity. The model predicts a strong expansion of these sectors with stagnant productivity. This includes, for example, the business services sector, which is predicted to grow rapidly in size but is characterized by sluggish productivity. These large shifts toward services with stagnant productivity represent a major drag on future productivity growth in Europe. According to the model, the annual rate of aggregate productivity growth will continue to slow from currently 1 percent to 0.8 percent over the next ten years.

Importantly, the model paints a less grim scenario for US productivity. The model also predicts a pronounced structural change in the US services sector, particularly toward business services. However, in contrast to Europe, the US business services sector is characterized by positive and sustained productivity growth. Therefore, the projected strong expansion of this sector will not be a drag on overall productivity growth as it is in Europe.

In summary, Europe is projected to experience a sustained slowdown of aggregate productivity growth in the future, while structural change in the US is projected to have only a moderate impact on aggregate productivity growth. As a result, Europe is expected to fall further behind the US in terms of productivity. The existing productivity gap between the US and Europe of 3 percent in 2017 is projected to widen to around 20 percent by 2027.

## POLICY CONCLUSIONS

A number of policy implications can be derived from this. Structural change has been shown to be one of the causes of the secular stagnation of productivity growth in Europe. Moreover, structural change is also predicted to have a significant negative impact on future productivity growth. However, these findings should not be interpreted as evidence calling for policy interventions to reverse the path of structural change – for example, through policies aimed at redirecting economic activity toward high-growth sectors such as agriculture and industry.

Structural change and deindustrialization in advanced economies are often met with deep scepticism and even outright fear by politicians and special-interest groups, who tend to be concerned about issues such as migration of companies abroad, mass unemployment, or threats to domestic competitiveness. Clearly, structural change can have adverse effects on individual workers, firms, or regions (e.g., through job losses or plant closures). At the aggregate level, however, these processes are the result of an efficient reallocation of economic activity, driven by differential productivity gains at the sectoral level. Thus, any policy aimed at forcing a shift in the path of the sectoral composition of an economy would be welfare reducing.

In an effort to boost aggregate growth, governments in many advanced countries have recently begun to use R&D tax credits as a tool to stimulate innovation. In 2021, twenty EU member states offered tax relief for R&D expenditures at the central or subnational government level. However, upon closer inspection, R&D tax credits may not be an effective cure for Europe's productivity malaise due to negative reallocation effects triggered by this policy.

To analyze R&D tax credits and their impact on growth, the model framework outlined above is extended to include private innovation activity as a driver of economic growth. In this framework, entrepreneurs engage in R&D to create new capital goods (machines) that increase productivity at the sectoral level. R&D tax credits stimulate private innovation by providing financial incentives to entrepreneurs.

However, the effect of the tax credit on innovation is not uniform across sectors but depends on the capital intensity of the sector. Some sectors are very capital-intensive and thus offer ample scope for further capital-embodied innovation. Empirically, these sectors include agriculture and industry, as well as subsectors of services such as transportation, trade, and finance. In these sectors, entrepreneurs respond strongly to R&D tax credits, which stimulates productivity growth in these sectors. Other sectors of the economy are highly labor-intensive, such as accommodation, personal services, business services, and education. In these sectors, there is limited scope for capital-embodied innovation and, as a result, entre-

preneurs' innovation efforts respond only moderately to more generous R&D policies.

Taken together, an untargeted R&D tax credit tends to stimulate innovation in capital-intensive sectors that already have strong productivity growth but has limited growth effects in labor-intensive sectors that are characterized by stagnant productivity growth.

The heterogeneous response of sectoral productivity implies that the productivity differential between the fast-growing sectors and the stagnant sectors in the economy further widens. This effect has important implications for the sectoral reallocation process, as it reinforces the substitution effect of structural change. Specifically, the larger gap in productivity growth across sectors accelerates the shift of economic activity from sectors with dynamic productivity growth to sectors with lower productivity growth. In other words, R&D tax credits may imply a worsening of the cost disease.

In sum, an R&D tax credit affects aggregate productivity growth through two opposing channels. It leads to a positive effect on aggregate growth by stimulating sectoral innovation and productivity growth, and to a negative reallocation effect by accelerating structural change toward stagnating sectors. Whether and to what extent the positive growth effect outweighs the negative reallocation effect is a quantitative question and depends on the specific parameterization of the model economy.

Finally, in order to boost aggregate productivity growth in Europe, policy efforts should focus primarily on the business services sector and other services with stagnant productivity and address the underlying

causes of sluggish productivity in these sectors. As noted above, these services are the main culprit of Europe's low productivity growth in the recent past and the projected decline in future growth. In most European countries, these service sectors are large and fast growing, and in contrast to the United States, they are characterized by stagnant productivity. To understand the causes of stagnant productivity in these sectors, it may be worthwhile to examine, possibly at the firm level, the role of regulation, firm dynamics, automation, human capital accumulation of workers, and occupational structure. Although these sectors have traditionally been seen as having an inherently limited scope for technological progress, intangible assets and digital technologies have a number of characteristics that could potentially improve the efficiency of production processes even in these sectors.

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