

Hartwig, Jochen; Krämer, Hagen M.

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Jochen Hartwig and Hagen M. Krämer

Revisiting Baumol's Disease: Structural Change, Productivity Slowdown and Income Inequality

The growing importance of services has led to significant structural change in advanced economies, with the service sector now accounting for the largest share of employment in developed countries. In his seminal model of the so-called cost disease of services, William Baumol noted that the prices of services, especially in health, education, arts and culture, tend to rise faster than the prices of material goods. Central to his model is the disparity in labour productivity growth rates between stagnant and progressive sectors. Baumol's model sheds light on the reasons behind the rising cost of services and provides a deeper understanding of its economic consequences. This article argues that Baumol's model of the cost disease of services retains its explanatory power and relevance today. It refutes criticisms that productivity growth in services is mismeasured and underestimated and that the increasing importance of services as inputs in manufacturing renders Baumol's model irrelevant. Instead, the article argues that Baumol's model can highlight the overlooked consequences of rising income inequality, particularly the severe impact of the cost disease, which disproportionately affects the poorer segments of the population.

The significance of services has steadily increased over time, resulting in substantial structural changes within the economies of advanced nations. The service sector contributes the largest share to aggregate output across all Organisation for Economic Co-operation and Development (OECD) countries, accounting for over two-thirds of the total GDP on average. As of 2020, approximately 70% of all employees in OECD countries were engaged in the service sector, a notable increase of ten percentage points since 1995 (Sorbe et al., 2018; OECD, 2023). Education, health and government services constitute major branches within the service sector. Currently, one quarter

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Jochen Hartwig, Chemnitz University of Technology, Germany; KOF Swiss Economic Institute, Zurich, Switzerland.

Hagen M. Krämer, Karlsruhe University of Applied Sciences, Germany.

of all people employed in OECD countries are working in these three subsectors, with most employees providing personal services (Krämer, 2021).

The prevailing trend towards a service-oriented economy aligns with expectations postulated by numerous economists throughout history. Notably, Sir William Petty expressed these expectations as early as 1691. In the 20th century, economists such as Allan G. B. Fisher, Colin Clark, Jean Fourastié, Martin Wolfe, William Baumol, Daniel Bell and Victor Fuchs further developed insightful explanations for long-term structural change. A common characteristic of most personal services is their limited potential for productivity growth. Based on this empirically verifiable fact, William Baumol formulated his renowned model of the cost disease of services in 1967.¹ This model elucidates the reasons behind the structural shift towards the service sector, highlighting the phenomenon of “unbalanced growth”. Baumol's simple neoclassical growth model, comprising two sectors, demonstrates that aggregate productivity growth gradually diminishes in the long run, leading to economic stagnation. Baumol's model continues to hold significant relevance to this day.

¹ The basic idea had already been exposed in Baumol and Bowen (1965, 1966).

Nevertheless, various developments have necessitated a critical examination of the model since its inception. This article addresses some of these developments and starts with a brief introduction of Baumol's model and the main objections that are raised against this model today. The article then examines the challenges associated with measuring service productivity. It also discusses the consequences for Baumol's model when considering the significance of services as intermediate products and contrasts the theoretical considerations with the results of empirical studies. Subsequently, the article looks at the social consequences of trend-like increases in the price of personal services, as predicted by the Baumol model. It asks what could be done when poorer segments of the population cannot afford certain services in the face of increasing income inequality.

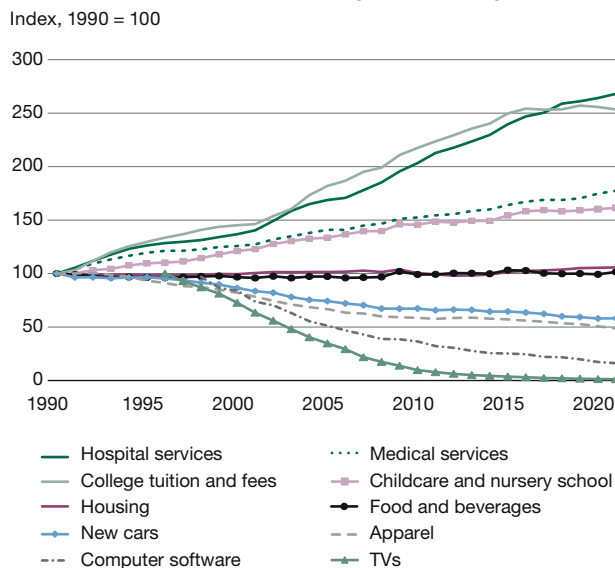
Baumol's model of unbalanced growth

In his 1967 paper "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis", published in the *American Economic Review*, William Baumol was primarily interested in the long-term economic consequences that occur when economic sectors have systematically different rates of productivity growth. In his model, Baumol (1967) divided the economy into a "progressive" and a "non-progressive" sector. The "progressive" sector shows higher labour productivity growth – in the long run and on average – than the "non-progressive" sector. One can broadly think of the "non-progressive" sector as the service sector and the "progressive" sector as the manufacturing sector (or "industry"). Baumol assumes that wages grow in both sectors at a rate set by the productivity growth in the progressive sector. Under these assumptions, productivity growth that is "unbalanced" between industry and the rest of the economy triggers a long-term structural change in which most services become increasingly expensive. This phenomenon was first described by Vandermeulen (1968) as "Baumol's disease".²

The model predictions are consistent with the observed developments in reality. Figure 1 presents the development of prices of selected goods and services in the USA between 1990 and 2020. It shows that during this period, prices for healthcare and educational services or for childcare and kindergartens rose much more sharply than the general consumer price index. In contrast, consumer

² It is sometimes referred to as "Baumol's cost disease". Authors such as Helland and Tabarrok (2019) prefer to speak of the "Baumol effect" which only refers to the long-term relative increase in the price of services compared with industrial goods.

Figure 1
Price changes of selected goods and services in the USA relative to the consumer price index (1990-2020)



Note: The base year is 1996 for TVs and 1997 for computer software.

Source: U.S. Bureau of Labor Statistics. The illustration is taken from Hartwig and Krämer (2022, 28).

goods such as clothing, food and beverages, and televisions became relatively cheaper during this period.³

Ever since Baumol's disease became known, this theorem has faced some objections. On the one hand, these objections express the hope that Baumol's cost disease will not break out in the first place. On the other hand, appropriate management of Baumol's disease is recommended to limit the consequences of the disease as much as possible. Some argue that service productivity actually increases beyond what is assumed due to measurement errors that produce false results. A second, more important, objection relates to services that enter the production process as intermediate inputs. Here, the argument goes that even weak productivity growth in the production of intermediate services increases the productivity in the final output. Therefore, a trend-like decline in aggregate productivity growth is not to be expected. A third point concerns the question of the social consequences of the cost disease of services. If personal services, in particular, are becoming relatively more expensive and disposable incomes grow unevenly, then the lower-income groups will no longer be able to afford certain services. These three topics are discussed in more detail below.

³ For a more detailed and formal exposition of Baumol's model of unbalanced growth see Hartwig (2015) and Hartwig and Krämer (2022).

Measurement problems

There are several fundamental difficulties in measuring productivity in general, which cannot be discussed in detail here.⁴ We focus here on data collection and measurement problems in the service sector. In determining service productivity, it is usually not, or not exclusively, the quantity (such as the number of patients treated, the number of students taught or the number of cases processed in a government agency) that is relevant as a measure of output. Instead, for most services, quality is likely to be the decisive criterion. This is especially true for personal services, which are most relevant in our context. However, determining the quality of a service is anything but trivial. It depends very much on the subjective view of the customer and the recipient's involvement since he or she is often involved as an "external factor" in the provision of a service. The price obtained on the market can rarely be used as a suitable indicator of service quality because many service prices are regulated by the state (e.g. in health care), or the services in question are not offered on the market at all, such as in education (Helland and Tabarrok, 2019, 45).

In addition, the correct method for calculating value added at constant prices, which is necessary to determine productivity changes, is particularly complex in the case of services. This is because price adjustments are not made directly for services; instead, both the production value and intermediate inputs are price-adjusted separately, requiring an elaborate procedure. Despite these and other problems, official statistics have made significant progress in measuring productivity in the services sector in recent years. Therefore, data availability allows for general statements, even though numerous open questions remain.⁵

Finally, it is important to note that the challenges described relate in particular to the measurement of productivity levels. For rates of change in (labour) productivity, however, which are the focus of interest here, the problems are less grave. A constant measurement error does not play a role in the determination of growth rates. Therefore, rates of change in (labour) productivity can be validly calculated. In addition, several empirical studies have found that the productivity weakness of services in

total cannot be explained by measurement errors (Sichel, 1997; Hartwig, 2008; Byrne et al., 2016, 2017). Even in empirical studies focusing on economic sectors whose value added is relatively easy to measure, the predictions of Baumol's model have not been refuted (Nordhaus, 2008; Hartwig, 2011).

Intermediate service inputs

A second challenge for Baumol's disease is the fact that services are becoming increasingly important as intermediate products. Baumol did not consider this type of service; he was concerned with services provided as a final product for private consumption. This is understandable since the increasing importance of services as an intermediate product did not emerge until the 1980s. At that time, outsourcing of services formerly provided within manufacturing companies began. Certain activities, such as operating canteens, car fleets or even IT centres, were outsourced. However, services as intermediate products have a very different impact on productivity growth than final products. We owe this insight to Oulton (2001), who has shown that services that act as intermediate inputs affect the aggregate productivity growth rate differently than services that enter final demand. In particular, even if they exhibit only low productivity growth, business services increase total factor productivity in industrial production and thus the aggregate productivity growth rate.⁶

Hartwig and Krämer (2019) have shown that although Oulton's claim is consistent from a theoretical perspective, the effects described by Oulton cannot be confirmed empirically. To illustrate why Oulton's objection does not hold empirically, let us first distinguish two cases that represent different ways in which the aggregate productivity growth rate can be affected:

The Baumol case. If manufactured goods are produced in the progressive sector and personal services in the stagnant sector, then the aggregate productivity growth rate tends to be lower than that of the manufacturing sector in the long run because the aggregate productivity growth rate is calculated as the weighted average of the two sectoral growth rates.

The Oulton case. Business services are provided in the stagnant sector and are included as intermediate inputs in the production of industrial goods. In Oulton's model, only industry manufactures final products. Under these conditions, business services used to produce industrial goods increase total factor productivity. Even if their pro-

⁴ See, for example, Moulton (2018) for a comprehensive discussion of productivity measurement issues.

⁵ To give a particularly striking example: in "business services", official statistics have been showing declining labour productivity in several developed economies (including Germany, France and Italy) for some time. There is a debate as to whether this is due to measurement errors or whether there are factual reasons for this (Hartwig and Krämer, 2019, 468-470; Flegler and Krämer, 2021).

⁶ Baumol later conceded that this phenomenon exists (Krueger, 2001).

ductivity growth is low, they increase total factor productivity in the industrial sector and thus the overall productivity growth rate.

Oulton's insight is important, and his argument is correct in principle. Nevertheless, it ultimately does not cancel out Baumol's cost disease for two reasons. First, Baumol effects occur as long as some form of low-productivity services are provided to final demand. Even though the share of business services has increased enormously in recent decades, personal services have not disappeared – and are very likely to remain in existence. Second, certain structural conditions must be in place for business services to have a positive effect on productivity growth in the economy as a whole: total factor productivity growth of business services must be positive, and the weight of these industries in total economic value added must tend to increase over time.

Using the EU KLEMS database, Hartwig and Krämer (2019) checked whether these conditions apply to six of the seven largest developed economies (the G7 countries except Canada). They have shown that the second condition is fulfilled. In line with the growing importance of business services for industrial production, the weight of these sectors (the so-called Domar weight) in total value added has tended to increase over time in all the countries studied.

The first condition is not met, however. For business services, total factor productivity growth is negative. As a result, the increasing weight of these industries contributes to a reduction in aggregate productivity growth. Therefore, the conditions for Oulton's theorem to hold in reality are not satisfied. For the sake of completeness, it should be added that the opposite is true for manufacturing in most countries: Total factor productivity increases, but the weight of the industry tends to decrease. This also harms aggregate productivity growth.

Hartwig and Krämer (2019) found that many business services exhibit negative productivity growth. This finding may seem surprising and implausible at first glance. Oulton (2016, 2017) has cast doubt on this kind of empirical data. Because he suspects measurement errors, Oulton makes various "corrections" that transform the productivity growth of the affected sectors from negative to positive values. Although initial scepticism about the data is quite understandable, it would be a mistake to rule out the possibility of technological regression in business services. In a sectoral study, Flegler and Krämer (2021) discuss various reasons why labour productivity declined in most business services in Germany in the period from 1991 to 2018. They argue that the organisational

demands of digital transformation and a lack of support for it among the workforce tend to have a negative impact on firms' productivity in the short term. Nor should it be forgotten that business services include not only modern services in the field of information and communications technology (ICT) but also numerous labour-intensive services, such as maintenance, repair, cleaning, accounting, training, security, advertising and marketing. These services are frequently provided by small or micro-enterprises and require direct and personal contact between the provider and recipient of the service (Fernandez and Palazuelos, 2012, 245). Therefore, it is unsurprising that labour productivity either increases only slightly or even declines in these sectors.

In summary, business services, which enter production as intermediate inputs, did not positively affect overall economic productivity growth in the past. Oulton's theorem is theoretically valid but (so far, at least) not practically relevant. However, it is not evident a priori that even if business services were to positively impact aggregate productivity growth (as in the Oulton case), it would outweigh the negative productivity effect of personal services (as in the Baumol case). Thus, Baumol's prediction that productivity growth will decline continuously in the wake of tertiarisation remains valid.

Income inequality

Many empirical studies have shown that disposable income in industrialised countries is much more unequally distributed today than it was when Baumol developed his theorem (OECD, 2015, 2023; Alvaredo et al., 2017). Combined with the cost disease of services, this gives rise to new social and distributional policy challenges. Baumol noted in a book published towards the end of his life that the cost disease of services primarily impacts those with lower incomes. In his own words: "The cost disease disproportionately affects the poor" (Baumol, 2012, 59).

While it is justified to assume that in the long term each society will be able to afford ever more expensive services as long as overall economic productivity and thus incomes grow, it must not be overlooked that this is only true on average. If personal services are becoming relatively more expensive and disposable incomes grow unevenly, lower-income groups will no longer be able to afford certain services – in particular, in education and health. On the one hand, this is a social problem. On the other hand, it can also cause demand problems for service providers. This issue did not play a role in the original Baumol model since it was assumed that, although services are becoming increasingly expensive, they remain affordable because productivity in manufactur-

ing, and hence wages, continues to grow. Therefore, all services can always be sold in principle, despite price increases.⁷

However, this assumption may not be correct, given the recent increase in income inequality. The social dimension of Baumol's cost disease emerges because the less well-off rely on many of the services provided by the state (especially in health care, social services and education), which will become relatively more and more costly over time. The funding problems that will worsen in the future due to the cost disease in these areas are likely to trigger further distributional conflicts that must not be underestimated. Baumol's cost disease, therefore, also presents itself as a severe distribution problem that will become increasingly difficult to ignore.

How can we ensure that low-income households keep access to services affected by the cost disease? Healthcare is an area significantly affected by the cost disease of services and particularly important for providing essential services. The health sector is expected to witness a substantial increase in its nominal GDP share due to demographic changes, higher average income and rising unit labour costs due to low productivity growth. Traditional approaches aimed at cost control in healthcare have proven ineffective in many countries, underscoring policymakers' failure to comprehend the underlying causes of cost escalation in personal and public services. In some areas, there may be private solutions to the problem, like do-it-yourself or neighbourhood assistance. But in other areas – such as healthcare – this cannot be the general solution to the problem. Professional providers are needed here, and the high costs must be paid. To ensure that low-income groups keep access to services such as healthcare, the state must intervene. This could be done, for example, by organising service provision for all and financing it with progressive taxes.⁸ A social insurance solution with income-dependent contributions can be designed in a similar way. Although the permanently increasing unit labour costs will have to be financed through fee or tax hikes, these will be difficult to implement in the current political climate. Therefore, funding these public services is expected to become more challenging and conflict-ridden. The recent disputes over wage increases for workers in sectors such as health, education, and transportation in many countries can be inter-

7 As Baumol (2012, xvii) notes, the British economist Joan Robinson had already brought this to his attention in the 1960s.

8 Mann and Pecorino (2023) present a model in which the state provides a good subject to Baumol's cost disease that is financed via income taxes. If this public good is a poor substitute for private goods then the tax rate rises monotonically up to the revenue-maximising level (the top of the Laffer curve). The tax increase need not happen, however, if both the public and private sectors provide stagnant services (see Andersen, 2016).

preted as a direct effect of Baumol's cost disease. Advice for economic policy could be: if society does not want to allow an ever-larger low-wage sector to develop, lawmakers must realise that cost increases in low-productivity services are unavoidable and must be adequately financed by the public sector.

However, not all services afflicted by the cost disease can or should be offered by the state or financed through social insurance. Think of activities in the cultural sphere. In order to ensure that lower-income groups can also participate in these, there is no alternative to redistributing income and wealth. There are many proposals on how the inequality that has increased since the 1980s could be reduced again (Atkinson, 2015; Milanović, 2016; Freeman, 2021). Although there have been no recent political majorities for such measures, this could change. Political pressure for greater redistribution is likely to grow as the cost disease makes personal services unaffordable for more and more people.

Concluding remarks

The model of the cost disease of services and unbalanced economic growth, developed by William Baumol more than 50 years ago, retains its explanatory power and relevance to the present day. The Baumol model has been repeatedly criticised. Criticisms include the claim that productivity growth in services is mismeasured and tends to be underestimated and that the increasing importance of services as an input in the production of manufactured goods would render Baumol's model irrelevant. We have argued that neither of these objections is valid. Moreover, Baumol's model can be used to reveal the neglected consequences of rising income inequality: the cost disease of services will have a particularly severe impact on the poorer segments of the population. In the future, economic and social policies will have to play an increasingly important role in solving this new distributive challenge.

Despite the explanatory power Baumol's seminal model still has today, its further developing is necessary and beneficial. For example, legitimate criticisms have been made of Baumol's neglect of aggregate demand. Some attempts have already been made to extend the model to incorporate the demand side and to eliminate the assumption of full employment (Notarangelo, 1999; Hartwig, 2015), but more research is needed on this issue.

Nonetheless, Baumol's cost disease remains a convincing and significant concept. The declining growth of aggregate productivity and the observed rise in relative service prices (depicted in Figure 1) indicate the continued

relevance of Baumol's ideas. Thus, his predictions have largely materialised, suggesting that we will continue to face the challenges posed by the cost disease in the future. Consequently, it is crucial to find appropriate responses to this phenomenon, particularly considering that many essential services vital to a good quality of life are affected.

Baumol's legacy serves as a warning against misguided policy choices. In the case of public services, the prevalent responses to the cost disease have predominantly entailed quality restrictions and attempts to impose cost limits, which represent misguided paths. The appropriate response to the cost disease is not to combat rising costs in healthcare, education or other personal services but, firstly, to acknowledge and, secondly, to address the inevitable price increases in stagnant sectors in a suitable manner. Baumol (2012) reminds us in his last book that, in principle, we can afford increasingly costly services. However, we must grapple with the accompanying distributional challenges. The social dimension of Baumol's cost disease lies in the fact that less affluent households rely heavily on numerous services provided by the state, particularly in healthcare, social services, and education. The funding predicaments arising from the cost disease in these areas are likely to exacerbate distributional conflicts in the future, demanding careful attention. As a result, Baumol's cost disease emerges as a significant distributional and social problem that will become increasingly important to tackle as time goes on.

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