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SWPS 2014-01

January, 2014

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Productivity in services twenty years on. A review of conceptual and measurement issues and a way forward

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Abstract

Griliches' seminal contribution on "Output measurement in the service sectors" (1992) is now more than twenty years old. The aim of this paper is to review and systematise the scholarship that has been produced since, to identify any step forward in the conceptualisation of service output, the measurement of service productivity and the account of technical change in affecting productivity in services that might have occurred. An agenda for both innovation and service scholars is proposed.

Keywords: Services; Productivity; Service output measurement; US-EU productivity gap
JEL: O14, O47, L80

Acknowledgments: The authors wish to thank Alex Coad, Paul Nightingale and Ed Steinmueller for insightful suggestions. All errors and omissions are ours.

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1. Introduction

Griliches' seminal contribution on "Output measurement in the service sectors" (1992) is now more than twenty years old. The aim of this paper is to review and systematise the scholarship that has been produced since, and identify (if any) steps forward in the conceptualisation of service output and measurement of service productivity. The reasons to embark on such a task are manifold.

First, not many scholars over the past two decades have tackled and solved the analytical and methodological issues revolving around the definition of service outputs and measurement of service productivity identified by Griliches (1992), such as the choice of a numerarius for immaterial output that cannot be measured in terms of physical volumes and the use of an appropriate price deflator.

Second, much of the technical progress that has affected the way services are produced and delivered, and most likely increased their productivity, has occurred in the past two decades[3]. This has raised new concerns as to whether technical progress is properly accounted for when identifying radically or incrementally new services, and more productive ones.

Third, these issues are not only interesting from a methodological perspective. Rather, as argued in Gallouj and Savona (2009) among others, the mis-measurement of service productivity has affected the evolution of theoretical stands on the role of services for aggregate economic growth. Processes of tertiarisation – i.e. long-term structural changes in the sectoral composition of economies toward service sectors – have been shifting over time from being a cause for concern linked to de-industrialisation and productivity slowdown[4], to representing a leverage for countries' competitiveness linked to the growth of 'knowledge-related activities'[5]. Both of these views rely upon a key, age-old economic concept: productivity.

Overall, exception made for Griliches (1992), not many scholars have attempted to solve the analytical and methodological puzzles linked to the measurement of productivity in services. A few overarching issues remain at stake. These are (i) the appropriateness of the standard concept and

[3] One of the first models of innovation in services based on the use and diffusion of ICT in financial services dates back to the end of the 1980s (See Barras, 1986).
[4] Kaldor (1966) analysed and explained the 'causes of slow rate of growth in the United Kingdom' on the basis of productivity figures in services. Kaldor sparked a whole stream of contributions concerned about the de-materialisation of the economy, which at the time was considered a synonymous of de-capitalisation.
[5] The literature has increasingly covered the role and impact of 'knowledge-intensive business services' (KIBS) (for a review, see Muller and Doloreaux (2009).

measurement of productivity for services; (ii) the account of technical change and innovation in both the conceptualisation and measurement of productivity in services; (iii) the proposal of new, better ways to conceptualise and measure productivity in services, should traditional indicators of productivity be found misleading or mis-representing when applied to services.

We first review successive generations of productivity indicators, highlighting in detail the issues above (Section 2). We then address how the use of different productivity indicators has affected empirical assessment of the contribution of services to aggregate productivity growth, touching upon the debate on the US-Europe productivity gap (Section 3). For the sake of completeness, we also review alternative conceptual and empirical stands, which have questioned the validity itself of productivity indicators for services (Section 4). We then put forward a new, more encompassing way of conceiving ICT-related and input-saving productivity enhancing opportunities in services, which might represent a useful way ahead to resolve the issues still at stake and put much of the debate on productivity slowdown in perspective (Section 5). Section 6 concludes.

2. Concepts and measurement of productivity: implications for services.

2.1 What is productivity?

Productivity does not equate to performance - the capacity of achieving predetermined goals – or to effectiveness – the actual realization of goals regardless the quantity of output produced or the costs sustained (see Djellal and Gallouj, 2008, for a review). Productivity is also different from efficiency – the capacity achieving predetermined goals while minimizing costs – being it financial efficiency (or profitability) or technical and operational efficiency. What is then productivity and how is it measured? The concept of productivity is as old as economic theory[6].

In very general and simple terms, productivity *(p)* can be defined as the ratio between a measure of the output *(O)* resulting from the productive process and a measure of the various inputs *(I)* used in the production process itself. Therefore $p=O/I$.

[6] The idea of productivity was already present in the book universally considered as the starting point of the modern economic thought: the Adam Smith's 1776 *An Inquiry into the Nature and Causes of the Wealth of Nations*. The first book, dedicated to the causes of the improvement in the productive powers of labour, describes how the division of labour increase its productivity, meant as the relative amount of output produced giving the inputs used in the production process (Smith, 1998 [1776]).

This straightforward definition is the one usually adopted and implemented, as suggested by the OECD in the 2001 manual on measuring productivity, where it is defined as “a ratio of a volume measure of output to a volume measure of input use” (OECD, 2001, p. 11). The OECD manual also specifies the main productivity measures used. Different measures are associated to different combinations of output indicators (gross output or value added) and inputs indicators (labour, capital, capital and labour or capital, labour and intermediate inputs).

As the OECD manual puts forward, each productivity indicator has advantages, drawbacks and limitations. For instance, labour productivity in terms of gross output has the advantage of being easy to measure, and no information on intermediate inputs are required. However, it is a partial measure of productivity, leaving unaccounted for the various intermediate inputs employed in the production process. Labour productivity in terms of value added presents additional problems related to the deflation procedure. Capital productivity based on value added, while being easy to read, suffers the same limitations of all partial measures of productivity.
Multi-factor productivity indicators based on value added overcome some of the limitations of partial measures of productivity, though they do not incorporate shifts in technology. Other multifactor productivity measures - such as the EU-KLEMS multifactor productivity – have the conceptual advantage of taking into account the effect of all the productive factors employed, but are very demanding in terms of data to compute them[7].

2.2 Measurement techniques

We can distinguish two broad families of techniques for measuring productivity: *index methods* and *productivity frontier methods*. Diewert (1992) summarises six different approaches to measurement of productivity change[8] and shows that they work quite well in the simple case of one output-one input.
These are:

1) The direct quantity index method, where productivity change between period t_{+1} and t is measured by the ratio of an output quantity index and an input quantity index;
2) The change in technical coefficient method, where productivity change is measured by the ratio of an output/input coefficient at time t_{+1} and the same output/input coefficient at time t;

[7] For more specific details on each productivity measure, see OECD, 2001, pp. 13-18
[8] For the analytical formulation and the technical description see Diewert (1992, pp. 164-169).

3) The deflated revenue divided by deflated cost method, where productivity change between period t_{+1} and t is measured by the revenue ratio deflated by the output price index divided by the cost ratio deflated by the input price index;
4) The Caves and Christensen method, where productivity change between period t+1 and t is measured by the ratio of an output index and an implicit input index (the cost ratio deflated by the input price index);
5) The deflated revenues divided by an input quantity index method, where productivity change between period t_{+1} and t is measured by the revenue ratio deflated by the output price index divided by the input growth rate;
6) The Jorgenson and Griliches' price index method, where productivity change between period t_{+1} and t is measured by the ratio of the rate of growth in input prices and the rate of growth in output prices.

Diewert (1992) demonstrates that all these methods to measure productivity change are equivalent in the ideal case of one homogeneous output and one homogeneous input (p. 168). However, modern economies are composed of multi-output and multi-input firms (in the manufacturing as well as in the service sector) and this complicates the computation of a simple ratio. The main problem is that in the multiple outputs and multiple inputs case different techniques give different productivity estimates. This depends on the choice of the weights for inputs and outputs, which largely influence the computation of the productivity measures (Diewert, and Nakamura, 2005, p. 30). As a consequence, depending on the chosen approach, we will have a different productivity estimate.

In order to deal with the case of multiple inputs and outputs, a different class of methods can be used: the index number methods.

Instead of using the ratio of simple measure of outputs and inputs, the index number methods allow to deal with multiple outputs and inputs with different prices. Various types of index numbers can be computed, with different properties depending on the weight structure and on the functional specification chosen. One of the most used is the Malmquist productivity index, introduced by Caves *et al.*, (1982). They used the original Malmquist intuition (1953) of deflating consumption to obtain a price compensation index and elaborate a productivity index. The Malmquist productivity index compares actual and potential production functions in terms of distance[9] to compute a

[9] The Malmquist productivity index, being based on the idea of distant functions, can be also be calculated using a DEA function.

productivity index. For example, if we consider the output of two different firms A and B, we will use the actual output of firm A and B plus the potential output of firm A - computed plugging into its production function the inputs used by firm B - and the potential output of firm B - computed plugging into its production function the inputs used by firm A – to compute a Malmquist output based productivity index[10]. The critical issue in using index numbers resides in the choice of the functional form to employ[11], which affects the productivity measurement.

In both the approaches above – simple ratios and complex index numbers – the accuracy of the measure depends on the availability of reliable output and input data (physical output, volume or value added) and of adequate price indexes, which is one of the major problems, most especially – and historically - for the service sector (see section 2.3).

A different approach to measure productivity is to estimate a productivity function. Instead of a ratio, a productivity function that expresses the productive possibility of the typical unit is considered. As Farrell (1957) points out in his pioneering contribution, it is possible to empirically estimate the productivity frontier of the most efficient productive unit and then measure the difference between this latter and the actual productivity of the unit considered. Two main approaches have followed from Farrell's seminal intuition, based on different production function considered.

The first set of techniques are non parametric as they do not assume an a priori functional form for the production function. The most popular among them is the data envelopment analysis (DEA) (Charnes *et al.,* 1978), which consists of empirically estimating the production frontier of the best performer in term of technical efficiency and using it as a benchmark to evaluate the performances of the other units considered. This kind of approach can be used to calculate the distance between the actual productivity function of the unit considered and the estimated best one and then using this distance to compute a Malmquist productivity index.

The second set of techniques is based on parametric methods, which rely instead on an a priori definition of a specific functional form for the unit production function (typically a Cobb-Douglas form augmented with others inputs rather than only labour and capital, such as energy inputs or

[10] A similar Malmquist productivity index can be computed looking at the input side. In this case we consider the amount of inputs firm A would need to produce its output given the production function of firm B and the amount of inputs firm B would need to produce its output given the production function of firm A.
[11] It is beyond the scope of this paper to go more in depth into this issue: for a more detailed discussion of how the choice of the functional form affects productivity measurements, see Diewert (1992).

intermediate material inputs) and then the estimation of the parameters to derive a direct measure of productivity.

In both parametric and non-parametric techniques the function can be specified as deterministic (without error term) or stochastic (allowing for an error term that can incorporate measurement inaccuracy). Stochastic parametric techniques are extremely powerful in estimating parameters and accounting for non-Hicks neutral technical change but are subject to problems such as omitted variables and selection bias (for a recent review see Van Beveren, 2012).

2.3 Unresolved issues

The most common – and still unresolved – issues affecting the accuracy of productivity measurement techniques are related to (i) levels of aggregation; (ii) reliability of data on output and input volumes and prices; (iii) incorporating quality change. All of these issues are – implicitly – valid and possibly more serious when considering services.

2.3.1 Level of aggregation

Productivity can be measured at different levels: firms, industry, or national level. In principle, it should be possible to construct an index of productivity at the industry level by "simply" aggregating the firm level measures of the particular sector. Similarly, it would be possible to do the same as we move up to the national level. However, as Triplett and Bosworth (2004) point out, two major problems arise when we compute industry productivity and then aggregate the results to get an aggregate measure:

> First, aggregate productivity is not just the aggregation of productivity changes within the individual industries. Aggregate productivity can also change because of reallocations across industries. […] A second issue concerns combining gross output productivity at the industry level with value added productivity at the aggregate level (Triplett and Bosworth, 2004, pp. 20-21).

Accounting for the reallocation effect across industries and combining gross output and value added measures are issues common to the manufacturing and service sector and can be tackled using different techniques. It is beyond the scope of this paper to go in detail on these (see Triplett and Bosworth, 2004, for a discussion).

2.3.2 Definition of inputs, outputs, process and availability of relevant data

A valid measure of productivity relies on appropriately measured inputs and outputs. The task of counting how many inputs and how many outputs are involved in the production process may seem an easy one, though the level of difficulty depends on the sector and aggregation level considered.

In the manufacturing sector, counting the physical output units produced and the inputs unit employed might be straightforward, when we consider a firm producing a single type of output using a single type of input. However, firms might use more than an input in the production process and often are multi-outputs, making the computation more difficult. Further problems arise on the inputs side, namely on the possibility to find satisfying volume measure for labour, capital and the other inputs entering the production process, such as energy or intermediate inputs[12].

In the service sector, the characteristics of the output make the measurement problems more severe. In particular, the fact that the typical output of service sectors is intangible to different degrees makes it clearly difficult to count it as a whole or in part and even harder to separate units of output. In addition, the production process in the service sector usually involves the contribution of the customer himself (Gadrey, 1988, McLaughlin and Coffey, 1990, Gadrey and Gallouj 2002; Gallouj and Weinstein, 1997; Gallouj and Savona, 2009). Intangibility/immateriality, indivisibility and co-production make the service output not easy to identify and count, often leading to mis-measurement in terms of underestimation of the volume of service sectors' output (Savona and Steinmueller, 2013). This has been suggested as being one of the main reasons of the low productivity figures registered in the sector (see, for example, Triplett & Bosworth, 2003). Whether the productivity slowdown registered in US and Europe in the seventies and eighties has been due to mis-measurement of the output in the service sector is still a matter of debate (see Griliches, 1992; Sichel 1997)[13].

Turning to price data availability, the problem mostly affects the service sector, in particular in the government and non-market sectors, and a substantial number of services traded with no corresponding price or at a highly subsidized price. Diewert (2011) suggests three methods for measuring government output in the non-market sector, in decreasing order of "desirability".

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[12] For a recent reviews of the problems connected to each kind of input and the actual measures used at the national account system level see, Diewert (2007), among others.

[13] We go back to this issue in section 3.2.

The first one is the attribution of market prices to purchasers' evaluations of government and non-market output. In principle, if there is a comparable market sector for which prices are available, it should be possible to use this latter as a proxy and attribute market prices to the non-market service purchases, possibly taking into account quality variations with hedonic price techniques (see section 2.3.3). If prices of a comparable sector are not available, we can use as proxy an indirect price index computed on user evaluations. The problem with this kind of method is that often there is not a real comparable sector or the amount of information request to calculate a user evaluation index is just too costly.

If any of the first type methods is not applicable, the second best alternative is to evaluate government and non-market output at producer's unit cost of production. In this case costs are used as a proxy of prices and we can also evaluate quality changes looking at them from a cost-based approach rather than a demand-based one (for a detailed description of the various specification of these two general methods see Diewert, 2011).

The third method is to be used only in case of lack of information on the volume of the output produced by the government, its value and its price. In this case, we assume that the aggregate growth of the output equates to the one of inputs used for producing it, both in terms of volume and prices. This clearly entails that the change in productivity is one by definition.
To sum up, while the problem of missing prices has sometimes no solution[14], the issue of quality can be tackle using different techniques, most of them based on hedonic prices.

2.3.3 How to deal with quality changes: the use of hedonic prices

Turning to price attribution, one of the most common and difficult issues is the ability of price indicators to reflect changes in quality of the good or service provided. As stressed by Grönroos and Ojasalo (2004), the standard productivity concept is based on a constant quality assumption: in the process of effective transformation of inputs into outputs quality is assumed to remain unchanged. Any change in quality will therefore not be recorded, giving rise to another potential source of mis-measurement and biased productivity indicators.

[14] The issue of productivity in the public sector is largely beyond the scope of the paper. This is nevertheless part of our research agenda.

In addition, a change in the inputs may sometimes alter – especially in services – the perceived quality of the outputs. This might create a twisted effect. For instance, let us assume that a change in the combination of inputs leads to an increase in the level of output and in productivity (computed using a standard output over input ratio). If the consumers perceive the results of the change in inputs as a decrease in the quality of output, this would entail a reduction of demand for that particular output. So an improvement in productivity is ironically translated in a worse economic performance (Grönroos and Ojasalo, 2004, pg 415).

One of the most prominent cases of quality changes – most especially in services – is the one made possible by ICT. This has brought about the necessity to take into account quality changes as reflected in prices and led to the use of hedonic prices. The so-called "Solow productivity paradox", the idea that "you can see the computer age everywhere but in the productivity statistics" (Solow, 1987, p. 36) has long affected research on the role of ICT in modern economic systems. The discussion of this paradox is beyond the scope of this paper (see Brynjolfsson, 1993 and Triplett 1999, who examine several possible explanation of it).

Van Ark (2002) identifies four possible categories of measurement problems linked to the increase of ICT in output or input, manufacturing or services. For three of them, the solution is the use of hedonic prices (Van Ark, 2002, p. 8). The use of hedonic prices technique allows detecting quality changes and has been first introduced by Griliches (1961) for the car industry and then largely applied in the ICT sector. According to the OECD Handbook of Hedonic Indexes and Quality Adjustments in Prices Indexes (2006): "a hedonic price index is any price index that makes use of a hedonic function. A hedonic function is a relation between the prices of different varieties of a product, such as the various models of personal computers, and the quantities of characteristics in them" (p. 41). Hence, to compute the hedonic price of a good or a service it is important to first list the characteristics affecting the price and then define and estimate the hedonic function.

Hedonic prices present several limitations, not least the considerable amount of information needed to compute them (for a review of the main critiques to the use of hedonic prices in ICT see OECD, 2006). Yet, their use is indeed a viable solution to overcome the quality issue - especially in the service sector.

In general, and from an innovation theory perspective as well, the puzzle of quality change is both conceptual and methodological: to what extent changes in quality of the inputs or outputs or both represent innovations? And how do we account for innovativeness in terms of quality change? What kind of relation can be established – again, both conceptually and from a measurement perspective – between traditional indicators of product and process innovation and quality improvement? How do we account for quality-enhancing productivity and input saving productivity? We will go back to these issues below.

2.3.4 What methods for services?

All the issues illustrated above apply to both manufacturing and services, though are possibly more serious for these latter. However, not many attempt have been made to tackle the specificity of intangibility, the lack of hedonic prices and the choices of functions that are to be used for services.

An interesting stand in this debate is the one taken by Baumol *et al.* (1989), who distinguish between three different *lieu* of productivity growth: productive capacity, welfare productivity and gross productivity.

Productivity intended as growth in the productive capacity implies that countries move towards their productivity frontier, most likely due to technical progress.

The notion of productivity as welfare productivity implies that increases of it entail increases in consumer and producer's welfare per unit of input. Welfare productivity takes therefore into account not just technical change but also allocative efficiency and quality change.

The third notion – productivity as gross productivity – implies to measure productivity through a simple ratio of output over input with no attempt to adjust for quality change.

Once clarified this distinction, Baumol *et al*. (1989, p. 235) argue that each of the three specifications of productivity has its valid and meaningful use. However, surprisingly, they claim that the most appropriate for services is this last one, rather than a measure adjusted for quality: "gross productivity is the primary determinant of the budgets, costs and prices of the product in question" (Baumol *et al.*, 1989, p. 242). They consider the case of high education, where the cost per student is the reciprocal of the student/teacher-time ratio (which is a measure of gross productivity) times the average hourly faculty salary. If we assume that wage dynamics are determined outside the university, the only way the administration can affect cost is by increasing gross productivity.

They go even further in their reasoning, suggesting that there are "some applications of productivity measurement for which it is simply wrong to take quality change into account" (Baumol *et al.*, 1989, p. 242). This line of reasoning suggests that most of the time there is no need to worry about quality changes and that gross measures of productivity can be quite accurate, especially in the service sector. To our knowledge, this view is in minority position in the literature of productivity in services, where it is far more common to call for adjustments of productivity measures to deal with services' characteristics.

More recently, the Eurostat Handbook on price and volume measures (2001) proposes a series of methods to measure price and volume and then classifies them according to their degree of "appropriateness". The methods employable to measure productivity in the market service sector are divided in three categories: "A methods" are the most appropriate methods, "B methods" are those that can be used in case an A method cannot be applied and "C methods" are those that shall be used only residually (p. 4). For each typology of market services the three kinds of methods are described. More specifically: "A methods are the methods that approximate the ideal as closely as possible. B methods are acceptable alternatives: they are further away from the ideal but still provide an acceptable approximation. C methods are too far away from the ideal to be acceptable" (p. 4)[15].

Inklaar *et.al.* (2008) have collected the inventories made around the year 2000 by each European National Statistical Institute of their own methods of compute productivity, rating them according to the Eurostat A,B,C classification. According to them, the average percentage of service sector output deflated using A methods was 12 per cent, of B methods 62 per cent and of C ones 26 per cent, with sectors like wholesale trade or financial intermediation for which the percentage of A methods was zero (Inklaar *et. al.*, 2008, p. 179). Although in the last decade the situation has possibly marginally improved and the above numbers refer to the European average (hiding difference sometimes considerable among countries), these figures are symptomatic of the difficulties of estimating productivity in the service sector.

[15] We revert the reader to the brief description of these methods in the EUROSTAT Handbook of prices (2001).

3. Productivity and technical change in services: reconciling alternative views?

All the methodological issues illustrated above and the potential mis-measurement of productivity changes in services have affected the theoretical stands on the consequences of tertiarisation on aggregate productivity performance and have therefore a relevance which goes beyond the mere measurement and methodological one. This section briefly reviews the terms of this debate, which naturally touches upon the way scholars have incorporated technical change in services within their reflections.

In his seminal contribution, (Griliches, 1992) pointed out two possible explanation of the US productivity slowdown in the eighties: on the one hand, an *intrinsic* lower technical progress in the service sector compared to the manufacturing one; on the other hand, he claimed that the slowdown resulted from a potential mis-measurement of productivity in the service sector due to above-mentioned difficulties in measuring output and prices.

The first explanation lays down an argument in line with the 'Kaldorian' strand of research, which the work of Baumol (1967) on unbalanced growth model implicitly extended to services. The main assumption behind this is that the service sector is *intrinsically* non-progressive, with stagnant labour productivity as a result of an inner low level of technical and capital intensity. The joint role of this and of rising wages – set at the national level in line to productivity gains of the progressive sector - causes a limitless increase in production costs and a corresponding slowdown of the economic growth (this phenomenon is known in the literature as the Baumol's cost disease).

The second explanation – as mentioned above - relates to the fact that specific characteristics of the service output (like intangibility or interactivity) can affect the possibility of measuring it, leading to a mis-measurement of productivity. In addition, output's prices measurement can be problematic in the service sector for the difficulty of taking into account quality changes or because for some services – like most of non-market services – there is simply no price.

These two not mutually exclusive explanations have paved the way to two distinct but connected lines of research.

The first one tries to question Baumol's argument of the "natural" low technological content of the service sector, especially in the light of the productivity increase registered from the mid-nineties onwards in the US, and the continuous increase of the service sector's contribution to national income in developed economies (and increasingly in developing ones) (see Bosworth and Triplett, 2007, Inklaar *et al.*, 2008 and Timmer *et al.*, 2011).

The second strand of research attempts to take Griliches (1992) seriously and tries to identify methods to calculate output and prices for the different services' typologies (Wölfl, 2003; Diewert, 2011).

Along with these connected mainstream lines of research, a third one emerged. While sharing concern about measurement problems, scholars begin to question the validity of the concept of productivity itself when it comes to services. Further, it distinguishes between those services for which the problem is the measurement itself and those sectors for which the concept of productivity is meaningless and alternative measure of performance should be used (see Djellal and Gallouj, 2008). We will deal with each of these strands below.

3.1 The tertiarisation "curse" – Baumol's cost disease argument

The basic assumption of the unbalanced growth model advanced by Baumol in 1967 is that it's possible to distinguish between two kinds of economic activities: the "progressive sector", characterised by high productivity and capital intensity and the so-called "non progressive" or "stagnant" sector, productivity laggard. At the time Baumol put forward the unbalanced growth model, therefore, he derived his assumptions on the basis of empirical evidence of supposedly appropriate measures of sectoral productivity changes.

Baumol argues that this division is not the product of chance or history, but the result of the technological *inner structure* of each activity. The two sectors make a different use of labour: while for the progressive sector labour is an input, for the stagnant sector labour is an end in itself. This characterization makes it easy to identify broadly the progressive sector with the manufacturing sector and the stagnant sector with the service one.

To construct his model, Baumol (1967) relies on other assumptions: he limits the analysis to labour costs and assumes that wages vary equally in the progressive and non progressive sectors, as wage increases are negotiated at the national level and adopted in each sector; finally, nominal wages rise accordingly to the output per worker of the sector that experiences higher productivity increases.

Given these assumptions, the model derives several implications.

The first and most important is that, while the unit cost of the high productivity sector remains constant, the one of the stagnant sector increases indefinitely, causing what has become known as the "cost disease" of the service sector. The logic behind this result is quite simple: given the assumptions, the growth of productivity in the progressive sector generates an increase in wages also in the non-progressive sector. Here, the wage increases that are not "paid back" by correspondent productivity increases, lead to increases in the unit cost per output (the famous "cost disease" (Baumol, 1967, p. 418).

The second implication of the model is that non progressive activities whose demand is highly price elastic experience a declining tendency of their output and, eventually, disappear by way of price competition. Cost increases in fact translate into price increases: the high elasticity of demand for these activities entails a large contraction of demand (Baumol, 1967, p. 418).

The third conclusion drawn from the model is that, holding constant the output ratios of the two sectors, an increasing amount of labour force is transferred from the progressive to the stagnant sector, with the amount of labour in the former tending asymptotically to zero (Baumol, 1967, p. 419).

The final implication of the unbalanced growth model is that a balanced growth is accompanied by a relative decrease of the rate of growth of the economy compared to the one of the labour force. This implies that, with constant (stagnant) productivity in one sector and constant amount of labour overall, economies' growth rate is bounded to asymptotically tend to zero (Baumol, 1967, p. 419).

To sum up, if we hold the assumption of the presence of a non-progressive (service) sector, this should experience inevitable and indefinite cost increases, coupled with a decline of its output and an increase in its labour force. Tertiarisation of employment leads therefore to a zero-growth economy.

In Baumol's original contribution, this phenomenon can be included among those "economic forces so powerful that they constantly break through all barriers erected for their suppression" (1967, p. 415). The main assumptions of the model have from the outset been subjects to criticism by several scholars (see below). Baumol has since revised his original formulation (Baumol *et al.*, 1985) introducing a third sector called "asymptotically stagnant", a sector in between the productive and non-productive one, which includes some service activities (like data processing and TV broadcasting) that over time is bounded to follow the same path of the non-productive one.

To examine the debate on Baumol's original idea - and more generally on the economic implication of tertiarization of the economy - is beyond the scope of this paper (see Lorentz and Savona, 2008 for a discussion). However, it is important to stress that in the context of Baumol – and indeed the Kaldorian line of argument (see also Fuchs, 1968) - the posit of an inner technical backwardness as the main reason of low productivity in the service sector is deeply rooted in the economic literature and empirically supported by the evidence available at the time.

Over time, more recent waves of empirical works on productivity (see, among others Bosworth and Triplett, 2007 and Inklaar *et al.*, 2008) have shown that this trend has reversed, at least in the US. These scholars look at the data on productivity over the last decades and find an upsurge of productivity growth in the US starting from 1995, while Europe still struggles with a productivity slowdown. Interestingly, Bosworth and Triplett (2007) and Inklaar *et al.*, (2008) attribute this mainly to the different productivity performance of market services in the two economies, *de facto* rejecting Baumol's cost disease in the case of US. It appears that services, rather than slowing down productivity growth, have actually been the engine that has sustained US overall productivity performance and the main reason behind the increasing productivity gap between US and EU. This point deserves a more detailed exploration.

3.2 The EU-US productivity gap: has the Baumol's disease been cured?

The later Baumol (Baumol *et al.*, 1985) claims that services are affected by a cost disease and supports this argument on the basis of empirical evidence of a productivity slowdown in the US economy from 1973 onwards. A productivity slowdown has actually characterized the US economy in the seventies and eighties (as pointed out by Griliches, 1992) and economists have tried to explain it, pointing the finger at the service sector, up to a flex point, which signs a change in trend and a new upsurge in productivity growth rates, as picked by Bosworth and Triplett (2007). In their own words “the post-1973 puzzle was never resolved, just abandoned by economists when they were confronted with a new problem – the acceleration of US productivity growth after about 1995” (Bosworth and Triplett, 2007, p. 413).

According to the empirical evidence, this increase can be mainly attributed to the growth of productivity in the market service sector, most likely linked to the diffusion of ICTs, relatively higher in services than in the manufacturing sector. So is the main suspect for the prior productivity slowdown now the main responsible for the recorded increase? On the basis of what empirical evidence? And why does this hold in the case of the US only and not in the EU economy? Let us try to answer these questions one by one, starting with the issue of data.

3.2.1 New evidence on productivity: the BEA and EU KLEMS datasets

Griliches (1992) used the statistics on productivity collected by the US Bureau of Economic Analysis (BEA) at the industry level and already at the time had identified several problematic aspects of the process of data collection. Among others, the measurement of the output of some service sectors by means of the inputs used in the production process (setting the productivity increase to zero by definition) or the problematic procedure of the double deflation (Griliches, 1992, p. 8).

Over time, the data collection of BEA has substantially improved, along the lines proposed by Griliches, as the inclusion among the inputs of capital services from diverse typology of assets, with separate measure for ICT capital services and deflated intermediate inputs (Bosworth and Triplett, 2007, p. 415).

At the European level, a new dataset at the industry level has been collected, which allows improved empirical analysis on productivity: the EU KLEMS database. This includes data from 25 EU member states[16] from 1970 to 2005, with different coverage from country to country (for a full description see Timmer *et al.*, 2007; O'Mahony and Timmer, 2009). The dataset is constructed in line with the growth accounting framework and decomposes the growth of gross output in eight components: intermediate energy inputs, intermediate material inputs, intermediate service inputs, ICT capital, non-ICT capital, labour composition, hours worked and technical change.

[16] Data on US an Japan are also included in the dataset.

Drawing on these more comprehensive sources, a new wave of empirical work has been able to prove that the increase of productivity in the US from 1995 onwards was mainly to be attributed to the market service sector and that the widening productivity gap between US and EU is therefore mainly due to differences of the service sectors in the two economies.

3.2.2 The productivity gap between the EU and US in historical perspective

A series of recent contributions (Inklaar *et al.*, 2008; Van Ark *et al.*, 2008; Timmer *et al.*, 2011) have reconstructed the historical differences in the productivity trend between the EU economies and the US, using the EU KLEMS database to investigate the causes of the patterns observed in the last decades.

Three distinct periods in the trend of EU-US productivity have been identified.
The first one, from the aftermath of World War II to 1973, was characterized by "the typical catching-up pattern, based on imitation and adaptation of foreign technology, coupled with strong investment and supporting institutions" (Timmer *et al.*, 2011, p. 4).

The second period, from 1973 to 1995, has registered a slowdown in productivity and economic growth both in the EU an US, but the distance in output and per capita income levels reduced and the EU experienced a brief period of relative faster productivity growth (although slower than the one in the previous period). The relative increase in the EU productivity was mainly due to a decrease in labour force participation rate coupled with the reduction in working hours per person employed, as a consequence of the prevalent labour market institutions in EU countries, characterized by a considerable level of rigidity, which in turn led to increasing labour cost. The other side of the decline in labour input was an increase in capital intensity.

In the third and last period, from 1995 to 2007, while EU productivity was steadily decreasing, the US experienced a steady and remarkable increase. EU productivity fell down from an average annual labour productivity of 2.7 per cent over 1973-1995 to a 1.5 per cent in the following 1995-2007 phase, while for the US we detected an increase from an annual average 1.3 to 2.1 per cent in the same time span (Timmer *et al.*, 2011, pg 8).

Before turning to the possible explanations of the widening EU-US gap, it is interesting to notice that this has also characterised the most recent financial crisis years 2007-2009. While the EU showed the usual pro-cyclical pattern, the US saw an unusual anti-cyclical trend, with labour productivity growing at an average 1.6 per cent per year, compared to an yearly average of -0.7 per cent in EU in the same period (Timmer *et al.*, 2011, p. 9).

3.2.3 The role of market services in productivity growth

Using the BEA dataset, combined with data from the Bureau of Labour Statistics (BLS), Bosworth and Triplett (2007) estimated labour productivity and multifactor productivity at different level of sectoral aggregation (1 and 2 digits). Table 1 summarises their findings.

Table 1: Labour productivity and multifactor productivity growth (average annual growth in percentage points) in goods producing and service producing industries

	1987–1995	1995–2001	Change
	Labor productivity		
Goods-producing industries	1.8	2.3	0.5
Service-producing industries	0.7	2.6	1.8
	Multifactor productivity		
Goods-producing industries	1.2	1.3	0.1
Service-producing industries	0.3	1.5	1.1

Source: adapted from table 14.1 in Bosworth and Triplett, 2007, pg. 416

Interestingly, the LP growth from 1987-1995 to the 1995-2001 has been respectively 1.8 per cent in the service sector and 0.5 per cent in manufacturing.

Also in terms of multifactor productivity (MFP), the annual growth in the service sector over 1995-2001 overtook the manufacturing one (1.5 against 1.3 per cent). The acceleration with respect to the period 1987-1995 is impressive, with an increase of 1.1 per cent point for the service sector and only 0.1 for the manufacturing one (Bosworth and Triplett, 2007, pg. 416).

Looking at the data at the industry level for both LP and MFP, not surprisingly in both sectors we find a disparity of trends across different industries. Still, at the aggregate level, the picture is quite clear, with a net increase in LP and MFP in the service sector, which leads Triplett and Bosworth to affirm that "Baumol's disease has been cured" (2003, p. 23).

Is the source of this productivity increase attributable to an actual improvement or is it a mere consequence of changes in data collection? According to Jorgenson *et al.* (2008), we can identify two distinct sources over 1995-2004. From 1995 to 2000, the growth of productivity was led by ICT-producing sectors and by the increasing use of ICT equipment in all the sectors of the economy (with a capital deepening effect). Starting from the year 2000, "the sources of productivity growth have shifted as total factor productivity growth outside of the production of information technology increased" (Jorgenson *et al.*, 2008, p. 4). Hence, the EU productivity slowdown (compared to the US) is likely to be due either to a lower production/use of ICT equipment or to a lower multifactor productivity, i.e. a lower efficiency in the use of inputs in the productive process.

Van Ark *et al.* (2008) and Timmer *et al.* (2011) using the EU-KLEMS data, decompose the growth in labour productivity and find that the major driver of the difference between the US and EU (and among EU countries) is the difference in multifactor productivity[17], especially in the market service sector, confirming what already shown by Inklaar *et al.*, 2007, based on a different data source.

All in all, the fact that the main reason behind the EU-US gap in productivity growth has been imputed to differences in multi-factor productivity is an implicit admission of 'our ignorance'[18] and that – despite improvements in the data collection and coverage and the admission of methodological problems - unresolved issues are still there and a conceptual effort to define service output and sources of productivity increases have not been guiding the empirical collection. Yet, much of the argument linked to the Baumol's cost disease seems to have been empirically rejected, on the basis of new, available data sources.

4. Does productivity always matter (for services)?

The empirical literature illustrated in Section 3 relies on the tools reviewed in Section 2 and has developed on the basis of traditional methods of measuring productivity. The question of whether

[17] Multifactor productivity (or total factor productivity) is a residual measure that accounts for the variation in output growth after having discounted the contribution of all the inputs used in the production process. MFP can therefore be interpreted as a measure of disembodied technical change and efficiency of the production process itself. However, as a residual measure, it actually includes by definition a whole series of other effects, such as the impact of organizational and institutional modifications, the changes in the returns to scale, the effects of externalities and unmeasured inputs and, finally, measurement errors (see Inklaar *et al*., 2008, p. 148).

[18] Rephrasing Abramovitz (1956, p. 11) we can say that "since we know little about the causes of productivity increase, the indicated importance of this element (multifactor productivity) may be taken to be some sort of measure of our ignorance about the causes of economic growth"

the very concept of productivity is appropriate for services has never been even raised, despite the methodological limitations already pointed out twenty years ago by Griliches (1992).

As anticipated, a further set of scholars – standing against the conventional ways of using productivity indicators to assess productivity performance in services, supported by scholars who believe that indicators should be adjusted and standardised to allow cross sectoral comparisons - claim that the concept of productivity itself does not matter for services the same way as in the manufacturing sector and that a radically new set of indicators to assess performance in services are needed. We briefly review these stands, and then put forward our own.

4.1 The "need for a readjustment of tools" stand

A substantial part of the literature on service sector productivity aims to adapt or redefine the analytical tools developed to measure productivity in manufacturing in order to take account of the specificities of services. The attempt to compute a productivity index for services that takes into account quality changes goes in this direction. This can be done directly (as suggested, among others, by Vourinen *et al.*, 1998) by including direct measure of quality in the gross productivity index. This becomes the ratio between a measure of output volume weighed by a measure of output quality and a measure of input volume weighed by a measure of input quality. The problem – once again - is to find a reliable direct measure of quality for output and input. Quality changes can be also considered in an indirect way through the use of hedonic prices, as done in the ICT sector (see section 2.3.3).

Further, non-parametric methods –and in particular data envelopment analysis (see section 2.2) - are adopted in the analysis on service sector productivity. Their ability to deal with multiple inputs and outputs without requiring a predetermined functional form of the production function is a feature that makes them suitable to be used in the service sector (for a recent review of the application of DEA methods in the service sector see, for example, Avkiran 2011).

A slightly different approach is the one proposed by Grönroos and Ojasalo (2004), who develop a specific model for services in which productivity is a function of internal efficiency, external efficiency and capacity efficiency. Internal efficiency is defined as the ability of convert inputs into outputs within the firm while external efficiency refers to how the quality of the service is perceived outside the firm. Capacity efficiency refers to the ability of the firm to deal with changes in demand, considering for instance that services are not stockable. Considering these three dimensions of efficiency, they end up with a general formula to calculate productivity in services as the ratio between revenues from a given services over cost of producing this services or, in more general terms, total revenues over total costs (Grönroos and Ojasalo, 2004, pg 421). The index increases if revenues increase due to an increase of quality or if costs decrease due to a reduction of inputs.

However, the use of revenues allows to take into account the fact – mentioned in Section 2.3.2 - that a reduction of input might be perceived as a reduction of quality, causing a reduction of revenue and so a reduction in the value of the index (as long as revenue reduction is greater than cost reduction). As Grönroos and Ojasalo (2004, p. 421) themselves point out, this kind of measure is not without problems, giving that revenues are not always an accurate measure of output and can be a bad measure of quality in non-competitive markets[19].

4.2 The "no need of the concept of productivity in services" stand

A somewhat radical position is proposed by Djellal and Gallouj (2008 and 2010). Drawing upon the distinction suggested by Gadrey (1988) between output and outcome and analysing the implications for the concept of productivity in the service sector, they call for a multi-criteria evaluation in which productivity is only part of the story.

They argue that the concept of productivity itself is perhaps not that essential in a post-fordist economy and propose to shift from the need of measuring to the one of evaluating. Their suggestion is to use valuation convention to define output and compute performance indexes, and consider a number of different "worlds and value systems" (Djellal and Gallouj, 2008, p. 51). There are six different worlds: industrial and technical world, market and financial world, relational or domestic world, civic world, world of innovation, world of reputation (for a more detailed description see Djellal and Gallouj, 2008, p. 53). Performance is then assessed with respect to the output or direct product and the outcome or indirect product, which have to be taken into account respectively in the short and long term.

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[19] It is worth noting that there is also a different perspective on the issue of productivity in services that can somehow be considered part of what we have called the "tool readjustment" position. This point of view reverses in a sense the perspective: instead of adjusting productivity measurement tools to consider services' specificities, we reinterpret services output to make it more similar to manufacturing so that we can use the standard productivity measures. With "industrialized" services, we can compute productivity as we do in the manufacturing sector with not many methodological or mis-measurement problems (for a recent example of this kind of view see Hartigh and Zegveld, 2011).

All in all, this approach boils down to a multi-criteria evaluation method to assess the performances in the service sector. As intriguing as this perspective can be, it would require a huge amount of data to be operationalized. Virtually the lack of possibility to compare performances across space (different organization are likely to have different value systems) and time (the same organization can have a certain value system at time t_1 and a different one at time t_2) makes this perspective very appealing though poorly operational.

5. A reflection and a proposed way forward

The existing literature has explored several directions that depart from the position of Adam Smith on "unproductive labour"[20]. Despite an initial predominance of the Kaldorian/Baumolian view of a "tertiarisation curse" in terms of productivity growth, this has been superseded by a 'knowledge economy" view, which instead views services as the main actors of the recent US productivity resurgence.

In practice, methods to calculate productivity employ a mix of methods differing by sector for measuring service output – 1) inputs are taken to be outputs, 2) rough deflation in which expenditure is deflated by an index not specific to the service output, 3) physical measures of services delivered (e.g. letters delivered) and 4) expenditures divided by a sector specific price index derived from expenditure surveys (as in the case of hair dressing) or from cost estimates. (Oulton, 1999). Each of these measures is an approximation that aims at treating service output in a comparable way to industries with relative homogeneous outputs. This subterfuge – as we have argued so far - was pointed out as a major drawback in services output (and productivity) measurement by Griliches twenty years ago (Griliches, 1992) and has not been substantially tackled by recent developments, both in terms of data collection and definition of output.

In the presence of technical change, these issues are even more severe, as technical change might lead to a significant increase in the heterogeneity of outputs and – along the same lines – might translate into a variety of input-saving processes, depending on which input is saved and whether an input re-allocation within the production process occurs. From both an economic and

[20] "Unproductive labour does not fix or realise itself in any particular subject or vendible commodity. His services generally perish in the very instant of their performance, and seldom leave any trace of value behind them, for which an equal quantity of services could afterwards be procured" (Smith (1998) [1776] : Book II, first para. of Ch. III)

innovation theory perspective, therefore, the puzzle is both conceptual and methodological: to what extent changes in quality of the inputs or outputs or both represent innovations leading to productivity increases? How do we account for innovativeness in terms of quality change and how do we embody this into measurement of productivity? What kind of relation can be established between traditional indicators of product and process innovation and, respectively, for quality-enhancing productivity and input saving productivity?

In order for advances to be made in these inter-linked domains of productivity and innovation in services, a better theoretical conception of service 'production' and output definition is needed. We propose one that builds upon the foundations of service production along the lines suggested by Gallouj and Weinstein, 1997 and Gallouj and Savona, 2009, who reprise the Lancasterian (and post-Lancasterian) approach to define output.

According to the characteristics- based approach in its original formulation (Lancaster, 1966) and in those which followed (Saviotti and Metcalfe, 1984; Gallouj and Weinstein, 1997; Gadrey, 2000; Gallouj and Savona, 2009), output is represented by a set of vectors of characteristics and competences, linked to each other. Vectors of characteristics include technical ones, service ones (or, interestingly, 'final users' value') and competences, both of supplier and user.

The Lancasterian framework offers an interesting conceptual platform that allows advances in both the output definition of services and on the effect of technical change on it in terms of various forms of innovation. Also, it allows including the role of customers in the innovation process – this latter having been claimed to be more important in services than in other sectors, due to the co-terminality between delivery and consumption. Further, and most importantly, looking at an output in terms of characteristics and competences makes us go beyond the market and non-market contexts in which outputs may be delivered to consumers.

Similarly, besides the urge of reworking output definition, we believe that a similar effort should be conducted on the *input side*. Productivity increases might well come from input-saving innovation – mostly associated to process innovation. In the case of services – as well as in goods – we argue that input-saving productivity increases are to be considered in terms of substitution between different intermediate inputs, including energy and time along with labour and capital. This would allow us to "weigh" from a welfare perspective the type of input-saving productivity enhancements (and even rank the specific input-saving process in terms of "social desirability").

For instance, energy saving (process) innovations might well be more desirable than labour-saving (process) innovation from a welfare perspective. Or, rather, deskilling innovation is less favourable than up-skilling innovation, should we be able to choose between two different (and seemingly equivalent) labour-saving productivity increases. Along the same lines, *time-saving productivity enhancements* have to be considered within an innovation framework and assessed against capital-deepening or capital-widening related productivity increases.

In another contribution (Savona and Steinmueller, 2013) we have put forward the concept of time-saving productivity in services, based on a simple model. This focuses on the productivity increases obtained from innovation offering time-saving opportunities, and/or innovations that allow changing the intensity of informatisation or degrees of co-production. Accounting for the interaction between co-production and information allows us to assess productivity increases on both producer and consumer side.

On the consumer side, the model considers the entire spectrum of choices of time allocation between customer self-production and different degrees of co-production with the supplier – up to the total outsource to the service provider of service provision.

On the producer side, productivity increases can be achieved through several channels. First, the service provider might aim at encouraging opportunities for co-production, in the case that this will reduce labour costs and, under certain conditions, increase the demand. Second, the informational component of the service, which is a typical sunk cost, is spread over a larger consumer base, where this latter is achieved either by increasing the extent of co-production or by directly increasing the demand. Third, the informational component of the service can benefit by increases in standardisation, which in turn might increase market shares and productivity. Finally, the degree of co-production might be extended to a pure self-service case, in line with what predicted by Gershuny (1978). The dramatic gains in productivity as a result of self-service might also be assessed against what has been labelled a 'transaction-multiplier effect' (Mesenbourg, 2000), and, despite the original application of this term to e-business services, it might well be occurring in e-services in general.

Overall, we suggest that – when considering technical change associated to the increasing informatisation of services[21] and the time-saving productivity gains resulting from it – the scenario put forward by Gershuny in the 1970s should be radically revisited. In his account, (see Gershuny 1978) the large diffusion of mass-consumption, durable goods with high capital intensity would have gradually replaced the use of services and led to a "self-service economy" (1978).

The paradigmatic change brought about by the ICT revolution and most especially the way this has affected how services are produced, organised and delivered, has – in our view – radically modified this trend. As argued in Savona and Steinmueller (2013), scenarios of self-service economies resulting from increasing capital-deepening and –widening are being replaced by a trend of increasing presence of co-produced, time-saving, ICT-deepening and –widening services. Increases in services productivity are no longer – or not only – to be found in durable goods replacing labour intensive services but mainly in ICT-enabled co-produced services, where productivity increases reside in time-saved for both producers and consumers. Such increases depend of course on the substitution elasticity between reduced labour costs and degree of co-production for the producer, and on time-saving preferences and trade-off between service price and costs associated to the time imputed in the co-production for the consumer. We are aware that use of the time-saving framework to capture productivity increases can in principle be applied to any final (or intermediate for what matters) good, where co-production is meant to represent the degree of division of labour occurring in the production process. However, we argue that it is of particular relevance for services, as the degree of co-production here typically involves customers rather than other producers.

An attempt to empirically support our conjecture is illustrated below. Here we cannot capture the degree of co-production associated with a certain amount of time-saving and labour-saving productivity increases for both consumer and producer. However, we are able to consider multiple dimensions of input-saving productivity increases.

5.1 An empirical example

Figures 1.A, 1.B and 1.C below show the trends of input using changes across sectors over time in the UK, taking into account a wider variety of intermediate inputs.

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[21] See for instance the cases of public e-services illustrated in Savona and Steinmueller (2013).

Using data from the EU KLEMS database[22], these figures show the relative use of inputs in the total economy, the manufacturing sector (excluding electrical appliances)[23] and the market services sector (excluding post and telecommunications)[24]. The inputs considered are: “labour”; “capital ICT”; “capital non ICT”; “intermediate energy inputs”; “intermediate material inputs”; and “intermediate service inputs”. All inputs are measured in volume terms (base year 1995), so being 100 the sum of all the inputs entering in the production process, the trend in their relative use covers a 35 years period (1970-2005).

Clearly, the most relevant trend is the change in the production mix due to the introduction and diffusion of ICT capital, with a relative reduction in the use of labour. This is true also if we look separately at the manufacturing and the service sectors.

A better account of input-saving productivity increases – and possibly time-saving productivity increases - seems to us a key starting point to re-assess productivity in services. This is all the more so, as it has a tremendous relevance from a policy perspective within the recent debate on EU smart and inclusive growth, that is in economies which are for their largest shares service economies.

[22] See section 3.2.1

[23] In this sector we have: “food products, beverages and tobacco”; ”textiles, textile products, leather and footwear”; “manufacturing nec; recycling”; “wood and products of wood and cork”; “pulp, paper, paper products, printing and publishing”; “Coke, refined petroleum products and nuclear fuel”; “Chemicals and chemical products”; “Rubber and plastics products”; “Other non-metallic mineral products”; “Basic metals and fabricated metal products”; “machinery, nec”; and “transport equipment”.

[24] In this sector we have: “trade”; “sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel”; “wholesale trade and commission trade, except of motor vehicles and motorcycles”; “retail trade, except of motor vehicles and motorcycles; repair of household goods”; “transport and storage”; “financial intermediation”; “renting of m&eq and other business activities”; “hotels and restaurants”; “other community, social and personal services”; and “private households with employed persons”.

Fig 1.A: Relative use of inputs (measured in volume indices, 1995 = 100) in the UK 1970-2005_Total Indusitres

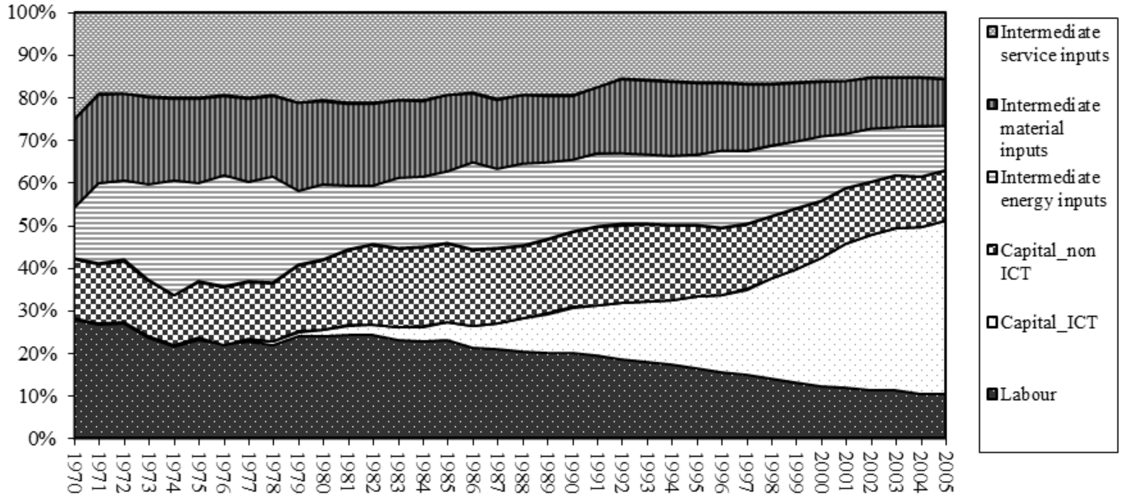


Fig 1.B: Relative use of inputs (measured in volume indices, 1995 = 100) in the UK 1970-2005_Total Manufacturing, excluding Electrical

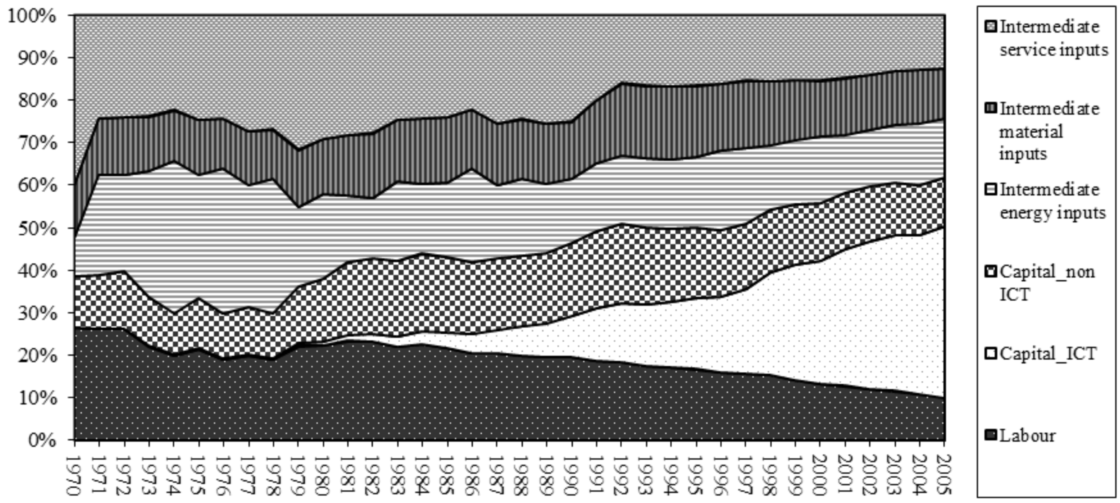
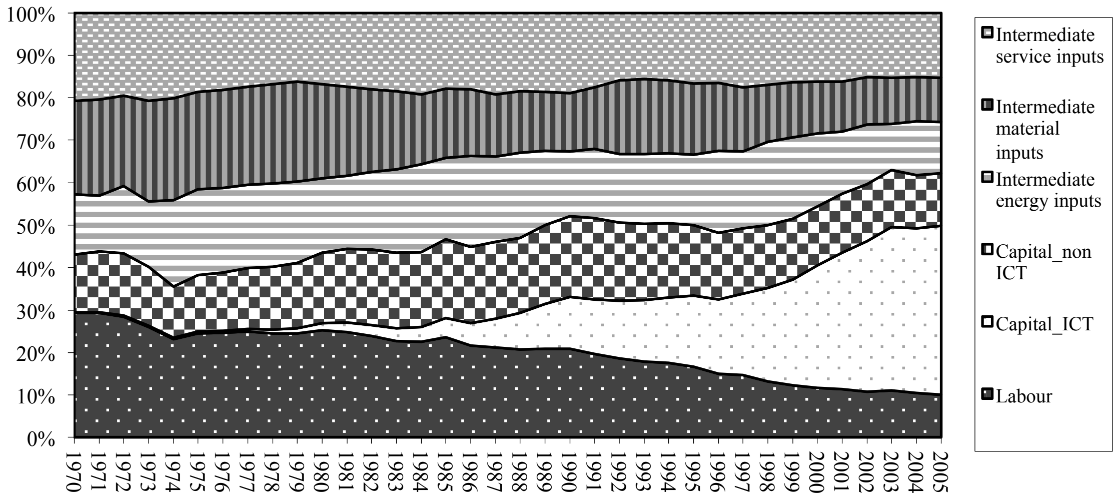


Fig 1.C: Relative use of inputs (measured in volume indices, 1995 = 100) in the UK 1970-2005_Market Services, excluding Post and Telecommunications



6. Concluding remarks

This paper has attempted to systematise the literature on productivity in services, by reviewing conceptualisation, measurement methods and empirical trends on productivity in services. We have singled out three issues which seem relevant in this context and selectively reviewed the literature according to whether it could provide us with convincing answers to these: (i) the appropriateness of the standard concept and measurement of productivity for services; (ii) the account of technical change and innovation in both the conceptualisation and measurement of productivity in services; (iii) the proposal of new, better ways to conceptualise and measure productivity in services, should traditional indicators of productivity be found misleading or mis-representing when applied to services.

What we have found is that most of the literature has for long time studied services using analytical and empirical tools developed for analysis in the manufacturing sector, often without tailoring them on the peculiarities of services. The use of productivity as a measure of economic performance is one of the most outstanding examples of this. We have seen how the characteristics of the output in the service sector have affected the initial estimates of productivity, guiding to the conclusion of the natural technological backwardness of services.

Only with improved conceptualization and more accurate data, evidence has emerged supporting the view of services not as an unproductive burden for the economic, but as a potential driver of economic growth.

The road ahead is still long, though here we have suggested two possible directions for further research.

The first one is a better conceptualization of the output of services along the line of the characteristics-based approach, and especially an empirical implementation of it, illustrated in Section 5.

The second, largely unexplored, direction regards a deeper understanding of inputs in their connection with productivity. Studying the input-saving and input-substitution effects of changes in productivity in the service sector, especially in a world of increasing pressure on “new” scarce resources such as *time* and - to a certain extent – *energy*, is an important goal for future analysis.

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