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Growth and productivity in the service sector: The state of the art

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GROWTH AND PRODUCTIVITY IN THE SERVICE SECTOR: THE STATE OF THE ART

ABSTRACT

Literature on growth accounting has generally introduced productivity to explain the growth of services. One of the most conventional statements in economics, with regard to the services sector suggests that, as a whole, this sector has a lower productivity level than the other productive sectors, and that its growth is always quite slow. Such a statement is based initially on the personal nature of many services, which makes it difficult to substitute the work for capital factor and the incorporation of technical progress. From this approach we can derive the relative lower productivity in some advanced economies (such as the European countries versus the United States and some particular emergent economies) as an explanation of the growth of the tertiary sector. In this working paper, we will look in greater depth at issues related to services productivity, from conceptual aspects regarding the definition and meaning of productivity, to methodological and measurement of services productivity. This paper is essentially a necessary state of the art of relationships between economic growth and productivity within services sector, reviewing not only the conventional literature but also those new waves of thinking.

Keywords: Services, Productivity, Structural Change, Economic Growth

RESUMEN:

La literatura económica sobre crecimiento económico y cambios estructurales tradicionalmente ha acudido a la productividad para explicar el crecimiento del sector servicios. Por otra parte, uno de los hechos convencionalmente más aceptados dentro de la teoría económica, en lo que respecta al sector servicios en particular, es que, en conjunto, dicho sector presenta unos niveles y tasas de crecimiento de la productividad por debajo del resto de sectores productivos. Dicha tesis se asentaba inicialmente en el carácter personal de muchos servicios, lo que dificultaba la sustitución de trabajo por capital y la incorporación de progresos técnicos a los procesos de producción. Desde este punto de vista, el estancamiento en el crecimiento de la productividad de algunas economías avanzadas (como es el caso de las europeas con respecto a Estados Unidos o algunos países emergentes) se podría deber al peso del sector servicios en dichas economías. En este documento de trabajo se profundizará en todos los aspectos relacionados con la productividad en el sector servicios, desde el punto de vista conceptual – en cuanto a su definición y significado – y metodológico – sesgos y problemas de medición. Esencialmente, se trata de una necesaria revisión sobre la literatura relacionada con los servicios, el crecimiento económico y la productividad, no sólo de las tesis tradicionales sino también de las últimas y novedades olas de pensamiento sobre la materia.

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1. INTRODUCTION

European economies are advanced economies, and this is why they are also services economies. In developed countries, the service sector has evolved continually over the past thirty years, modifying the structure of employment and the composition of value added. Nowadays, services companies generate about 70 per cent of value added and employment in the most developed countries. Both economic historians and economists have invested great efforts in the attempt to explain the conundrums of economic growth. But, in spite of the large part played by services in modern economies, this sector has received little attention. As stated in the previous block, the service economy has not necessarily grown at the expense of the industrial economy, but within a type of 'servindustrial' society where interrelations between goods and services are of primary importance.

Despite the recent advances, services are still inadequately studied by researchers, underestimated by politicians and insufficiently exploited by many entrepreneurs. The traditional perception of services as unproductive still persists in the common mind of the present society. Even today, in the centre of a society characterized by knowledge, information and intangibles, many still consider services as secondary activities to economic growth. This idea is inherited from a materialist concept which, literally speaking, ostentatiously conflicts with the current reality.

Taking as a basis the 'new' characteristics of the service economy (Rubalcaba, 2007) the reasons for analyzing services can be summarized as follows. First, they represent the major share of developed economies and are increasingly integrated in the overall production system. Secondly, they play a much more active role in market integration and globalisation. Third, the creation of employment, added value and income is increasingly related to the good performance of services. And finally, many services markets and advanced economies, having been protected by public monopolies and protectionist regulations, are opening up to competition in recent decades. These basic characteristics can be complemented with some specific new EU developments. A series of deficits and challenges concerning the services economy have been pointed out, and it is therefore necessary to identify, document and justify those policies most consistent with the real problems of the sector.

This paper summarizes the literature views on the reasons underlying the growth of services and related employment, and we will deep into the role and impact of services on economic growth in the first section. This section will introduce productivity to explain the growth of services. One of the most conventional statement in economics, with regard to the services sector, states that, as a whole, this sector has a lower productivity level than the other productive sectors, and that its growth

is always quite slow. In the second section, we will look in greater depth at issues related to services productivity, from conceptual aspects regarding the definition and meaning of productivity, to methodological and measurement of services productivity. The latter gives rise to serious difficulties when analysing the relationships between productivity and services sector. Analysis of the existing statistics reveals an alternative approach to this controversial issue, thus contributing unexpected results when taking into account the traditional theory.

2. SERVICES AND ECONOMIC GROWTH: ONE WAY OR RETURN TICKET?

What is the relationship between the structural change and economic growth? Does the economy grow independently from economic structure? An essential insight of classical development economies was that economic growth is intrinsically linked to changes in the structure of production and employment. According to this point of view, industrialization is the driver of technical change, and overall productivity increases are mainly the results of the reallocation of labour from low- to high-productivity activities. The role of the structural changes in economic growth has been taken into consideration from Adam Smith and David Ricardo onwards. Despite the growing interest in this topic and the originality of some models recently presented, the idea that the productive structure and the changes in its pattern influence growth is as old as the Economy (Reinert, 1993, 1995). The studies have traditionally focused on two processes¹: '*tertiarization*' or the creation of a services society (Chenery and Taylor, 1968; Bell, 1974; Fuchs, 1968; and Lanciotti, 1971, among others); and '*deindustrialization*' which started in the economic crisis of the 70s (OECD, 1975; Blackaby, 1978; Gemmell, 1982, among others).

At the dawn of the 21st century, all highly industrialized countries have become 'service economies', at least when measured in terms of the share of the workforce employed in services and even more so if the employment share in service occupations is considered. The 'revolutionary proportions' of which Fuchs spoke in his influential 1968 study, have become increasingly visible². Although the revolution of the structure of employment has reached unprecedented proportions, only a few authors (Raa and Schettkat, 2001; Schettkat and Yocarini, 2003 and 2006) have faced at a full understanding of the factors accounting for the continuous shift to service industry employment.

Due to the numerous factors affecting dimensions of the services sector, this section aims to prove that one sole argument is insufficient to

¹ For further information, consult Siniscalco (1985).

² Although some authors say that official data overstate the shift to services (Hammes et al., 1989; Gunlach, 1994).

explain the boost experienced by the sector in the last thirty years. Here, the two classical reasons for services growth will be explained: its difference of productivity compared to other sectors and the effects of the income increase of developed countries; but, we will also tackle the most recent explanations developed since the 80s considering the role of the progressive flexibility of production systems, the incorporation of new technologies, human capital, interrelations with industries and business services, outsourcing, globalization and governmental regulations in this process.

Firstly, researchers have mainly cited the relative **productivity** of services to explain the sector's growth. Although its development dates back to the 40s from works carried out by Fourastié (1949), it was not until the 60s that the thesis reached its peak with Baumol's 'cost disease' arguments (Baumol and Bowen, 1966; Baumol, 1967). It explains the uneven growth of sectors due to relocation of resources towards more or less productive sectors. This resource relocation affects the total aggregate growth, which at the same time is depleted by the uneven growth (Kravis *et al.*, 1983). Services, which have difficulty with incorporating technological capital, consider labour as a good in itself, and have high price (Kravis *et al.* 1981; Summers, 1985; Bhagwati, 1984; Summers and Heston, 1988; Baumol *et al.*, 1985), and income inelasticities (Curtis and Murthy, 1998). They tend, however, to adopt the salaries of more productive sectors, playing the role of a stagnant sector. One way to check this theory, as did Wölfl (2005), is to compare the growths of productivity in manufacturing and services, thus demonstrating lower growth in services productivity. Another method for verifying Baumol's thesis is to compare directly the employment and productivity growth rates of intra- and inter-sectors, as in Rubalcaba (2007). Results suggest that Baumol's hypothesis may still hold validity for the service sector as such. Nevertheless, similar analyses of specific service sectors provide different results (Maroto and Rubalcaba, 2008; Baily and Solow, 2001; van Ark *et al.*, 2002), suggesting even that cost disease may be cured (Bosworth and Triplett, 2001).

Another explanation for services expansion, which is a result of the well-known *Engel's law*³, is the increased **income** level in developed economics. In those countries with higher income per capita, the participation of the services sector in employment is also higher (Samuelson, 1964, Bhagwati, 1984, 1985). This fact has been proven on many occasions, such as in the works carried out by Maddison (1980) or more recently by those of Kravis *et al.* (1984), Falvey and Gemmel (1996) or OECD (2005a). This '*hierarchy of needs*' hypothesis has been empirically challenged by the work of Summers (1985), who investigated the relationship between the shares of expenditures on services and income levels in various countries. Baumol (2001) uses

³ Fisher (1935) and Clark (1940) applied it to the demand for manufacturing goods arguing that the income elasticity of demand for goods is less than one but that services are luxuries with an income-elasticity greater than one.

Summer's evidence as support for his hypothesis of constant service shares in real output. Another, more natural, approach to test whether final demand shifts to services to rising income per capita is to exploit the longitudinal dimension of demand within countries (Shettkat, 2004). Even at the aggregate level the constant demand share hypothesis requires that service demand either have a price elasticity of zero or that the positive income elasticities exactly compensate the negative price elasticities (Appelbaum and Schettkat, 1999). Finally, other works have analyzed household demand patterns for services and goods (Fuchs, 1968; Skolka, 1976; Gershuny, 1978; Gershuny and Miles, 1983; Rawthorn and Wells, 1987; Gregory *et al.*, 2007).

Limits to income and productivity as explanations of services growth suggest more **structural explanations**. These alternative explanations include services in the whole productive system, which has been facilitated by the increase of flexibility, the incorporation of new technologies and the emergence of new qualifications and the need for labour specialization.

A number of studies have attempted to develop a better understanding of the expansion of service employment by reclassifying service industries⁴ according to the purpose of a service or to the form of its provision. Recent studies conclude that the increasing services employment is to 10-40% caused by shifts in **intermediate demand** (Elfring, 1988a and b, 1989). Another way of investigating the changing size of services is by dividing the economy on the basis of occupations rather than industries, thereby capturing the increasing tertiarization of the goods production process (Freeman and Schettkat, 1999). One specific reason explains the emergence of services as an intermediate demand: the changes in the productive systems, which explain their use, and, where relevant, their outsourcing (Kox, 2002; Rubalcaba, 1999; OECD, 2005a). Changes in productive systems refer to a higher flexibility of the production processes, which can be associated with new specializations that led to more professional services and, therefore, to processes of services use and outsourcing (Pilat, 2000). Although flexible systems have existed since the industrial revolution (Gertler, 1988), it must be acknowledged that the foundations for a completely new working environment are being laid out (Giarini and Stahel, 1993). The initial theories put forward by Taylor (1911) and Fayol (1916) remain obsolete in those production systems where the issue of information and *metainformation* play a predominant role. In this context, new concepts derive from the limited rationality principle introduced by Simon's organization theory (1945). The concepts of flexible specialization (Piore and Sabel, 1984) and flexible integration

⁴ Most reclassification studies (Scharpf, 1990) use a fourfold classification of services first developed by Katouzian (1970) and subsequently altered by Singelmann (1978) distinguishing between distributive, producer, social, and personal services (Schettkat and Yocarini, 2006). Other classifications distinguishes between information-processing and goods-handling activities (Castles, 1995; Albin and Appelbaum, 1990)

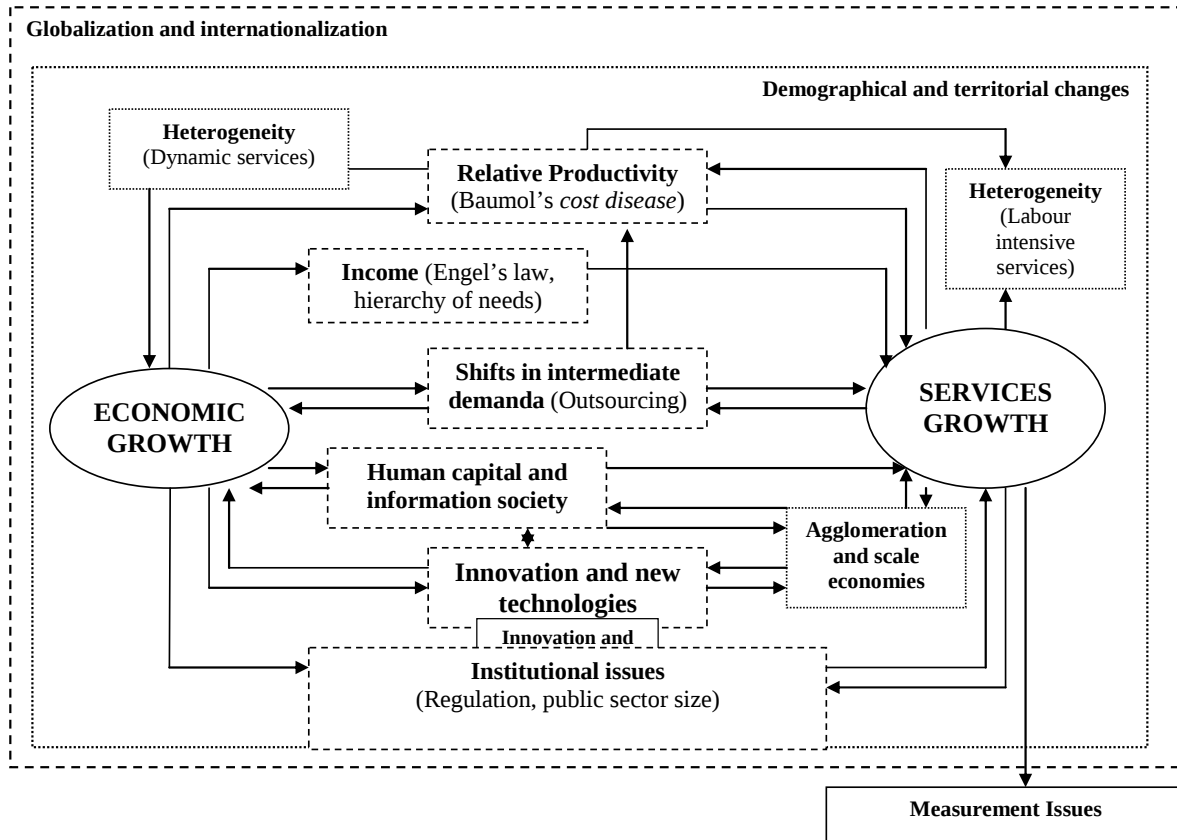
(Cooke, 1988; Valery, 1987) have turned the word '*flexibility*' into the new sphere of the industrial production game.

In part, the incomes in specialization derived from the flexible production system have been channelled towards **outsourcing**, as in the case of services. De Groot (1998) made a first move to standardize outsourcing processes of service activities by manufacturing companies, and to analyze their effects on economic growth. Rubalcaba in 1999 defined the advantages and disadvantages of outsourcing. Kox (2002) analyses the effects of labour division using services outsourcing processes. François and Reinert (1995) discovered that those countries where services producers played a more important role over the total of intermediate inputs within the manufacturing sector also registered a higher GDP per capita. According to Pilat and Wölfl (2005) deep interrelations between services and manufacturing cause an increasingly diffuse distinction between both. Even, commentators such as Greenhalgh and Gregory (2001) or Gregory and Russo (2006) show that outsourcing from service industries to service industries rather than from manufacturing to services is the major force for the expansion of business services. Finally, other works with input-output tables have emphasized the integration between services and manufacturing using direct use coefficients (Petit, 1986; Russo and Schettkat, 1999, 2001; Greenhalgh and Gregory, 2001; European Commission, 2004a; Wölfl, 2005; Gregory and Russo, 2006; Camacho and Rodriguez, 2007; Baker, 2007).

Although the latter explanations have been those more extended in the specialized literature, some others are worth to be mentioned in this paper. Technology and innovation are key elements for boosting the economy (Freeman and Soete, 1987). **ICTs**, in particular, have implied a revolution in the tertiary sector (Hansen, 1993; Glasmeier and Howland, 1994). Additionally, growth and development of services might be based on **human capital**. It is known fact that production in the tertiary sector has a higher amount of qualified labour than in manufacturing (Messina, 2004; OECD, 2005a). In the late 90s the proportion of university and non-university workers contracted by the services industry was three times that of the secondary sector (OECD, 2000b). The growth of some business services (such as management consultants) has been associated with the accumulation of expertise and specialization processes (Stanback, 1979; Stanback *et al.*, 1981; Wood, 1991). Competitive pressures associated with market globalisation have changed the relationships among companies, increasing the need for modernization and promoting interaction. In this sense, **internationalization** contributes to the increase in demand for services (Illeris, 1989; Coffey and Bailey, 1990; Howells, 1988; Cuadrado *et al.*, 2002), although these results are limited (Wölfl, 2005). The last block of explanatory factors covers the role of the **State, institutions and social changes**. The State is influential in various ways. Apart from the existence of public services and the management of services in liberalization processes (François and Schuknecht, 1999; Mattoo *et al.*,

2001; Gordon and Gupta, 2004; Banga and Goldar, 2004), public regulations are in themselves a growth factor for some services, such as professional services (Vittadini and Barea, 1999). Finally, private institutions have also undergone social changes that have boosted the growth of specific services (Wirtz, 2001).

FIGURE 1.
Relationships between services and economic growth: A summary



Source: Own elaboration

In order to summarize and put into order the group of factors under analysis, four types of essential changes (previously described) can be distinguished: changes in production factors (mainly labour and human capital); changes in productive systems (flexibility and integration goods-services); changes in markets and income (due to economic growth and external economies); and, finally, changes in institutional system (public services, regulations, cultural and social changes). For each of these factors, three decisive elements of current societies interact: the incorporation of new technologies and innovations, globalization, and demographic and territorial changes. These three elements of socio-economic change simultaneously cause and affect the afore-mentioned four driving forces of structural change. In addition, some aspects interact with each other but cannot be assigned a specific

explanatory dimension. These include not only the three factors of socio-economic change (ICT, globalization and social and territorial change), but also many other, individual elements under consideration. Figure 1 recaps these dimensions.

The growth of employment in the service industries has been one of the features of economic change in the 20th century. But, additionally, it has also become a source of controversy as some scholars have identified the growth of services and the decline of industry as the cause of poor economic performance. When services have been considered in the context of economic growth they have been regarded as being, at best, parasitic, feeding off more productive sectors of the economy or, at worst, inimical to the entire process of economic development (Lee, 1996). Thus, how services affect to economic growth in advanced economies? Both economists and historians have invested great efforts in the attempt to explain the conundrums of economic growth. But, in spite of the large part played by services in both modern and preindustrial economics, this group of activities has received little attention.

The thesis of the poor economic performance of services, developed by the classical economists in the 19th century, relied heavily on the notion of capital accumulation in terms of tangible goods. In two celebrated works, Kaldor developed an explanation for economic growth driven by manufacturing productivity⁵ (1966, 1967). He subsequently diagnosed a slow growth as a function of the excessively large service sector which, he argued, retained labour when it was in short supply⁶. Similar ideas underpinned the diagnosis offered by Bacon and Eltis (1976). This was an attack on the size of the public sector, which was almost entirely comprised of services. Theoretically, the culmination of this strand of thought is encompassed in Baumol's growth model (1967). However, in recent years these negative thoughts on services has revisited or limited. Some works (Economic Council of Canada, 1984; Swan, 1984) affirm that 'the service industries, through productivity growth and agglomeration economies, can generate significant economic growth in western countries' (Mansell, 1985). Despite the interest on theoretical works, there have been only a few empirical studies on services and economic growth. Dutt and Lee (1993) found that the effect of a service sector expansion is either positive or negative depending on how the expansion is measured, although there is a strong case that the effect is in fact usually negative⁷. Wilber (2001, 2002) argue that the impact of

⁵ It has become standard in multisectoral growth models to assume that the service sector exhibits lower productivity growth than the manufacturing (Echevarria, 1997, Kongsamut *et al.*, 1997; Xu, 1993; Kozicki, 1997).

⁶ Rawthorn (1975) and others have argued that Kaldor's tests were misspecified and that no such relationship exists. See Bairam (1987) for a survey on this debate.

⁷ This result was later confirmed by Atesoglu (1993) and Neomi (1999), among others.

services expansion will depend on the relative factor intensities in the economic sectors. Additionally, deciding whether slow growth is a consequence of the shift to services is complicated by the absence of satisfactory performance measures for many service industries (U.S. Department of Commerce, 1996).

Measurement problems aside, official data showed a gradual decade-to-decade slowing in average growth rates, coupled with steady expansion in the services share of total output and employment in many of the advanced economies during the post-war period⁸ (Feldstein, 1999; OECD, 1989; Wolff, 1985a; McCombie and Ridder, 1983; Kendrick, 1988, Bjork, 1999, among others). Nevertheless, recent works show a slight opposite trend since 1995, at least in some advanced countries, such as the United States (Bosworth and Triplett, 2007) or the European Union (Maroto and Cuadrado, 2007). In addition, new research shows that, in some service industries, heavy IT investments since the 90s have begun to yield high productivity returns and to positively push economic growth (Brynjolfsson and Hitt, 1993; Roach, 1991; Turk and Montes, 1995, among others).

In conclusion, the effect of an expansion of the service sector depends on which services are expanding. An expansion that is dominated by the more labour-intensive services, such as personal and social services, hotels and restaurants or some business services, will tend to have a negative impact on economic growth. An expansion that is dominated by capital-intensive services, such as transportation and telecommunications, will have a positive impact on growth. This highlights the need for further disaggregation in both the theoretical and, more importantly, the empirical research on the relationship between services and economic growth.

3. SERVICE SECTOR AND PRODUCTIVITY: THE SQUARING OF THE CIRCLE?

Within services research, productivity has been one of the most important issues from an economic point of view. The reasons for why services productivity is important are easy to understand. Developed economies have shown a progressive intensification of the services sector. For this reason, in the long term, the overall productivity should converge with growth rates similar to productivity rates in the service industries. In addition, the productivity of services is not only important in itself, but important in the case of intermediate services used to increase productivity in any economic sector. Nevertheless, standard indicators of labour productivity show that services make a contribution to overall productivity growth that is

⁸ See Wolff (1985b) for a survey.

relatively limited compared with the size of the sector. Slow productivity growth overall, however, masks a wide variety of experiences and is also influenced by measurement problems.

The first section of this paper introduced productivity to explain the growth of services. One of the most conventional statements in economics is that services present a lower productivity level than the other productive sectors, and that its growth is always quite slow. Such a statement is based initially on the personal nature of many services, which makes it difficult to substitute the work for capital factor and the incorporation of technical progress. In this section, we will look in greater depth at issues related to services productivity, from conceptual aspects regarding the definition and meaning of productivity, to methodological and measurement of services productivity.

3.1. The concept of productivity in services:

An easily contrasted fact is that when discussing about productivity, some confusions arise (Sharpe, 1995; Gadrey, 1992). It seems to be necessary to clarify the different concepts of '*productivity*' in services sector. Despite its limitations, the indicator traditionally used to measure productivity in services is the relationship between production and labour force, also known as '*apparent labour productivity*' or '*relative labour productivity*' (OECD, 2001a). However, when analyzing the services sector, the value and significance of this index could be also questioned⁹.

The *physiocrats* introduced the concept of '*productivity*' in which the agricultural sector was regarded as the only sector capable of creates wealth¹⁰. In the context of present time it should be noted that the *physiocrats*', including Adam Smith's and Karl Marx's, notion of services is generally based upon what we today determine as '*consumer services*' or '*personal services*' (Andersen and Corley, 2008). The concept of '*productivity*' has been sophisticated and, in the 20th century, economist defined it as the relationship between the output and the inputs necessary to produce it (Eatwell and Newman, 1991; Antle and Capalbo, 1988; Sharpe, 2002; Kaci, 2006; Mawson *et al.*, 2003; Maroto and Cuadrado, 2006). This definition stands invariable whatever the production system or political framework will be considered (Prokopenko, 1997) and seems to denote the efficiency in the use of productive factors (Samuelson and Nordhaus, 1995).

⁹ The value added of a certain number of services, especially in the case of non-sale ones, is practically equivalent to the use and costs of the labour factor. For this reason, there is a direct relationship between how the production and evolution of productivity per employed person are estimated (De Bandt, 1989; Gadrey *et al.*, 1992).

¹⁰ See Quesnay's Tableau Economique from 1758, or for overview, Screpanti and Zagmagni (1995).

However, current economic realities (liberalized and dynamic markets, constantly changing customer preferences, new structure of production and work, etc.) are leading to a rethinking of the notion of productivity. Whereas traditionally, productivity is viewed mainly as an efficiency concept, it is now viewed increasingly as an efficiency and effectiveness concept, effectiveness being how the enterprise meets the dynamic needs and expectations of customers. Productivity is now seen to depend on the value of the products and services (utility, uniqueness, quality, convenience, availability, etc) and the efficiency with which they are produced and delivered to the customers (Tolentini, 2004). Correspondingly, such broader conception of productivity calls for a wider set of indicators to catch and reflect the new elements and parameters involved. Some of these new parameters are the processes and methods used to improve productivity, sustainable development and 'green productivity', better value-chain and supply-chain management, and, especially, the human factor as key.

3.2. Productivity and structural changes:

Structural change in the economy implies that some industries or sectors experience faster long-term growth than others, leading to shifts of the shares of these industries or sectors in the overall aggregate. Baumol *et al.* (1989) observe that great diversity of productivity developments across industries and sectors and emphasize not only the fact that structural change is a long-term phenomenon, but also that productivity growth is particularly relevant in the long term. This diversity is also a widespread empirical finding in the literature on firm growth (Caves, 1998) and the role of productivity growth in that process (Bartelsman and Doms, 2000).

The topic of structural change and productivity is frequently neglected in economic research¹¹, despite its high relevance for growth theory, business cycle theory and labour market theory as well as for economic policy. This survey section brings together very different strands of literature that are dealing with the relation of productivity and structural change at various levels of aggregation. The synthesis of this survey shows that structural change is shaped by the interaction of differential technological developments on the supply side with demand-side factors.

Under the **3-sector hypothesis** literature, the long-run development of the three main sectors of the private economy (primary, secondary and tertiary) is investigated at a highly aggregate level¹². This pattern of

¹¹ See Krüger (2008a) for a detailed survey on this topic.

¹² This hypothesis postulates a systematic succession of the development of the three main sectors. Initially, the primary sector is dominant. With the advent of industrialization the secondary begins to gain in importance at the expense of the primary sector while the tertiary stagnates. Even later in economic

development was firstly observed by Fisher (1939) and systematically documented in Kuznets (1957, 1966, 1973) for the US case¹³. Broader international evidence to support the tendency of an increasing tertiary sector in terms of employment shares is discussed in Baumol *et al.* (1989) and Nelson and Wright (1992).

Initially, the theoretical literature on the 3-sector hypothesis was concerned with the discussion of different criteria for the classification of the sectors that lead to potentially different theoretical explanations for the observed development (Fisher, 1952; Clark, 1957; Wolfe, 1955). Of these, the explanation by Fourastié (1949), where the growth rate of labour productivity is the criterion, is the most compelling. This issue is analyzed by Baumol (1967), who focuses on the situation of unbalancedness in the transition phase. The empirical evidence can be viewed as a formal support for Fourastié's reasoning that the differential rates of productivity growth are associated with a large-scale labour reallocation towards the tertiary sector. Against this strong prediction several reservations have been raised in the literature. Baumol *et al.* (1985) recognize that not all activities in the services are stagnant. Williamson (1991) points out that part of the evidence may be ascribed to a flawed approach to measuring productivity and to the fact that most services are nontradables. Gunlach (1994) claims that those stylized facts are valid only if the demand for services is income elastic. Moreover, Oulton (2001) shows that Baumol's result crucially depends on the assumption that the stagnant industries produce final products.

Neoclassical economic growth theory also addresses structural change. Meanwhile, a number of models¹⁴ exist that are directly aimed at explaining the development pattern postulated by the 3-sector hypothesis (see, among others, Echevarria, 1997; Laitner, 2000; Kongsamut *et al.* 2001). Other models are not limited to just two or three sectors but in the most extreme cases deal with a continuum of infinitely many sectors. These **multisector models** treat the sectors as symmetric after a certain stage of analysis. Prominent examples are Aghion and Howitt (1992), Grossman and Helpman (1991) and Romer (1990) which are the seminal papers of what has later been called *Schumpeterian growth theory*. Other models¹⁵ combine the increasing number of sectors with the aspect of quality improvements in these sectors (Aghion and Howitt, 2005; Jones, 1999). The multisector endogenous growth model of Aghion and Howitt (1998) is relatively

development, labour and production begin to shift from the primary and secondary sectors towards activities in the tertiary sector.

¹³ Kongsamut *et al.* (2001) term these empirical regularities as the Kuznets facts – in analogy to the stylized facts established by Kaldor (1961) for aggregate magnitudes.

¹⁴ They all build on the standard general equilibrium framework of growth models according to Solow (1956), Ramsey (1928), Cass (1965) and Koopmans (1965).

¹⁵ See Kortum (1997) for a more detailed discussion.

general and reveals the deficiencies of this type of model for the analysis of structural change¹⁶. Even more sophisticated is the model of Klette and Kortum (2004) in which heterogeneous firms are innovating and growing and shrinking, thereby shaping the aggregate outcomes. This is exactly the pattern that Harberger (1998) refers to as the 'yeast' process. A notable exception to the symmetric treatment of industries is the model constructed by Meckl (2002). Three further related models are worth discussing at this point: Acemoglu and Guerrieri (2006), Ngai and Pissarides (2007) and Foellmi and Zweimüller (2002). They all show that balanced growth at the aggregate level is consistent with structural change at the level of sectors. In a rather different framework, Durlauf (1993) uses random field methods to model how technological complementarities across industries affect industry and aggregate dynamics.

The criticism by Harberger (1998) is best addressed in a theoretical framework such as that of **evolutionary economics** (Dosi, 1988; Dosi and Nelson, 1994; Nelson, 1995; Nelson and Winter, 1982). In two books, published in 1981 and 1996, Pasinetti presents a theory of structural change based on post-Keynesian and classical elements. Notarangelo (1999) shows that Baumol's (1967) two-sector model can be viewed as a special case of the pure-labour model analyzed in Pasinetti. The decisive factor influencing the direction of structural change in the models for the 3-sector hypothesis as well as for Pasinetti's one is the demand side. In other evolutionary perspectives on structural change, the influence of the supply side is considered to be more important. Salter (1960) develops a theory in which the differential differences of productivity growth rates across industries change relative prices and lead to differential rates of output growth. These considerations can now be analyzed more formally using the replicator dynamics mechanism originating from population biology. Some examples are Metcalfe (1994, 1998), Montobbio (2002) and Metcalfe *et al.* (2006). A completely different approach, based on a Markov process, is taken in Krüger (2005, 2008b). Pasinetti (1981) already introduced the possibility of an increasing number of industries. A more recent and elaborate analysis through the emergence of new industries and sectors is presented in Saviotti and Pyka (2004a and b). Their analysis highlights the technology-driven nature of structural change together with the force of intra- and inter-industry competition.

Another strand of literature is concerned with the effects that reallocation among industries exerts on aggregate productivity growth. This research originates from empirical studies of entry, exit and growth dynamics at the level of firms and individual establishments (Dunne *et al.*, 1988, 1989; Caves, 1998). The empirical studies of Baily *et al.* (1992, 1996, 2001), Disney *et al.* (2003) and Foster *et al.* (1998) all use alternative descriptive decompositions of a share-weighted measure of average productivity growth or productivity levels. Griliches and Regev

¹⁶ See Howitt (2000) for an extension.

(1995) propose an alternative decomposition that is less sensitive to measurement errors. Olley and Pakes (1996) decompose the average productivity level into the sum of the equal-weighted average productivity and a term representing the effect of reallocation from below-average productivity industries to above-average productivity ones.

At the industry level, Fegerberg (2000), Peneder (2003) and Krüger (2006) employ decompositions very similar to that of Baily *et al.* (1996), although with a slightly different interpretation of the between-industry effect. The results regarding structural change among US manufacturing are surveyed by Bartelsman and Doms (2000) and Haltiwanger (2000). Cantner and Krüger (2006) investigate a sample of German manufacturing firms. Haltiwanger (1997) emphasizes that structural change is much more intense within industries than between industries. Finally, Maroto and Cuadrado (2007 and 2009) focus particularly on the service industries within their study on structural change and overall productivity growth in a sample of OECD countries.

3.3. Traditional theories on service sector productivity: Baumol's 'disease costs' or Services as 'guilty' of overall low productivity.

As it was previously mentioned in the first section of the paper, researchers have mainly cited the relative productivity of services to explain the sector's growth, and this reason is still used in many areas. With regard to the relationship between the progressive growth of services in the economy and their low productivity, the most important advances are due to those works written by William Baumol (1967 and 1986; *et al.*, 1985 and 1989). Baumol showed the differences in productivity as a result of the role played by the labour force in each of the activities. The well known Baumol's 'disease' brings out a decrease in economic growth due to its influence on productivity, while at the same time prices in services increase. The results of the above-mentioned 'Baumol's disease' would consist on a decreasing path of economic growth and aggregate productivity growth in advanced economies. Taking account the increasing role of service activities within economic structure of these countries, the aggregate productivity growth would slow due to less dynamic behaviour of productivity within tertiary branches and its contribution to the evolution of total factor productivity. Many recent empirical works have tried to provide a contrast to this series of relationships in the services sector. Oulton (2001) analyzed the contribution of services to overall productivity growth in the United Kingdom and United States since end-70s to mid-90s. Wölfl (2003, 2005, 2006) used a sample of OECD countries and related the weight of services in economic activity and productivity growth rates in them. Maroto and Cuadrado (2007) updated this kind of research for a wider sample of advanced economies. Finally, Maroto and Rubalcaba (2008) have contrasted the contribution of services to overall economic growth in the European Union and United States since 1980 onwards. A negative relationship between aggregate productivity growth

and the percentage of service activities over the total economy (both in terms of employment and value added) seems to appear.

The aggregate evidence for the majority of developed countries suggests a negative relationship between the growth of aggregate productivity and the weight of the tertiary sector, not only in terms of production but also in terms of employment. (Maroto and Cuadrado, 2009). Obviously, the different ways in which services may be incorporated into production processes may bias these results. In any case, the argument is usually based on the traditional idea that services are characterized by a low productivity growth in comparison with other productive sectors. However, as we will consider at the next section, his hypothesis has been recently refuted by numerous authors, and mainly by the empirical evidence itself (see Table 1 for a summary).

3.4. Revisions and new developments:

In recent years, as other authors have criticized or have even contemplated that Baumol's disease has been '*cured*', Baumol (1989) has corrected and redefined his positions by distinguishing between types of services. Along the same lines, more recent studies show that only one-third of the services sector can be identified as low productivity growth activities, while the rest includes sectors registering similar growth rates or even higher than the manufacturing sector (Rubalcaba and Maroto, 2007). More recently, Baumol (2000) draws conclusions that highlight the importance of services and their innovation to economic growth.

In general, criticism and reviews (see Table 1) are based on the following points:

1. The need to take the indirect effects, measures and indicators of services productivity into consideration (Rubalcaba, 1999; Wolff, 1999; and Rubalcaba and Kox, 2007), as a result of the conceptual and statistical debate arising over the last ten years, from the decisive works by Gadrey (1996) and other French authors, and up until the most recent works developed by the OECD and other international organizations (European Commission, 2004b, 2005 and 2008).
2. The need to limit the application of Baumol's theories solely to end-use services and not to those assigned to intermediate use: although the same services industries have stagnant productivities, the movement of resources towards them must be interpreted not as the result of a fall, but as an increase of productivity (Oulton, 2001). On the other hand, a lower services productivity can be a reflection of the higher productivity generated in the companies using them (Raa and Wolff, 1996; and Fixler and Siegel, 1999; Ciccone and Hall, 1996; de Groot, 1998).

TABLE 1.
Relationships between services and productivity. Main theoretical approaches

Historical age	Cited authors	Theoretical views	Summary
First half of the 20 th century	Fisher, A.G.B.; Kuznets, R.; Clark, C.; Fuchs, V.; Wolfe, M.	First appearance of services in the studies on long run economic growth	First approaches on the relationship between services and productivity
	J. Fourastié	Low relative productivity of services as explanation of growth of the sector → First approach to the relationship between productivity and services (1949)	
From end-60s to the 90s	W. Baumol and others (Blackman, Wolff, Bowen)	Services' cost disease and its explanations	'Boom' on productivity and services: services as guilty of low overall productivity → Conventional theories
From the 90s	L. Foster and others (Haltiwanger, Krizan)	Effects of the reallocation of resources towards services on the productivity growth	
	Bernard, A. and Jones, C.; Raymond, J.L.	Effects of the low relative productivity growth within services on the overall productivity growth	Revisions and new theoretical inputs → Services as themselves are not unproductive, but it depends on the analyzed branch or subsector and other issues to be taken into account
	Baumol, W.; Triplett, J.; Bosworth, B.	Services dualism or heterogeneity : Dynamic services versus labour intensive ones	
	Gadrey, J. ; Gallouj, F.	Role of innovation and knowledge on the productivity growth within some services	
	N. Oulton ; Schreyer, P.	Service 'quality' and theories on hedonic prices	
	Wolff, E.N. ; Raa, T.; Fixler, D.; Siegel, D.; Rubalcaba, L.	Indirect indicators and estimations (Baumol's thesis could only be observed in the final demand services → Outsourcing and indirect productivity	
	Pilat, D. ; Kox, H.; De Bandt, J.	Role of other elements independent from the labour factor , such as the nature of the service, the substitution relationships or the market segmentation	
	Van Ark, B.; O'Mahony, M. ; Piatkowski, M., Stiroh, K.; Jorgenson, D.	Role of ITCs and the Information Society in the dynamism of some service subsectors	
	Griliches, Z. ; Wölfl, A.; Hartwig, J.; Inklaar, R.; Timmer, M.; Ahmad, N.	Measurement and definition issues and possible infraestimation of services productivity	

Source: Own elaboration

3. Recent empirical approaches highlight the role of the strong productivity in some services branches, especially those related to ICT (O'Mahony and van Ark, 2003; van Ark and Piatkowski, 2004; Stiroh, 2001; Triplett and Bosworth, 2002). Paradoxically, and despite the strong investments carried out in ICT, another relevant aspect regarding the concept of technological change and services innovation is that several empirical studies have pointed out that investing effort is out of sync with results achieved in terms of productivity. This phenomenon is known as the '*paradox of productivity*'¹⁷. There have been numerous explanations of this apparent lack of concordance between both variables. Roach (1991) and Brynjolfsson (1993b) focused on the differential features of the market structure of the services sector activities as an explanatory element.
4. Other authors have basically interpreted this phenomenon as a measurement problem (Griliches, 1994; Siegel, 1994; Schreyer, 1998 and 2001; Pilat *et al.*, 2002; Ahmad *et al.*, 2003; Berndt *et al.*, 1998; Elderidge, 1999; Lebow and Ruud, 2001; Berndt and Griliches, 1993; Nelson *et al.*, 1994; and Berndt *et al.*, 1995).
5. Other explanations have focused on the aggregate nature of the studies carried out, so that the microeconomic – rather than the macroeconomic – analysis approach seems the most appropriate (Lichtenberg, 1995; Brynjolfsson and Hitt, 1993; and Pilat, 2004; David, 1990).

3.5. Indicators and methodological issues for productivity measurement in services sector:

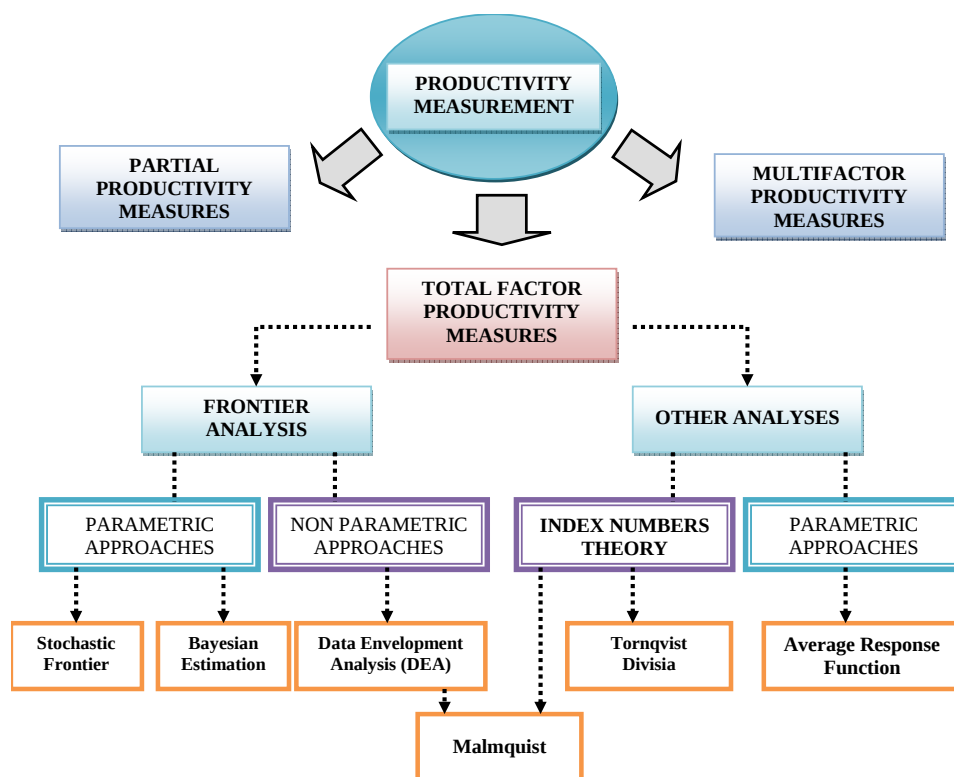
Productivity measurement can be approached by different ways. Determination of which one to use should be based on the particular aim of the research and the availability of data. A summary of most techniques to measure productivity is shown in Figure 2. When economists refer to productivity, at the broadest level they are referring to an economy's ability to convert inputs into outputs. Productivity is a relative concept with comparisons either being made across time or between different production units (Owyong, 2000; Mawson *et al.*, 2003). Different types of input measure give rise to different productivity indicators. Productivity measures, such as labour productivity and capital productivity, which only relate to one class of inputs, are known as *partial productivity measures*¹⁸. Matters related to

¹⁷ Term introduced by Roach (1988) although extended by the winner of Nobel Prize Robert Solow (1987).

¹⁸ Caution needs to be applied when using partial productivity measures as changes in inputs proportions can influence them. However, they are useful as measures of potential growth (Steiner, 1950). Sargent and Rodriguez (2000) argue that determination of which measure to use should be based on the time period of interest.

univariate productivity indicators have aimed to work out with the concept of *total factor productivity measures*¹⁹ (TFP). Partial and total factor productivity measures are, nevertheless, not independent because multifactor productivity growth accounts among the sources of labour productivity growth (Schreyer and Pilat, 2001). When all inputs in the production process are accounted for, TFP growth can be thought of as the amount of growth in real output that is not explained by the growth in inputs. This is why Abramovitz (1956) described the TFP residual as a '*measure of our ignorance*'.

FIGURE 2.
Methodological approaches to productivity measurement



Source: Own elaboration

Productivity measurement presents several issues and problems (Ahmad *et al.*, 2003; Schreyer, 1996; Gullickson and Harper, 1999; van Ark, 1996; Nordhaus, 2000; Kuroda *et al.*, 1996). But these issues are even more significant when services are analyzed (Griliches, 1992 and 1994;

¹⁹ These factors generally aggregate only labour and capital inputs (not considering other inputs, such as land, energy or service inputs). Thus, some authors prefer defining this kind of indicator as *multifactor productivity measures* (MFP) (BLS, 2001; Eatwell and Newman, 1991, OECD, 2001a).

Kendrick, 1985; Bosworth and Triplett, 2000; Wölfl, 2004; Maroto, 2009). The key role of services in advanced economies and the relatively slow growth of the real tertiary output have guided to an increase of the relevance of the debate on productivity measurement within services. International comparisons started with the work by Paige and Bombach (1959). Since then, there have not been studies covering every service industries until the research series of the University of Groningen²⁰. Schreyer and Pilat (2001) presented the state of the art of productivity measurement within each service activity.

Empirical evidence may be linked to an under-estimation of service productivity growth (Gordon, 1995; Baily and Gordon, 1988; Slifman and Corrado, 1996; Gullickson and Harper, 1999; Sharpe *et al.*, 2002; Vijselaar, 2003; Rubalcaba and Maroto, 2007; Inklaar *et al.*, 2003). The effect of different measurement biases would depend on the role of mismeasured service industries to other industries and overall activity (De Bandt, 1995; OECD, 1997; Wölfl, 2003 and 2004). There are three areas where measurement biases may arise. These relate, firstly, to the choice of inputs, secondly to the choice of outputs at current and constant prices, and finally to the approach of aggregation across industries (Schreyer, 2001; Diewert, 2007 and 2008; OECD, 2001a). Not all of these possible measurement biases can be easily examined. This might be the reason why, in the empirical literature, there are only few studies that analyze measurement bias in a comprehensive way. Indeed, alternative approaches to measure productivity in services are introduced along the literature (Riddle, 1986; Elfring, 1988a; De Bandt, 1991; Griliches, 1992; van Ark, 2002; or statistical improvements of *Voorburg Group on Service Statistics* in Canada).

The first component of measurement bias relates to the **choice of inputs**. In the case of labour productivity growth, this means first of all measuring the primary input labour in terms of total number employed or total hours worked²¹. Absolute differences between productivity growth in manufacturing and services are wider if the number of employed people is used (McLean, 1997). According to Nordhaus (1972) and Baily and Gordon (1988), estimations of labour productivity could have forgotten the downturn of hours worked per employee, underestimating the productivity growth during the 70s and 80s. The second issue concerning the choice of inputs is the relationship between labour input and intermediate input. This is particularly relevant in relation to the increasing tendency of firms towards outsourcing. Measurement problems might, in particular, arise indirectly via the input-output flow of goods and services. Two notorious examples are distributive services (Oi, 1992; Johnston *et al.*, 2000) and financial services (Triplett, 1992; Colwell and Davis, 1992; Fixler, 1993). The final issue related to inputs might be the localization of capital services

²⁰ Under the framework of ICOP project.

²¹ This issue might be notorious, particularly, when self-employed and part-time jobs are analyzed (OECD, 2001c).

among subsectors (Triplett and Gunter, 2001) and the time series of capital flows (Diewert and Lawrence, 1999; Lequiller *et al.*, 2003).

The second measurement component relates to the **choice of output** at current and constant prices. This is the most discussed component of measurement bias in the context of service productivity growth. A first key question is the definition of output of some services, e.g. financial services, which is not necessarily the same across countries (Griliches, 1999; Sichel, 1997; Sharp, 1998). The second issue concerning the output component of measurement bias is the calculation of constant price value added. It is for instance difficult for several services to isolate price effects that are due to changes in the quality or mix of services from pure price changes, and to adjust for such quality changes in the price index (McGukin and Stiroh, 2001; Triplett and Bosworth, 2001; Swick *et al.*, 2006; and the recent papers by the Brookings Institution Program on Productivity Measurement²²). As a result, different measures are used in OECD countries for the computation of constant price value added (OECD, 1996; BLS, 1992). This issue has been widely analyzed in the economic literature (Baumol and Wolff, 1984; Eldridge, 1999; Lebow and Rudd, 2001; Wölfl, 2003). One of the most relevant examples of the underestimation of productivity growth in services sector is the one related to ICT sectors (Dean, 1999; Landefeld and Fraumeni, 2001; Triplett and Bosworth, 2000).

The third component of potential measurement bias relates to the **estimation of aggregate productivity growth**. There are two main channels through which measurement bias in services might work through to the aggregate level. The first channel is via aggregation and is related to the relative weight that is attributed to the mismeasured services in total value-added and employment of the economy. The second channel concerns the role of specific services as intermediate inputs for other industries.

Indeed, many recent studies look at measurement problems in services, including Wölfl (2003 and 2004), Triplett and Bosworth (2004, 2008); Crespi *et al.* (2006), Hartwig (2008) or Inklaar *et al.* (2008a and b). Triplett and Bosworth in particular conclude that in the United States, productivity measurement in services has improved considerably, even as numerous areas for further improvement still exist. Additionally, Inklaar, Timmer and van Ark affirm that progress is still uneven across Europe and less extensive than in the United States. Progress is possible in various ways. First, many countries can improve measurement of services output by adopting best-practice methods already applied in other countries. Second, a more careful application of existing models of production in services such as wholesale and retail trade (Triplett and Bosworth, 2004; van Ark *et al.*, 2003a; Gordon, 2004; Inklaar and Timmer, 2008; Manser, 2005), but also transport and communications or health (Feldstein, 1969; Mukerjee and Witte, 1992; Triplett, 1999;

²² Available at www.brookings.edu/es/research/projects/productivity.htm

Berndt *et al.*, 2000 and 2001), can be very fruitful. Finally, in other services industries, like banking (Berger and Humphrey, 1992; Basu *et al.*, 2008; Colangelo and Inklaar, 2008; Inklaar and Wang, 2007; Wang *et al.*, 2004; Basu and Wang, 2006) and insurance (Hornstein and Prescott, 1991; Deny, 1990; Hirshorn and Geehan, 1977, 1980), more research is needed to develop a good conceptual framework of production and define the data needs to implement such a framework.

The empirical evidence up to now can only give an initial picture of the extent of measurement bias and its effect on industry and aggregate productivity growth. It does not resolve the measurement problems that have become increasingly apparent in the services sector. Some countries have recently taken steps to improve output measurement and OECD (OECD, 2001b, 2002a-d) is working with its member countries in several areas, including financial services, insurance and software. Nevertheless, further progress is required to improve productivity growth measures and enhance our understanding of the drivers of growth and the cross-country differences in productivity growth performance.

4. CONCLUSIONS:

The processes of structural change in recent decades have turned developed economies into services economies. The literature review carried out in this paper confirms the multiplicity of explanatory factors of services growth, although no decisive theory exists for its explanatory capacity. Traditional ideas associate services growth with both their lower apparent relative productivity and higher levels of income. Although there is some validity to these theories, current evidence and recent data reveal other underlying elements that act as driving forces on services: changes in production factors, changes in productive systems, changes in markets and changes in the institutional system. These changes are related to factors such as information and communication society, globalization and demographical and territorial changes. Among these factors, some stand out: integration between goods and services, which has increased the intermediate demand for business services; the interrelation between new technologies, innovation and services; the importance of human capital and qualifications (particularly in advanced services) and specialization; the role of international trade and investment; and finally, through its regulations and institutional changes, the role of the State in the economy. Moreover, the influence of statistical factors is, to a certain extent, present in the advances experienced by services as a sector. Large enterprises traditionally considered manufacturers became tertiary companies when their production of services exceeded a certain threshold.

Secondly, various relevant conclusions can be drawn from the analyses carried out in the productivity review. Firstly, it seems clear that the analysis regarding productivity in the services sector is the core of an increasing debate, principally regarding its definition and measurement. A major concern is produced when stagnant or slow productivity in services may slow to entire economic growth due to a major participation of services in total economy. In recent years, the so-called '*Baumol's disease*' has been submitted to criticism in some important works. Major revisions of his ideas has been made when intersectoral relationships are taken into account, the role of ICT has been revised, measuring and conceptual factors are pointed out, and finally, when a set of explanatory factors for services is identify so productivity is just one dimension of the complex service growth.

This is, however, just a starting point. The effect of errors in the definition and measurement of productivity in services on the aggregate economic growth, as well as the heterogeneity in terms of productivity within the sector itself, need a far deeper analysis. Not only political-economic authorities, but also service market protagonists themselves (companies and public organizations) have a wide area in which to act and achieve improvements in their respective productivity growth rates. For this very reason, many countries are now developing policies and studies aimed at the improvement of these aspects, and international organizations are working together with national offices in order to improve the information and its analysis in numerous areas, such as financial and insurances services, or business services. This is the way to better measure the productivity of services and to extend the knowledge regarding growth factors and international differences that underlie the operation and growth of productivity.

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